APCO
ASIA PACIFIC CONSORTIUM ON OSTEOPOROSIS

A summary of The APCO Framework

The 1st pan-Asia Pacific clinical practice standards for the screening, diagnosis & management of osteoporosis

Disclaimer

The information provided by APCO, including but not limited to the APCO Framework, the APCO Healthcare Practitioner Educational Slides, and the APCO QI Toolkit (collectively, the "APCO Materials"), are intended for qualified medical doctors and provided solely for information purposes only. The information provided does not constitute medical advice and shall not operate in any way to substitute, replace or affect any proper medical advice, diagnosis, analysis, testing, and treatment provided by qualified medical doctors. APCO assume no responsibility for any circumstances arising out of or in connection with the use, misuse, interpretation or application of any information contained in the APCO Materials.

APCO exclude all implied conditions, warranties, representations or other terms which may apply to the APCO Materials, APCO's website, any content of APCO's website and any documents or information made available on APCO's website. APCO will not be liable for any loss or damage, whether in contract, tort (including negligence), breach of statutory duty, or otherwise, even if it is foreseeable, arising out of or in connection with the use or the inability to use APCO's website, use of or reliance on any content on APCO's website or any documents or information (including the APCO Materials) made available on APCO's website. In particular, APCO will not be liable under any circumstances for (i) loss of profits, sales, business, or revenue; (ii) business interruption; (iii) loss of anticipated savings; (iv) loss of business opportunity, goodwill or reputation; or (v) any indirect or consequential loss or damage.

Publishing details

The APCO Framework
Asia Pacific Consortium on Osteoporosis (APCO)
www.apcobonehealth.org
c/o Osteoporosis Australia

C2.11, Level 2, 22-36 Mountain Street
Ultimo NSW 2007
AUSTRALIA

Tel: + 61 (0)2 9518 8140 / 1800 242 141
secretariat@apcobonehealth.org

Osteoporosis International
Development of the Asia Pacific Consortium on Osteoporosis (APCO) Framework. Clinical standards of care for the screening, diagnosis, and management of osteoporosis in the Asia-Pacific region.

DOI number
https://doi.org/10.1007/s00198-020-05742-0

First edition published 2021

The APCO Framework was developed by the Asia Pacific Consortium on Osteoporosis and published in Osteoporosis International by Springer Publishing

Recommended citation
Chandran, M., Mitchell, P.J., Amphansap, T. et al. Development of the Asia Pacific Consortium on Osteoporosis (APCO) Framework: clinical standards of care for the screening, diagnosis, and management of osteoporosis in the Asia-Pacific region. Osteoporos Int (2021). https://doi.org/10.1007/s00198-020-05742-0

Contents

About APCO, APCO mission & vision i.

Executive summary ii.

Authors ii.

Foreword iii.

The landscape 1.

The APCO Framework 2.

5IQ analysis and Delphi Consensus process 3-5.

16 minimum clinical standards 6-9.

The APCO Framework infographic 10-11.

Application of the Framework to clinical practice guidelines 12.

Recently established and emerging themes in osteoporosis care 12-13.

References 14.

Appendices 15.

1. Appendix 1. The 5IQ model for analysing the content of clinical practice guidelines
2. Appendix 2. Delphi questionnaires toward consensus on clinical standards for osteoporosis

Declarations 21.

Conflicts of interest 21.

Acknowledgements 22.

About APCO

The Asia Pacific Consortium on Osteoporosis (APCO) comprises osteoporosis experts from several countries and regions in the Asia Pacific, charged with developing tangible solutions to the substantive challenges involving osteoporosis management and fracture prevention in this most populated and fastest growing part of the world.

Mission

APCO's mission is to engage with relevant stakeholders, including healthcare providers, policy makers and the public, to help develop and implement country and region-specific programs for the prevention and treatment of osteoporosis, and its complication of fragility fractures, in the Asia Pacific.

Vision

APCO's vision – to move "towards reducing the burden of osteoporosis and fragility fractures in the Asia Pacific region" – will be achieved by:

- **Securing stakeholder acceptance of osteoporosis as a key public health priority;**
- **Creating solutions to minimise the burden of osteoporosis and reduce fragility fractures; and**
- **Enabling healthier ageing through fewer fractures.**

The APCO Framework

Executive summary

The APCO Framework represents the first pan-Asia Pacific clinical practice standards for the screening, diagnosis and management of osteoporosis, targeting a broad range of high-risk groups.

Published in Osteoporosis International, 'The APCO Framework' comprises 16 minimum clinical standards that serve as a benchmark for the provision of optimal osteoporosis care in the region.

The APCO Framework represents a set of clear, concise, relevant and pragmatic clinical standards to support national societies, guidelines development authorities, and health care policy makers with the development of new guidelines, and to encourage the revision of existing guidelines.

Implementation of the minimum clinical standards proposed by the APCO Framework, and reform of existing guidelines, will support clinical improvement initiatives, while also helping to pave the way for a more holistic approach to osteoporosis care, and ultimately, greater consistency across all national and regional clinical practice guidelines in the Asia Pacific.

The APCO Framework authors

Manju Chandran

Paul James Mitchell

Tanawat Amphansap

Leilani Asis

Sanjay K Bhadada

Manoj Chadha

Ding-Cheng Chan

Yoon-Sok Chung

Peter Ebeling

Nigel Gilchrist

Philippe Halbout

Fen Lee Hew

Aysha Habib Khan

Lan T. Ho-Pham

Tang Ching Lau

Joon Kiong Lee

Sarath Lekamwasam

Greg Lyubomirsky

Ambrish Mithal

Tuan V. Nguyen

Dipendra Pandey

Ian Reid

Atsushi Suzuki

Tet Tun Chit

Kwok Leong Tiu

Thanut Valleenukal

Chee Kwang Yung

Yan Ling Zhao

On behalf of the Asia Pacific Consortium on Osteoporosis (APCO).

