OSTEOPOROSIS

4th Canadian Musculoskeletal Conference

A PROFESSIONAL EDUCATIONAL SYMPOSIUM FOCUSED ON TREATMENT, MANAGEMENT & PREVENTION

Introducing Osteoporosis Canada's 2023 Clinical Practice Guideline (CPG)

Introduction

Rowena Ridout, MD, M.ENG, FRCPC

Disclosure

- Relevant relationships with commercial entities:
  - None
- Potential for conflicts within this presentation:
  - Osteoporosis Canada Board of Directors 2020-present
- Steps taken to review and mitigate potential bias:
  - Not applicable

Welcome

Famida Jiwa, MHSc, CHE, D.C., BSc (Hons)

President and CEO of Osteoporosis Canada

CMC 2023

Agenda (AM)

Time	Topic	Faculty
10:00 AM	Introduction and Welcome	Rowena Ridout, MD & Famida Jiwa, DC
10:10 AM	OC Clinical Practice Guideline - An Overview	Suzanne Morin, MD
10:20 AM	Patient Engagement in Research	Larry Funnell
10:30 AM	OC Clinical Practice Guideline Update Session 1 Fracture Risk Assessment	Sid Feldman, MD
11:00 AM	Stretch Break	
11:10 AM	OC Clinical Practice Guideline Update Session 2 Pharmacotherapy	Sandra Kim, MD
11:40 AM	OC Clinical Practice Guideline Update Session 3 Nutrition	Wendy Ward, PhD
12:00 PM	OC Clinical Practice Guideline Update Session 4 Exercise	Lora Giangregorio, PhD
12:20 PM	Lunch	

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Agenda (PM)

Time	Topic	Faculty
12:20 – 1:00 PM	Lunch	
1:00 PM	Virtual Keynote Presentation: Advances in Personalised Fracture Risk Assessment: FRAXplus® and FRAX® 2	Nicholas Harvey, MD
2:00 PM	Young Investigator Award Presentation	Andy Kin On Wong, PhD
2:15 PM	Break	
2:35 PM	Clinical Case Presentations	Heather Frame, MD
4:00 PM	Ask the Expert Panel	Heather McDonald-Blumer, MD
4:30 PM	Closing/Wrap-Up	

Presentation
OC Clinical Practice Guideline: An Overview

Suzanne Morin, MD, MSc

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Clinical practice guideline for management of osteoporosis and fracture prevention in Canada: 2023 update

Suzanne N Morin MD MSc
Department of Medicine, McGill University
Director, Division of General Internal Medicine
McGill University Health Centre
Scientist, Centre for Outcomes Research and Evaluation
Research Institute of the MUHC

Disclosure

- **Relevant relationships with commercial entities:**
  - None
- **Potential for conflicts within this presentation:**
  - None
- **Steps taken to review and mitigate potential bias:**
  - I will not be discussing any off-label use of medications, and will be adhering to national/international guidelines

- I am a Member of the Advisory Board of the Institute of Musculoskeletal Health and Arthritis (CIHR)

Learning Objectives

- Discuss the importance of fracture prevention in Canadians
- Describe the process supporting the 2023 guideline development
- Engage in implementing the guideline in their practice and community