Foreword

Developing 'The APCO Framework' has been a challenging, yet highly fulfilling task. It was heartening to see our APCO members, who represent 19 countries and regions in the Asia Pacific, working together, voluntarily, over many months, to achieve this common goal.

The Framework represents the culmination of our APCO membership's knowledge, expertise and commitment to developing tangible solutions to the substantial challenges involving osteoporosis management and fracture prevention for the Asia Pacific – the most populated and fastest growing region of the world.

The Framework will be instrumental in setting a new and enhanced benchmark for the provision of quality care across the region.

The Framework of Minimum Clinical Standards of Care emphasises the need for countries in the Asia Pacific region to develop country-specific, cost-effective intervention thresholds for the management of osteoporosis, whilst still adhering to the minimum standards of care advocated in the Framework.

Dr Manju Chandran

Dr Manju Chandran, MD, FACP, FACE, FAMS, CCD

Chairperson, Asia Pacific Consortium on Osteoporosis (APCO)

Senior Consultant and Director
Osteoporosis and Bone Metabolism Unit
Department of Endocrinology
Singapore General Hospital

Member of the Board, International Osteoporosis Foundation (IOF)

Council Member, Committee of Scientific Advisors (CSA), International Osteoporosis Foundation (IOF)

Deputy Chairperson, Asia Pacific Regional Advisory Council (RAC), IOF

Vice Chairperson, Asia Pacific Panel, International Society of Clinical Densitometry (ISCD)

Osteoporosis landscape

Globally, the population aged 65 years or over increased from six per cent in 1990, to nine per cent in 2019.[1]

This proportion is projected to rise to 16 per cent by 2050,1 meaning one in six people worldwide will be aged 65 years or over by 2050.[1]

Asia Pacific is home to 4.5 billion people, and comprises 71 countries with vastly different healthcare systems.[2]

The number of people aged 60 years and over in the Asia-Pacific region – home to more than a third of the world's population aged 65 years and over, and to more elderly people than any other region[3] – is predicted to triple between 2010 and 2050, reaching a staggering 1.3 billion people.[4]

Osteoporosis is a common disease characterised by porous brittle bones, low bone density and quality, and structural deterioration.[5] It can compromise a person's quality of life through loss of independence and productivity, chronic pain, disability, emotional distress, reduced social interaction, and self-limitation caused by a fear of falling.[6]

Fragility fractures, also known as osteoporotic fractures, are caused by reduced bone strength, and occur following minimal trauma, such as a fall from standing height or less.[7]

In 2010, an estimated 158 million people aged 50 years and above were at high risk of osteoporotic fracture – a figure which is set to double by 2040.[8]

Among all osteoporotic fractures, hip fractures incur the greatest morbidity, mortality, and social and financial costs.[9]

More than 1.1 million hip fractures were estimated to have occurred in China, Chinese Taipei, Hong Kong SAR, India, Japan, Malaysia, Singapore, South Korea and Thailand in 2018, incurring an estimated direct cost of USD 7.5 billion. By 2050, the number of hip fractures are projected to increase by 2.3-fold, to more than 2.5 million cases each year, resulting in staggering projected costs of almost USD 13 billion.[10]

The cost of treating a single hip fracture represents approximately 19 per cent of Asia Pacific's regional per-head gross domestic product (GDP) each year.[9]

The APCO Framework

As its first major initiative, APCO members representing key osteoporosis stakeholders and multiple medical and surgical specialties, developed a set of clear, concise, relevant and pragmatic clinical standards to support national societies, guidelines development authorities, and health care policy makers with the development of new guidelines, and to encourage the revision of existing guidelines.

This new benchmark is set to deliver optimal osteoporosis care throughout the region and address the abundance of anecdotal evidence to date, that demonstrates significant disparity in osteoporosis clinical practice guidelines in the Asia Pacific region. Further, a significant proportion of current guidelines were published more than five years ago, and there is a lack of information on adherence with national guidelines in day-to-day clinical practice across the region.

Although clinical guidelines for managing osteoporosis are available in many countries throughout Asia Pacific, their lack of implementation-related guidance poses the biggest challenge for the optimal diagnosis and management of osteoporosis.[10]

The APCO Framework, published January 27, 2021, 2021, represents the first pan-Asia Pacific clinical practice standards for the screening, diagnosis and management of osteoporosis, targeting a broad range of high-risk groups.

Published in Osteoporosis International, 'The APCO Framework' comprises 16 minimum clinical standards that serve as a benchmark for the provision of optimal osteoporosis care in the region.

Implementation of the minimum clinical standards proposed by the Framework, and reform of existing guidelines, will support clinical improvement initiatives, while also helping to pave the way for a more holistic approach to osteoporosis care, and ultimately, greater consistency across all national and regional clinical practice guidelines in the Asia Pacific.

Implementation of the Framework, or a similar set of standards of care informed by the Framework, is expected to significantly reduce the burden of osteoporosis in the Asia-Pacific region, and worldwide.

The APCO Framework aims to provide clinicians with structured, well-articulated and readily accessible clinical practice guidelines that clearly define:

- Individuals to be identified for assessment;
- Investigations required;
- Relevant indications for treatment;
- Appropriate selection of interventions to be made;
- The guidance and information patients need for self-care;
- Integration of healthcare systems for optimal provision of care; and
- The need, and methods for monitoring and improving the quality of osteoporosis care.

5IQ analysis and Delphi Consensus process

Development of 'The APCO Framework'

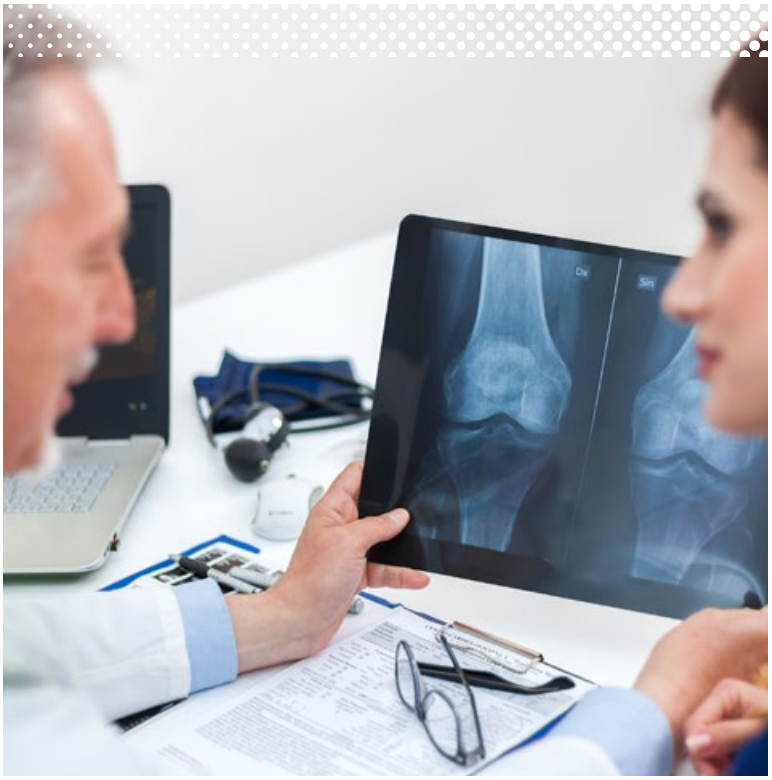
APCO employed a 5IQ analysis to evaluate clinical practice guidelines currently available in Asia Pacific. A subsequent comprehensive, four-round Delphi consensus method enabled APCO members to reach agreement on a benchmark set of clinical standards for the provision of quality osteoporosis care for the Asia Pacific region.[11]

To develop the Framework, APCO:[11]

I. Conducted a systematic, structured analysis of existing guidelines in the Asia Pacific region;

II. Identified regionally relevant key guidelines elements and

III. Using a structured consensus process, developed feasible regional clinical care standards designed to support clinical improvement initiatives, and to provide a Framework for adaptation and adoption throughout the region.



The 5IQ model used for analysing the content of the clinical practice guidelines accounted for the following:[1]

- **Identification** – A statement of which individuals should be identified;
- **Investigation** – A description of the types of investigations to be undertaken;
- **Information** – A description of the type of information to be provided to an individual;
- **Intervention** – A description of pharmacological interventions and falls prevention;
- **Integration** – A statement on the need for integration between primary and secondary care; and
- **Quality** – A description of professional development, audit, and peer review activities.

The 5IQ exercise assessed the extent of heterogeneity when comparing the national guidelines currently available throughout the Asia Pacific.

From each guideline, information was gathered on case identification, investigations, patient advice and education, interventions, strategies for long-term management and integration of osteoporosis into health systems, strategies to promote the delivery of quality clinical care and other background data.

Findings from the 18 clinical guidelines examined using the 5IQ analysis revealed marked disparity in recommendations:[11]

Identification

The most commonly cited risk factors for osteoporosis included excessive alcohol consumption, family history of osteoporosis and/ or fracture, smoking, low body mass index (BMI), height loss, age (70 years or over), and early menopause.

Rheumatoid arthritis, malabsorption, hyperthyroidism, multiple myeloma and diabetes were among the medical conditions listed as common risk factors for osteoporosis.

Investigations

Investigations included in the various clinical guidelines examined, canvassed biochemical tests, risk assessment tools, vertebral fracture assessments, falls risk assessment and specialist assessment.

Information

All guidelines recommended the provision of information on calcium intake, and all but one endorsed information on exercise, while only a portion of the guidelines recommended the provision of information to patients on sun exposure and fracture risk.

Interventions

Intervention recommendations included pharmacological treatment options, adjunctive treatments, and falls prevention programs. Various guidelines comprised specific directions on adverse effects, monitoring therapeutic response, and long-term follow up, treatment duration and adherence.

Integration

Only two of the guidelines clearly demonstrated the need for a long-term care plan to be devised and provided to the patient or their primary care provider.

Quality

There was a lack of guidance on the audit of practice standards or the need for continuing professional development (CPD) and learning for health care professionals (HCPs).

The Delphi process

The Delphi technique (a structured communication technique using a systematic, interactive forecasting method reliant upon an expert panel) was employed to achieve APCO member consensus for the development of clinical standards of care.[12]

Delphi rounds

Round 1 – APCO members were invited to complete an online survey comprising 32 questions, to determine which aspects of care warranted development of specific clinical care standards. From this first round of the Delphi analysis, notable findings were identified, the Framework structure was determined, and the 16 draft clinical standards were established.

Round 2 – Articulation of the 16 clinical standards and relevant levels of attainment for certain standards were proposed for consensus.

Rounds 3 & 4 – Wording of the clinical standards and relevant levels of attainment were reviewed, amended and finalised.

16 minimum clinical standards

Minimum standards for osteoporosis care that are relevant, pragmatic, and feasible to implement for the Asia Pacific region.[11]

1 Clinical standard 1.

Men and women who sustain a fragility fracture should be systematically and proactively identified to undergo assessment of bone health and, where appropriate, falls risk.

Levels of attainment for clinical standard 1:

- **Level 1:** Individuals who sustain hip fractures should be identified.
- **Level 2:** Individuals who sustain hip and/or clinical vertebral fractures should be identified.
- **Level 3:** Individuals who sustain hip, clinical and/or morphometric vertebral, and/or non-hip, non-vertebral major osteoporotic fractures should be identified.