Osteoporosis is a disorder of bone strength

Biomechanical, biological and genetic factors

Bone Quality + **Bone Density** + **Bone Geometry**

Bone mineral content

Bone turnover
Activation Frequency
Damage accumulation
Quality of material

Bone diameter
Cortical thickness
Limb alignment

Bone Strength

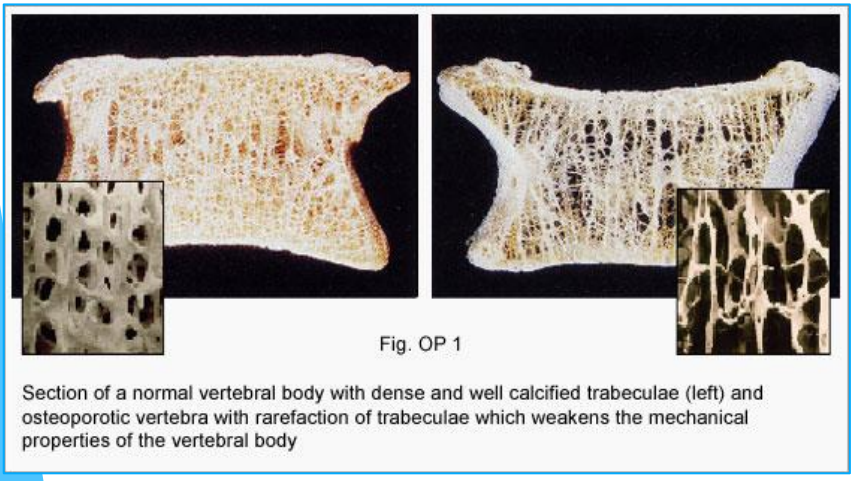
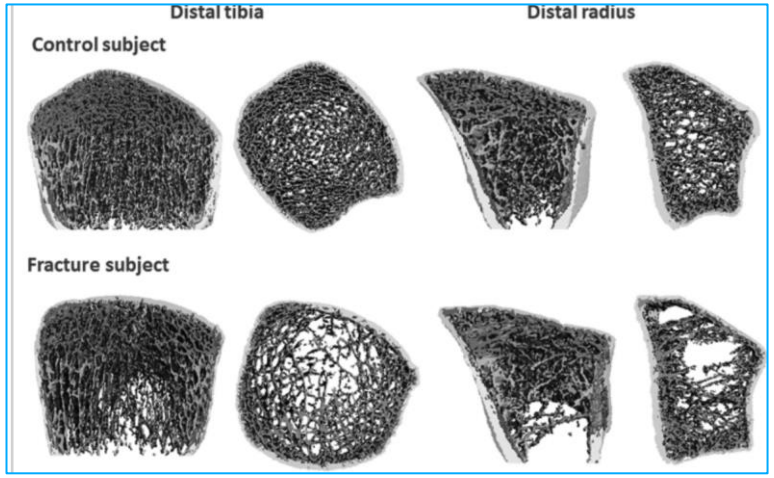
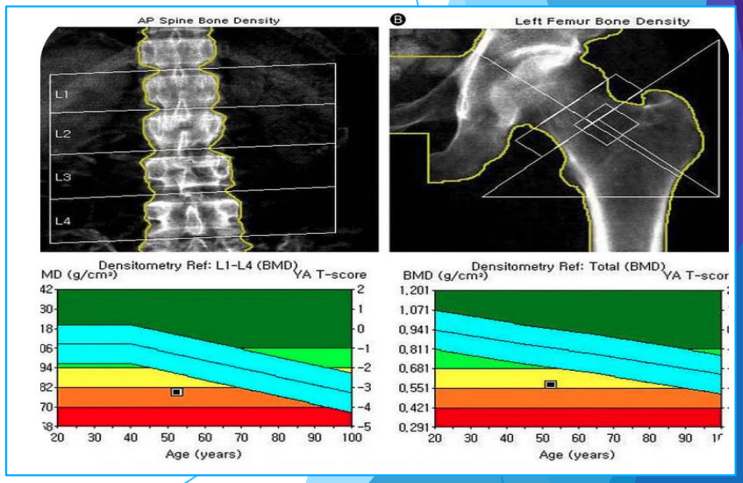


Fig. OP 1

Section of a normal vertebral body with dense and well calcified trabeculae (left) and osteoporotic vertebra with rarefaction of trabeculae which weakens the mechanical properties of the vertebral body