2 Clinical Standard 2.

Men and women with common risk factors for osteoporosis should be proactively identified to undergo assessment of bone health and, where appropriate, falls risk. A sex-specific age threshold for assessment should be determined for each country or region, and should be included in new or revised osteoporosis clinical guidelines.

3 Clinical Standard 3.

Men and women who take medicines that are associated with bone loss and/or increased fracture risk should be proactively identified to undergo assessment of bone health and, where appropriate, falls risk. A commentary should be included in new or revised osteoporosis clinical guidelines to highlight commonly used medicines that are associated with bone loss and/or increased fracture risk.

4 Clinical Standard 4.

Men and women who have conditions associated with bone loss and/or increased fracture risk should be proactively identified to undergo assessment of bone health. A commentary should be included in new or revised osteoporosis clinical guidelines to highlight common prevalent conditions in the country or region.

5 Clinical Standard 5.

The use of country-specific (if available) fracture risk assessment tools (e.g. FRAX®, Garvan, etc.) or osteoporosis screening tools (e.g. OSTA) should be a standard component of investigation of an individual's bone health and prediction of future fracture risk and/or osteoporosis risk.

6 Clinical Standard 6.

Assessment for presence of vertebral fracture(s) either by X-ray (or other radiological investigations such as CT or MRI), or DXA-based VFA should be a standard component of investigation of osteoporosis and prediction of future fracture risk.

Levels of attainment for clinical standard 6:

- **Level 1:** Individuals presenting with clinical vertebral fractures should undergo assessment for osteoporosis.
- **Level 2:** Individuals with incidentally detected vertebral fractures on X-ray and/or other radiological investigations should be assessed for osteoporosis.
- **Level 3:** Individuals being assessed for osteoporosis should undergo spinal imaging with X-ray or other appropriate radiological modalities, or with DXA-based VFA.

7 Clinical Standard 7.

A falls risk assessment should be a standard component of investigation of an individual's future fracture risk.

8 Clinical Standard 8.

In order to engage individuals in their own care, information should be provided on calcium and vitamin D intake, sun exposure, exercise, and the relationship between osteoporosis and fracture risk.

9 Clinical Standard 9.

The decision to treat with osteoporosis-specific therapies and the choice of therapy should be informed as much as possible by country-specific and cost-effective intervention thresholds. Intervention thresholds that can be considered include:

- History of fragility fracture
- BMD T-Score ≤ –2.5 S.D.
- High fracture risk as assessed by country-specific intervention thresholds.

10 Clinical Standard 10.

New or revised osteoporosis clinical guidelines should include a commentary on the common side effects of pharmacological treatments that are recommended in the guidelines.

11

Clinical Standard 11.

New or revised osteoporosis clinical guidelines should provide a commentary on monitoring of pharmacological treatments. This could include, e.g. the role of biochemical markers of bone turnover and bone mineral density (BMD) measurement.

12

Clinical Standard 12.

New or revised osteoporosis clinical guidelines should provide a commentary on the duration of pharmacological treatments that are recommended in the guidelines. This should include a discussion on the appropriate order of sequential treatment with available therapies and the role of 'drug holidays'.

13

Clinical Standard 13.

Assessment of adherence to pharmacological treatments that are recommended in new or revised osteoporosis clinical guidelines should be undertaken on an ongoing basis after initiation of therapy, and appropriate corrective action be taken if treated individuals have become non-adherent.

14

Clinical Standard 14.

New and revised osteoporosis clinical guidelines should provide a commentary on recommended non-pharmacological interventions, such as exercise and nutrition (including dietary calcium intake) and other non-pharmacological interventions (e.g. hip protectors).

15

Clinical Standard 15.

In collaboration with the patient, the treating clinician (hospital specialist and/or primary care provider) should develop a long-term management plan, that provides recommendations on pharmacological and non-pharmacological interventions to improve bone health and, where appropriate, measures to reduce falls risk.

16

Clinical Standard 16.

New or revised osteoporosis clinical guidelines should provide a commentary on what quality metrics should be in place to assess adherence with guideline-based care.

Levels of attainment for clinical standard 16:

- **Level 1:** Conduct a local 'pathfinder audit' in a hospital or primary care practice to assess adherence to APCO Framework Clinical Standards 1–9, 13 and 15.
- **Level 2:** Contribute to a local fracture/osteoporosis registry.
- **Level 3:** Contribute to a fracture/ osteoporosis registry for your country or region.

The APCO Framework

DOWNLOAD THE COMPLETE APCO FRAMEWORK & CLINICAL STANDARDS:

www.apcobonehealth.org secretariat@apcobonehealth.org asia-pacific-consortium-on-osteoporosis

The APCO Framework Clinical Standards

1ST SET OF MINIMUM CLINICAL STANDARDS (16) FOR THE SCREENING, DIAGNOSIS & MANAGEMENT OF OSTEOPOROSIS

DOWNLOAD THE COMPLETE APCO FRAMEWORK & CLINICAL STANDARDS:

www.apcobonehealth.org secretariat@apcobonehealth.org asia-pacific-consortium-on-osteoporosis

Application of the Framework to clinical practice guidelines

Development of The APCO Framework offers APCO members the opportunity to invite their clinical peers to perform 'pathfinder baseline audits' of adherence to the Framework's standards of care within their respective hospitals, enabling the establishment of baseline levels of adherence with the standards proposed by the Framework, region-wide.

APCO members could also utilise their pathfinder audit results to encourage their respective national guidelines development groups to incorporate the standards of care advocated in the Framework, into new or revised national osteoporosis guidelines.[12]

Recently established and emerging themes in osteoporosis care[11]

In recent years, several paramount themes that profoundly impact strategies employed for osteoporosis management, have emerged. Notably, these themes are either missing or only briefly mentioned in the 18 guidelines dissected through the Delphi analysis.