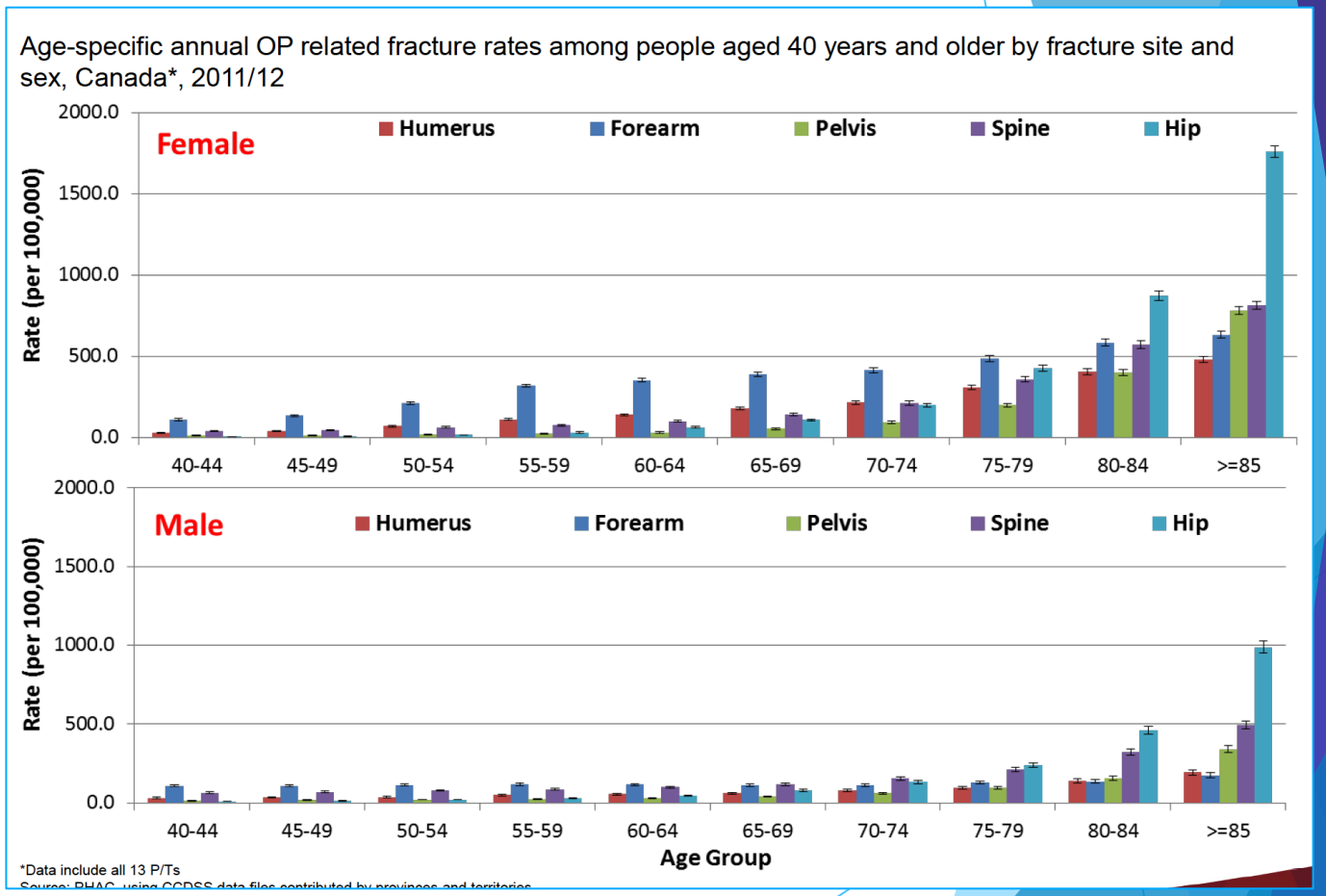
Fractures- Clinical Consequence of OP

OP is a disease of older women

1 in 3 fractures occur in men

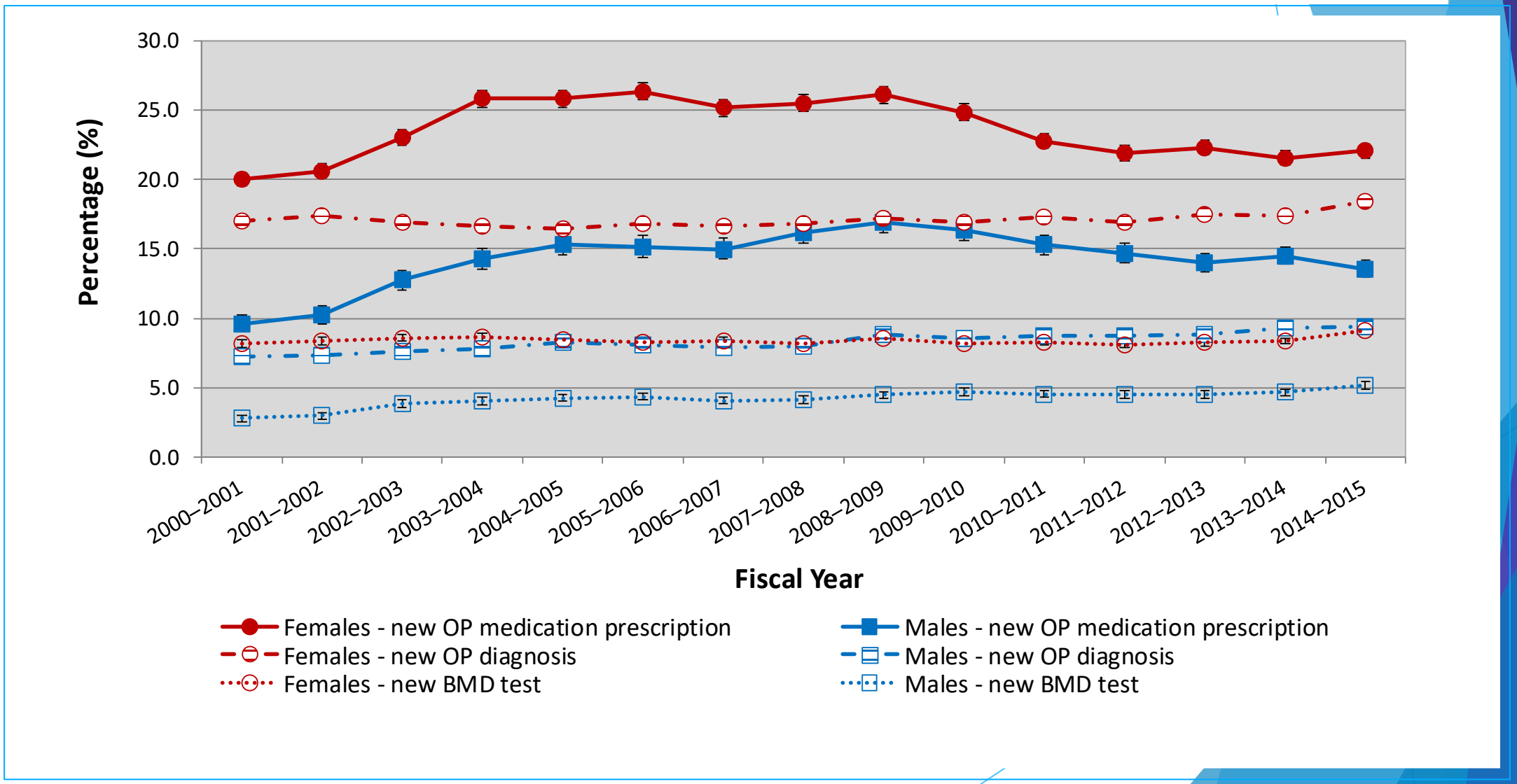
Men have **greater** fracture-related morbidity and mortality