Emerging concepts in osteoporosis care should be astutely considered and incorporated into new and revised guidelines, following careful deliberation of their applicability to local health care practices.

These include:

- Systematic integration of case identification and management at all levels of health systems, including acute care services, when patients present with fractures (e.g. through FLSs)
- Stratification of individual fracture risk
- The role of sequential therapies
- The use of health economics to inform intervention thresholds and indications for specific classes of osteoporosis therapies.

FLS

- Fracture Liaison Services (FLS) are considered to be the most effective intervention for secondary fracture prevention, with consensus among professionals world-wide on the need for FLS to be adopted and adapted for global implementation.[13]
- Components of effective FLSs include multidisciplinary involvement, dedicated case managers and clinician champions, regular assessment and follow-up, multifaceted interventions and patient education.
- FLS are associated with a reduced number of subsequent fractures and premature mortality,[14] as well as significant increases in rates of BMD testing, initiation of osteoporosis treatment, and adherence to treatment.[15,16]
- From the Asia Pacific region, 111 FLSs are included on the IOF Capture the Fracture – Global Map of Best Practice, 19 of which have been awarded a Gold Star. The IOF Capture the Fracture is a global initiative providing an international benchmark for FLSs through 13 globally-endorsed standards of service delivery.
- Despite the extensive body of literature supporting the use of FLSs, only four out of the 18 guidelines evaluated emphasised the role of FLSs, demonstrating a lack of recognition for their importance.

Risk stratification

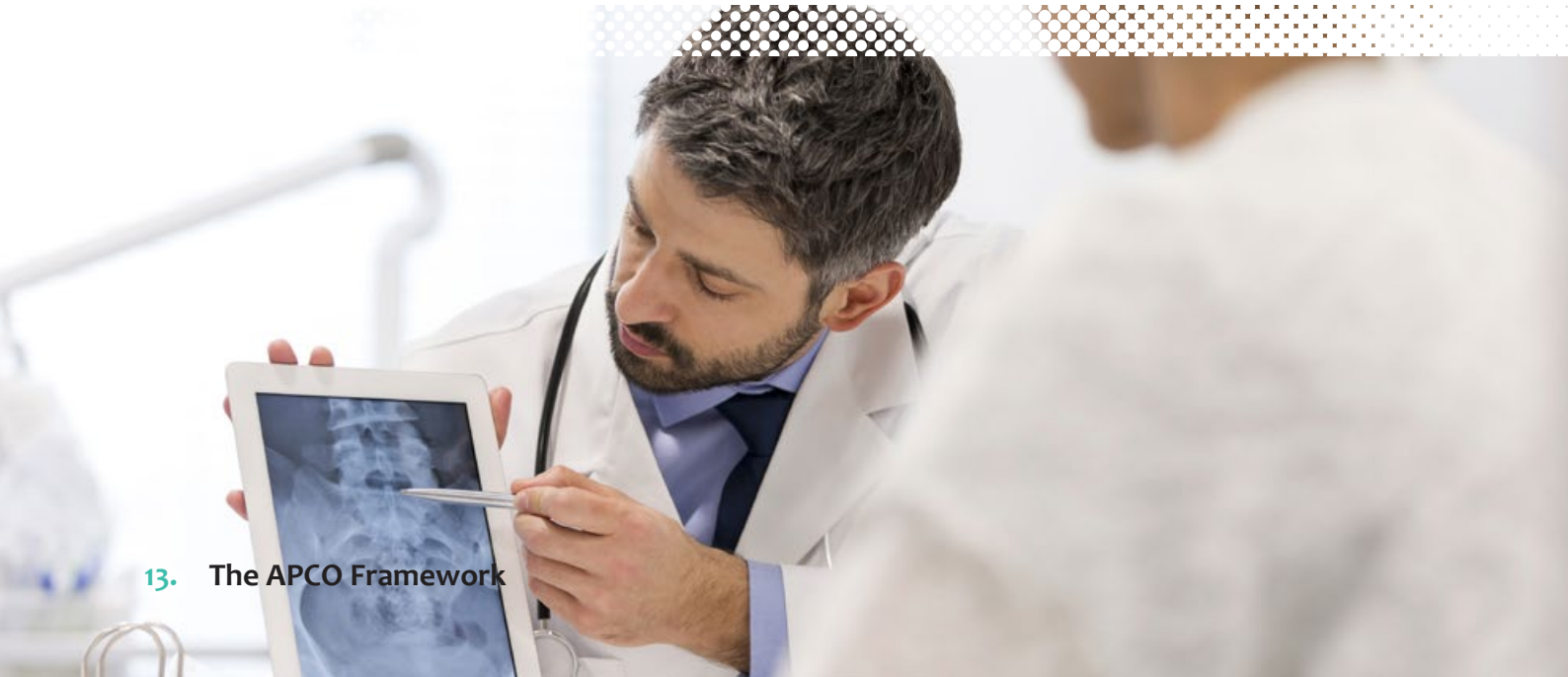
- Risk factors, such as imminent fracture risk, age, family history of fracture and glucocorticoid use, particularly in the event of multiple risk factors, can shift individuals into a higher strata of risk.[17]
- Stratification of osteoporotic fracture risk to guide choice of therapeutic agents are recommeded by the European Society for Clinical and Economic Aspects of Osteoporosis (ESCEO) and the International Osteoporosis Foundation (IOF)[18], and by the American Association of Clinical Endocrinologists (AACE).[19]
- Risk stratification would need to tailored to local populations and practices.

Sequential therapies

- The chronicity of osteoporosis demands personalised management plans and consideration of multiple antiosteoporosis medications throughout the course of treatment.[11]
- Sequential therapies, an emerging approach for treating high risk fracture patients, is another important consideration for national and regional guidelines. Currently restrictions in reimbursement criteria and limitations imposed by existing guidelines in the region, may not permit sequential therapy as a viable option for patient management. [11]

Health economics

- Health economic analysis is playing an increasingly important role to inform the relative value of osteoporosis therapies and to help determine how best to allocate finite health care resources and determine the cost effectiveness of interventions. [11]
- Vast heterogeneity exists in epidemiologic and economic characteristics of countries, undoubtedly influencing recommendations included in national and regional clinical practice guidelines.



References

1. United Nations - Department of Economic and Social Affairs, World Population Ageing 2019 Highlights. 2019.
2. Chandran, M., et al., IQ driving QI: the Asia Pacific Consortium on Osteoporosis (APCO): an innovative and collaborative initiative to improve osteoporosis care in the Asia Pacific. Osteoporos Int, 2020. 31(11): p. 2077-2081.
3. World Bank Group, Live Long and Prosper - Aging in East Asia and Pacific. 2016.
4. United National Population Fund (UNFPA) Asia & the Pacific. Ageing. [Nov, 2020]; Available from: https://asiapacific.unfpa.org/en/node/15208.
5. International Osteoporosis Foundation. What is Osteoporosis? [Jan 2020]; Available from: https://www.iofbonehealth.org/what-is-osteoporosis.
6. Office of the Surgeon General (US). Bone Health and Osteoporosis. A Report of the Surgeon General. Rockville (MD): Office of the Surgeon General (US) - The Burden of Bone Disease. 2004 [Jan, 2020]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK45502/.
7. Sanchez-Riera, L. and N. Wilson, Fragility Fractures & Their Impact on Older People. Best Pract Res Clin Rheumatol, 2017. 31(2): p. 169-191.
8. Odén, A., et al., Burden of high fracture probability worldwide: secular increases 2010-2040. Osteoporos Int, 2015. 26(9): p. 2243-8.
9. Cheung, C.-L., et al., An updated hip fracture projection in Asia: The Asian Federation of Osteoporosis Societies study. Osteoporosis and Sarcopenia, 2018. 4(1): p. 16-21.
10. Ebeling, P., et al., Secondary prevention of fragility fractures in Asia Pacific: an educational initiative. Osteoporosis International, 2019.
11. Chandran, M., et al., Development of the Asia Pacific Consortium on Osteoporosis (APCO) Framework: clinical standards of care for the screening, diagnosis, and management of osteoporosis in the Asia-Pacific region. Osteoporosis International, 2021.
12. Royal College of Obstetricians and Gynaecologists. The Delphi technique. 2005 [Jan, 2020]; Available from: https://obgyn.onlinelibrary.wiley.com/doi/pdf/10.1576/toag.7.2.120.27071.
13. International Osteoporosis Foundation - Capture the Fracture. Fracture Liaison Services. [Nov, 2020]; Available from: https://www.capturethefracture.org/fracture-liaison-services.
14. Huntjens, K., et al., Risk of subsequent fracture and mortality within 5 years after a non-vertebral fracture. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA, 2010. 21: p. 2075-82.
15. Wu, C.H., et al., Identifying characteristics of an effective fracture liaison service: systematic literature review. Osteoporos Int, 2018. 29(5): p. 1023-1047.
16. Wu, C.H., et al., Fracture liaison services improve outcomes of patients with osteoporosis-related fractures: A systematic literature review and meta-analysis. Bone, 2018. 111: p. 92-100.
17. Kanis, J.A., et al., A brief history of FRAX. Archives of osteoporosis, 2018. 13(1): p. 118-118.
18. Kanis, J.A., et al., Algorithm for the management of patients at low, high and very high risk of osteoporotic fractures. Osteoporos Int, 2020. 31(1): p. 1-12.
19. Camacho, P.M., et al., AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS/AMERICAN COLLEGE OF ENDOCRINOLOGY CLINICAL PRACTICE GUIDELINES FOR THE DIAGNOSIS AND TREATMENT OF POSTMENOPAUSAL OSTEOPOROSIS-2020 UPDATE. Endocr Pract, 2020. 26(Suppl 1): p. 1-46.

Appendices

Appendix 1. The 5IQ model for analysing the content of clinical practice guidelines

Component	Description
Identification	A statement by which individuals should be identified
Investigation	A description of the types of investigations that will be undertaken
Information	A description of the types of information that will be provided to the individual
Intervention	A description of pharmacological interventions and falls prevention
Integration	A statement on the need for integration between primary and secondary care
Quality	A description of professional development, audit, and peer-review activities

Appendix 2. Delphi questionnaires toward consensus on clinical standards for osteoporosis

Domain 1: Notable findings from the 5IQ Comparative analysis of osteoporosis clinical guidelines from across the Asia Pacific region.

This domain of the questionnaire includes a series of open-ended questions which invite you to share your opinions on the most notable findings of the 5IQ analysis report.

5IQ item	Question	Options
Identification	Considering the groups of individuals that the various guidelines recommend should be identified for bone health assessment, what are the most notable findings in the analysis? (You can indicate more than one)	[Free text]
Investigation	Considering the investigations that the various guidelines recommend should be undertaken, what are the most notable findings in the analysis?	[Free text]
Information	Considering the types of information that should be imparted to patients to engage them in their care, which are the most notable points identified by the analysis in your view?	[Free text]

Intervention	Considering the **indications** for treatment that are advocated, what are the most notable findings identified by the analysis in your view?	[Free text]
	Considering the **pharmacological** treatments for specific patient groups identified by the analysis, what are the most notable findings in your view?	[Free text]
	Considering the findings of the analysis related to **falls prevention**, what are the most notable in your view?	[Free text]
Integration	Considering how integration should occur between primary and secondary care, what are the most notable findings identified by the analysis in your view?	[Free text]
Quality	Considering the findings of the 5IQ Comparative analysis related to quality metrics, what are the most notable findings in your view?	[Free text]

Domain 2: How should the Framework be structured?