Men suffer **higher** rates of subsequent fractures



PHAC report 2020

% of individuals who received a new OP Dx or BMD or OP Rx in the year following an OP-related fracture



Canadian OP 2023 Guideline Update

- **Target audience:** Primary healthcare professionals
- **Target population:** Postmenopausal women and men 50 years and older
- **Aim:** To assist in screening for the presence of risk factors for osteoporosis and fractures and to provide interventions to optimize skeletal health and fracture prevention
- **Methods:**
  - Panel composition: Patient partner and Family MD represented throughout
  - Priority topics selection
  - Literature search
  - Recommendation development

Canadian OP 2023 Guideline Update -Committees and Working Groups

Steering committee

- GRADE methodologist
- Primary care providers
- Patient partners
- Clinicians
- Researchers

COI committee

- Patient partner
- Steering committee member
- Other members
- GIN Principles for disclosure

Working Groups

- Fracture risk assessment
  - Fracture risk
  - Treatment threshold
  - Monitoring on-off Rx
- Pharmacotherapy
  - Initiation of therapy
  - Medications
  - Duration of therapy

Working Groups

- Nutrition
  - Vitamin D
  - Calcium
  - Protein
  - Other nutrients
- Exercise
  - Resistance
  - Balance
  - Functional training

Canadian OP 2023 Guideline Update - Grade Framework

www.gradeworkinggroup.org

GRADE

Strong Recommendation

- "We recommend"
- Desirable consequences CLEARLY outweigh the undesirable consequences

Interpretation:

- Patients: Most would want the recommended course of action, but only a small number would not
- Clinicians: Most should receive the recommended course of action

Conditional recommendation

- "We suggest"
- Desirable consequences PROBABLY outweigh the undesirable consequences

Interpretation

- Patients: Most would want the suggested course of action, but many would not
- Clinicians: Should recognize that different choices will be appropriate for each person and they must help each person arrive at a decision

Canadian OP 2023 Guideline Update

- 25 recommendations
- 10 Good practice statements

- Changes from the 2010 Guideline:
  - Use of GRADE framework
  - Expanded recommendations on exercise and nutrients other than calcium and vit D
  - Clearer guidance on treatment initiation, duration of therapy and monitoring
  - Guidance on use of anabolic therapy

Canadian OP 2023 Guideline Update - Implementation

- Knowledge mobilization through publication, presentations, podcasts
- Tools:
  - To support patients and clinicians in discussion around treatment initiation
  - To support patients in the evaluation of calcium intake and in regards with OP management in general (COPN https://osteoporosis.ca/copn-patient-network/)
  - To support clinicians in the assessment of fracture risk and treatment initiation
- Guidance on how to support behavior change

- CMAJ Publication: https://doi.org/10.1503/cmaj.221647
- Osteoporosis Canada: osteoporosis.ca
- Canadian Osteoporosis Patient Network: osteoporosis.ca/copn-patient-network/
- Nutrient calculator: https://osteoporosis.ca/nutrient-calculator/
- Discussion tool High risk of fractures and treatment initiation: osteoporosis.ca/2023-starting-medication/

Presentation
Patient Engagement in Research

Larry Funnell

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PATIENT ENGAGEMENT IN CLINICAL PRACTICE GUIDELINE DEVELOPMENT

LARRY FUNNELL

Disclosure

- Relevant relationships with commercial entities:
  - None
- Potential for conflicts within this presentation:
  - None
- Steps taken to review and mitigate potential bias:
  - Not applicable

Objectives

After this presentation participants will be able to:

- Explain what motivates patients to engage in, and the value they bring to, health initiatives like the new Clinical Practice Guideline.
- Describe how patients were engaged in the development of the new Guideline.
- Identify patients' expectations of the new Guideline.

From diagnosis to engaged patient

My Osteoporosis Journey

CIHR Definition of Patient Engagement

…meaningful and active collaboration in governance, priority setting, conducting research and knowledge translation.

Patient Engagement in Guideline Development

- The Guidelines International Network and the National Academy of Medicine recommend that patients be engaged on guideline development panels alongside physicians, researchers and other professionals[1-3]
- Patient participation influences the inclusion of patient-relevant topics, outcomes selection and approaches to recommendation development
- Most guidelines do not mention patients' beliefs, values and preferences[4]

[1]Armstrong MJ et al 2017 *PloS one* 12:e0174329
[2]Graham R MM et al 2011 *Institute of Medicine, The National Academies Press Washington D. C*
[3]Qaseem A et al 2012 *Annals of Internal Medicine 156:525-531*
[4]Sale JEM et al 2019 *Osteopor Int* Mar 11 Epub

Our Approach to Patient Engagement in the Guideline Update

- Patients MUST be engaged from start to finish in all components of the update process
- Confirmed commitment of COPN Executive Committee at first guideline update scoping meeting in 2017
- Five members of COPN Exec matched to each working group and committee as full and active members
- First priority - set the stage with a survey to identify the wants and needs of COPN members

COPN

For patients.

By patients.

CANADIAN OSTEOPOROSIS PATIENT NETWORK (COPN)

is a national network of people living with or affected by osteoporosis. COPN supports members by:

- Connecting through newsletters and resources made *by patients, for patients*
- Sharing evidence-based information about this disease, its challenges, and living well with osteoporosis

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For more information and to join COPN, visit:
osteoporosis.ca/copn-patient-network/

COPN Guideline Survey – Spring 2018

OBJECTIVE: To inform the guideline update process by identifying the needs of, and issues important to Canadians living with osteoporosis

More than 1100 COPN members completed a self-administered **on-line** survey composed of 25 open-ended and 10 closed-ended questions.

Closed-ended questions were analyzed using descriptive statistics, and content analysis was conducted for the open-ended questions

The survey results were an important, integral part of the guideline committees' work