This domain of the questionnaire includes a series of open-ended questions which invite you to share your opinions on the most notable findings of the 5IQ analysis report.

Question	Options
How do you envisage the Framework being structured? Would you like to have it as a simple list of standards or have several levels of attainment (i.e. Level 1, Level 2, Level 3)?	[Free text]

Domain 3: What clinical standards are required?

This domain seeks your opinions on what specific aspects of care merit having a clinical standard. We invite you to rate the importance or not of having particular standards and invite you to add any comments as free text.

5IQ item	Question	Options
Identification	How important is it to have a standard relating to identification of individuals with **fragility fractures**?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to identification of individuals with **common risk factors** for osteoporosis (e.g. age 70 years or over, early menopause, excessive alcohol intake, family history, height loss, low body mass index/weight, prolonged immobility, smoking)?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to identification of individuals who take **medicines associated with bone loss and/or increased fracture risk**?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to identification of individuals with **conditions associated with bone loss and/or increased fracture risk**?	Extremely important Very important Somewhat important Not so important Not at all important
Investigation	How important is it to have a standard relating to **biochemical investigations** of individuals undergoing assessment?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to **BMD testing** of individuals undergoing assessment?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to use of **risk assessment tools** for individuals undergoing assessment?	Extremely important Very important Somewhat important Not so important Not at all important

5IQ item	Question	Options
Investigation (continued)	How important is it to have a standard relating to to vertebral fracture assessment for individuals undergoing assessment?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to **falls risk assessment** for individuals undergoing assessment?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to scenarios when **referral to a specialist** is required?	Extremely important Very important Somewhat important Not so important Not at all important
Intervention	The 5IQ analysis identified a broad range of **indications for treatment**, as listed below. In your opinion, which of the following indications for treatment should feature in osteoporosis clinical guidelines? Please indicate in priority order (where number 1 is the highest priority). Only provide rankings for those indications which you believe should be included. [ ] Hip fracture [ ] Vertebral fracture [ ] Non-hip, non-vertebral fracture [ ] BMD T-Score ≤ –2.5 SD [ ] Osteopenia + FRAX® ≥3% Hip or ≥20% MOF [ ] Osteopenia + RFs or eligible by OSTA or SCORE [ ] Osteopenia + ≥10 years postmenopausal [ ] FRAX® or Garvan ≥3% Hip or ≥20% MOF [ ] Eligible by OSTA, MORES or SCORE [ ] QCT <80 mg/cm3 [ ] Height loss >4 cm [ ] Androgen deprivation therapy use [ ] Aromatase inhibitor use [ ] Glucocorticoid use [ ] Country-specific thresholds	[Select items and rank according to priority]

5IQ item	Question	Options
Intervention (continued)	How important is it to have a standard relating to which **pharmacological treatments** should be recommended for specific patient groups?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to which **non-pharmacological interventions** should be recommended?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to description of **side effects** associated with pharmacological treatments?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to **monitoring of treatment** with pharmacologic agents?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to **duration of treatment** with pharmacologic agents?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to **treatment adherence** with pharmacologic agents?	Extremely important Very important Somewhat important Not so important Not at all important
	How important is it to have a standard relating to **referral of patients to falls prevention programmes**?	Extremely important Very important Somewhat important Not so important Not at all important

5IQ item	Question	Options
Integration	How important is it to have a standard relating to provision of a long-term management plan to the patients and/or primary care provider?	Extremely important Very important Somewhat important Not so important Not at all important
Quality	How important is it to have a standard relating to what quality metrics should be in place to assess adherence with guidelines-based care?	Extremely important Very important Somewhat important Not so important Not at all important

General

Question	Options
Do you have any other comments related to the development of the Framework clinical standards?	[Free text]

Declarations

Funding

Amgen Asia provided financial support to fund the secretariat function, event management and communication activities for the formation of APCO. All APCO members, except the Project Manager, contribute to APCO on a purely voluntary basis, and are not paid/compensated for their time. The Project Manager who is a paid consultant for APCO, assisted APCO with the 5IQ analysis and the formulation and processing of the Delphi Questionnaires. The opinions and activities of APCO are not influenced by Amgen, nor did Amgen have any role in the writing of this manuscript.

Conflicts of interest/ Competing interests

A Statement of Disclosure accompanies this submission.

Manju Chandran (MC): Chairperson of APCO. MC has received honoraria for lectures organised by DKSH, Amgen and Zuellig Pharma, and for chairing advisory board meetings for Amgen.

Paul Mitchell (PM): PM has undertaken consultancy for governments, national and international osteoporosis societies, healthcare professional organisations and private sector companies relating to systematic approaches to fragility fracture care and prevention since 2005. PM is a paid consultant for APCO.

Tanawat Amphansap (TA): TA has received honoraria for lectures organised by Amgen, DKSH, MSD and Zuellig Pharma.

Manoj Chadha (MC): MC has received honorariums for serving on the steering committee of Amgen's South East Asia & India Bone Academy Board.

Ding-Chen Chan (DC) reports personal fees (consulting fees) from Amgen, Lotus, Eli-Lilly and Harvester Trading Co, Ltd.

Peter Ebeling (PE): PE has research funding from Amgen, Eli-Lilly, Novartis and Alexion and has received honoraria from Amgen and Alexion.

Nigel Gilchrist (NG): NG has received research grants from Amgen.

Lau Tang Ching (LTC): LTC has received honoraria for speaking at symposia and financial support for attending symposia by Amgen Pte Ltd.