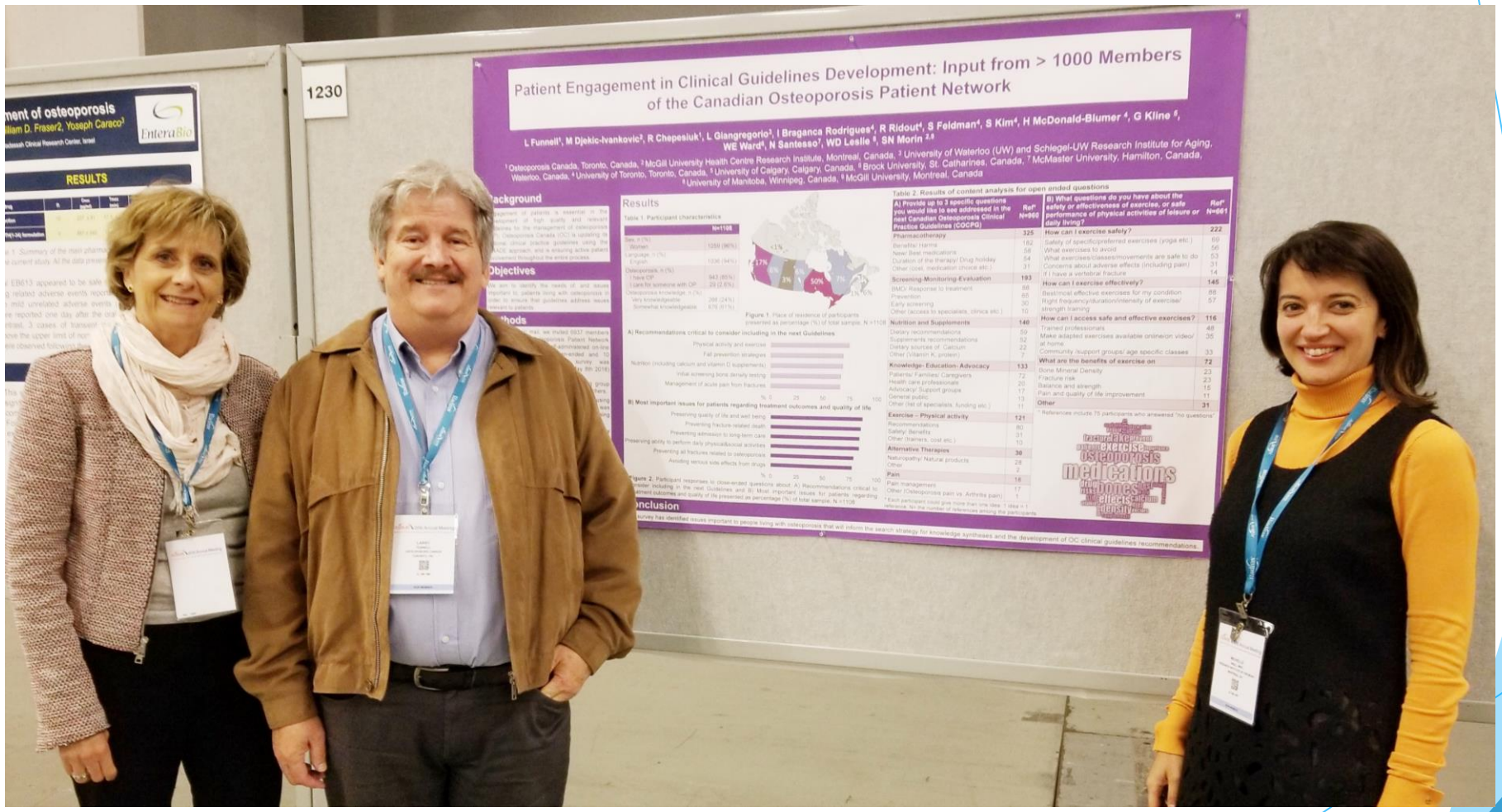
Survey said…

- As expected, respondents thought that information about pharmacotherapy, screening and monitoring were important topics to cover in the updated guidelines
- However, over 75% of respondents felt it was critical to ensure that **Autonomy**, **Mobility** and **Quality of Life** be considered in addition to **Fracture Prevention** in the new guideline recommendations

The Survey spread its wings

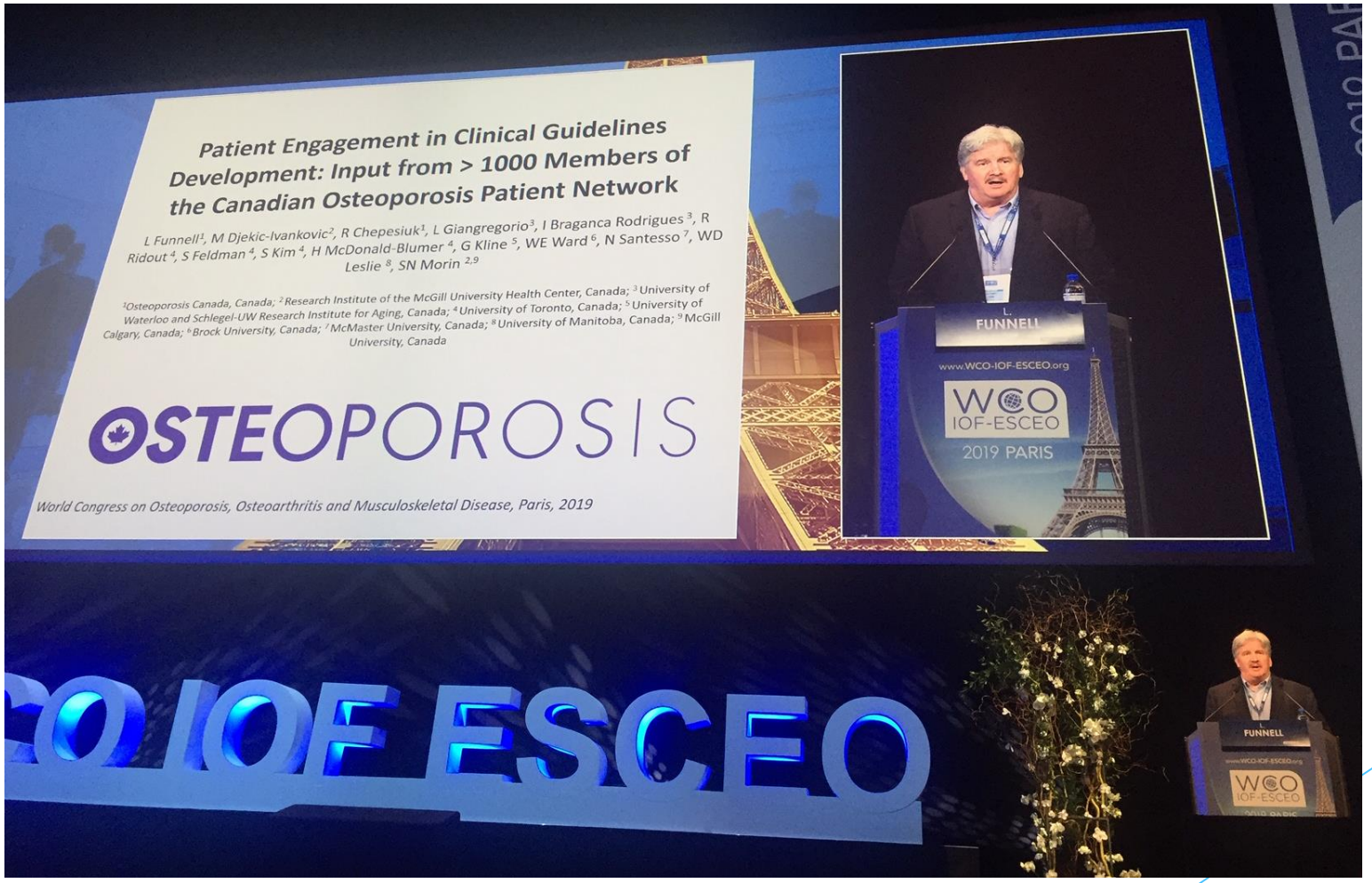
Although intended as a resource to inform the internal workings of the Guideline development process, the survey received considerable “outside” attention.

Poster Presentation at ASBMR in Montreal in 2018



ASMBR, American Society for Bone and Mineral Research

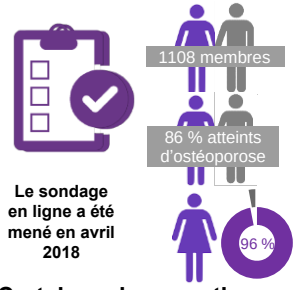
Presentation to Plenary Scientific Session of the WOC in Paris, 2019



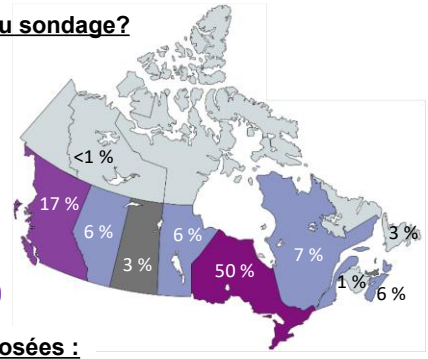
Lay-language Poster, Prepared in English and French, Sent to COPN Members in 2019

Participation du réseau canadien de patients atteints d'ostéoporose à la mise à jour des Lignes directrices de la pratique clinique

Qui sont les répondants au sondage?



Le sondage en ligne a été mené en avril 2018



Certaines des questions posées :

1. Pourcentage (%) des répondants qui considèrent important d'inclure chacune des recommandations suivantes dans la prochaine version du Guide.

2. Pourcentage (%) des répondants qui considèrent important chacun des énoncés suivants :

3) Quelles sont vos questions concernant la sécurité et l'efficacité des exercices ou la pratique sécuritaire d'activités physiques récréatives ou de la vie quotidienne?	réponses N=661
Comment puis-je faire des exercices de façon sécuritaire?	**222**
Sécurité d'exercices précis/préférés (yoga, etc.) Quels exercices sont à éviter? Quels exercices/cours/mouvements sont sécuritaires? En cas de fracture vertébrale, quels sont les effets négatifs (y compris la douleur)?	
Comment puis-je faire des exercices de façon efficace?	**145**
Quels sont les meilleurs exercices ou les plus efficaces pour mon état de santé? Quelles sont la fréquence/durée/intensité recommandées des exercices/de l'entraînement musculaire?	
Comment puis-je avoir accès à un entraînement sécuritaire et efficace?	**116**
Professionnels adéquatement formés Exercices adaptés offerts en ligne/sur vidéo/à domicile Communauté/groupes de soutien/cours ciblés pour personnes âgées	
Quels sont les bienfaits de faire des exercices sur...	**72**
La densité minérale osseuse Les risques de fractures L'équilibre et la force L'apaisement de la douleur et l'amélioration de la qualité de vie	

4) Énoncez jusqu'à 3 questions précises que vous voudriez que la prochaine version des Lignes directrices cliniques d'Ostéoporose Canada aborde?	réponses N=964
Pharmacothérapie	**327**
Avantages/effets néfastes des médicaments Nouveaux/meilleurs médicaments Durée de la thérapie/congé de médicaments Autres (coûts, choix de médicaments, etc.)	
Examen-Surveillance-Évaluation	**193**
DMO/Réponse au traitement Prévention Détection précoce Autres (accès aux spécialistes, cliniques, etc.)	
Nutrition et suppléments	**140**
Recommandations alimentaires Recommandations concernant les suppléments Sources alimentaires de calcium Autres (vitamine K, protéines, etc.)	
Connaissances-Éducation-Promotion	**135**
Patients/familles/soignants Professionnels de la santé Groupes d'action/de soutien Grand public Autres (listes de spécialistes, financement, etc.)	
Exercices-Activités physiques	**121**
Recommandations Sécurité/avantages Autres (entraîneurs, coûts, etc.)	
Thérapies complémentaires	**30**
Naturopathie/produits naturels, Autres	
Douleur	**18**
Gestion de la douleur Autres (douleur de l'ostéoporose par rapport à l'arthrite)	

MERCI au réseau de patients d'Ostéoporose Canada!