Lee Joon Kiong (LJK): LJK has received honoraria from Amgen, Mylan and Zuellig Pharma for speaking at symposia, as an advisory board member and for educational programs and workshops.

Tuan V. Nguyen (TVN): TVN has received grant support from Amgen and honoraria for lectures and conference engagements from Novartis, MSD, Amgen, and Bridge Health Care.

Atsushi Suzuki (AS): AS has received research funding from Chugai Pharmaceutical Co. Ltd, Kowa Co. Ltd, Ono Pharmaceutical Co. Ltd, Taisho Pharmaceutical Co Ltd, and Takeda Pharmaceutical Co. Ltd, and has received symposium honoraria from Asahi Kasei Pharma Co, Astellas Pharma Inc, Chugai Pharmaceutical Co Ltd, Daiichi Sankyo Co. Ltd, Eli Lilly Japan K.K, Kyowa Kirin Co. Ltd, and Taisho Pharmaceutical Co. Ltd.

Thanut Valleenukul (TV): TV has received honoraria for lectures organised by Amgen.

The following authors declare that they have no conflict of interest: Sanjay Bhadada (SB), Yoon-Sok Chung (YSC), Aysha Habib Khan (AHK), Philippe Halbout (PH), Hew Fen Lee (HFL), Lan T. Ho-Pham (LTH), Sarath Lekamwasam (SL), Greg Lyuobomirsky (GL), Leilani B. Mercado-Asis (LBMA), Ambrish Mithal (AM), Dipendra Pandey (DP), Ian R. Reid (IRR), Tet Tun Chit (TTC), Tiu Kwok Leung (TKL), Yung Chee Kwang (YCK), Zhao Yan Ling (ZYL).

Acknowledgements

Linguistico (Sydney, Australia) provided English translations of the four Chinese clinical practice guidelines. Dr David Kim performed data extraction for the South Korean guidelines. Editorial assistance and writing support were provided by Ms Jennifer Harman of Meducation Australia Pty Ltd, contracted by APCO for the purpose. To learn more, visit www.apcobonehealth.org

APCO executive committee

1. Dr Manju Chandran (Chairperson), Singapore General Hospital, Singapore
2. Dr Philippe Halbout, International Osteoporosis Foundation, Nyon, Switzerland
3. Dr Greg Lyubomirsky, Osteoporosis Australia, Sydney, Australia
4. Professor Peter Ebeling, Monash Health, Melbourne, Australia
5. Professor Tuan V. Nguyen, Garvan Institute of Medical Research, Sydney, Australia
6. Professor Xia Weibo, Peking Union Medical College Hospital, Beijing, China
7. Dr Cae Tolman, Amgen Asia, Industry Representative, Hong Kong, Hong Kong SAR (non-voting member)
8. Dr Tiu Kwok Leung, Queen Elizabeth Hospital, Hong Kong, Hong Kong SAR
9. Professor Sanjay K. Bhadada, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh, India
10. Mr Paul Mitchell, APCO Project Manager, Synthesis Medical NZ Limited, Auckland, New Zealand (non-voting member)
11. Dr Nigel Gilchrist, Canterbury District Health Board, Christchurch, New Zealand
12. Dr Aysha Habib Khan, Aga Khan University, Karachi, Pakistan
13. Dr Sarath Lekamwasam, University of Ruhuna, Matara, Sri Lanka.

APCO members

1. Dr Tanawat Amphansap (Police General Hospital, Thailand)
2. Professor Manoj Chadha (Hinduja Hospital and Research Centre, India)
3. Professor Ding-Chen Chan (National Taiwan University Hospital, Chinese Taipei)
4. Professor Yoon-Sok Chung (Ajou University School of Medicine, Republic of Korea)
5. Dr Hew Fen Lee (Subang Jaya Medical Centre, Malaysia)
6. Professor Kee Hyung Rhyu (Kyung Hee University, Republic of Korea)
7. Dr Lan T. Ho-Pham (Pham Ngoc Thach University of Medicine, Vietnam)
8. Professor Tint Swe Latt (Shwe Baho Hospital, Myanmar)
9. Dr Edith Lau (Hong Kong Orthopaedic and Osteoporosis Center for Treatment and Research, Hong Kong SAR)
10. Dr Lau Tang Ching (National University Hospital, Singapore)
11. Dr Dong Ock Lee (National Cancer Center, Republic of Korea)
12. Dr Lee Joon Kiong (Beacon International Specialist Centre, Malaysia)
13. Professor Liu Jianmin (Shanghai Ruijin Hospital, China)
14. Professor Leilani B. Mercado-Asis (University of Santo Tomas)
15. Professor Ambrish Mithal (Max Healthcare - Pan-Max, India)
16. Dr Dipendra Pandey (National Trauma Centre, Nepal)
17. Professor Ian R. Reid (University of Auckland, New Zealand)
18. Professor Atsushi Suzuki (Fujita Health University, Japan)
19. Professor Akira Taguchi (Matsumoto Dental University, Japan)
20. Associate Professor Vu Thanh Thuy (Bach Mai Hospital, Vietnam)
21. Dr Tet Tun Chit (East Yangon General Hospital, Myanmar)
22. Dr Gunawan Tirtarahardja (Indonesian Osteoporosis Association)
23. Dr Thanut Valleenukul (Bhumibol Adulyadej Hospital, Thailand)
24. Dr Yung Chee Kwang (Raja Isteri Pengiran Anak Saleha Hospital, Brunei Darussalam)
25. Dr Zhao Yanling (Beijing United Family Hospital, China).

APCO
ASIA PACIFIC CONSORTIUM
ON OSTEOPOROSIS

www.apcobonehealth.org

secretariat@apcobonehealth.org

asia-pacific-consortium-on-osteoporosis