Ce sondage cerne des enjeux importants pour les personnes vivant avec l'ostéoporose en vue d'alimenter la stratégie de recherche pour la synthèse des connaissances et l'élaboration des lignes directrices de la pratique clinique recommandées par Ostéoporose Canada.

Osteoporosis International Article 2019

Osteoporosis International (2020) 31:867–874
https://doi.org/10.1007/s00198-019-05248-4

ORIGINAL ARTICLE

Patient engagement in clinical guidelines development: input from > 1000 members of the Canadian Osteoporosis Patient Network

S. N. Morin[1,2] · M. Djekic-Ivankovic[2] · L. Funnell[3] · L. Giangregorio[4] · I. B. Rodrigues[4] · R. Ridout[5] · S. Feldman[5] · S. Kim[5] · H. McDonald-Blumer[5] · G. Kline[6] · W. E. Ward[7] · N. Santesso[8] · W. D. Leslie[9]

Received: 12 October 2019 / Accepted: 22 November 2019 / Published online: 14 December 2019

Abstract

Summary Patient engagement in clinical guidelines development is essential. The results of a self-administered online survey identified themes important to people living with osteoporosis and will inform the development of Osteoporosis Canada clinical guidelines recommendations.

5 Engaged Patient Partners

- All members of the COPN Executive Committee
- Diverse interests, skill sets and lived experiences
- Each assigned to a working group or committee





Virginia McIntyre – Patient Partner Risk Assessment Working Group

"Having the perspective of people who have been through the system, who have experienced what works and what does not work *is essential*."

Chair of COPN 2018 – 2022

President and Executive Director
People In Pain Network (PIPN)

Christine Thomas – Patient Partner Pharmacotherapy Working Group

"My team embraced the patient perspective and believed it helped make these guidelines more relevant. I learned so much, which in turn allowed me to share my experiences and contribute meaningfully to the development of the online ***How-to Guide for Patient Engagement in Research***. It was a win, win, win!"

Patient Engagement Research Ambassador, CIHR IMHA

Director, OC Board of Directors

Ina Ilse – Patient Partner
Nutrition Working Group

"As a volunteer counsellor on OC's 1-800 line since 1995 I have talked to thousands of Canadians who called with questions about osteoporosis. I am confident and delighted that this new Guideline will help clarify the many answers they need to live well with osteoporosis."

Co-Founded COPN in 2004

Joan Bartley – Patient Partner Exercise Working Group

"This g*ood practice statement* underpins '*how I can* safely do'- everyday living tasks, therapy exercises, at-home workouts, community or Zoom fitness classes, family physical activities, club sports, …"

Activities that involve rapid, repetitive, sustained, weighted or end range-of-motion twisting or flexion of the spine may need to be modified, especially in people at high risk of fracture.

Chair of COPN 2017-2018

We must continue to engage. Healthcare providers are stretched very thin and need up-to-date, evidence-based guidance, summarized and at their fingertips to help us manage our bone health. Our care and quality of life depend on making the best possible KT tools accessible to all.

Christine Thomas

NEXT STEPS for Patient Partners

- Engage in the development and dissemination of appropriate KT tools and other resources for HCPs, patients and community partners
- Monitor patient reaction to the new Guideline and identify questions and issues that might require additional work
- Close the loop, ensure COPN membership has access to the new KT resources for the Guideline

Top question patients want addressed

	Ref* N=960
Pharmacotherapy	**325**
Benefits/ Harms	182
New/ Best medications	58
Duration of the therapy/ Drug holiday	54
Other (cost, medication choice etc.)	31
Screening-Monitoring-Evaluation	**193**
BMD/ Response to treatment	88
Prevention	65
Early screening	30
Other (access to specialists, clinics etc.)	10
Nutrition and Supplements	**140**
Dietary recommendations	59
Supplements recommendations	52
Dietary sources of Calcium	22
Other (Vitamin K, protein)	7
Knowledge- Education- Advocacy	**133**
Patients/ Families/ Caregivers	72
Health care professionals	20
Advocacy/ Support groups	17
General public	13
Other (list of specialists, funding etc.)	11
Exercise – Physical activity	**121**
Recommendations	80
Safety/ Benefits	31
Other (trainers, cost etc.)	10
Other	**48**

1st KT Tool - Assist decision making

HIGH RISK OF OSTEOPOROSIS-RELATED FRACTURE: NEXT STEPS

Key Points

- If you are at high risk of osteoporosis-related fractures, starting medication is your recommended course of action.
- Bisphosphonates are the first-line treatment in Canada. They are safe and will reduce your risk of fractures.
- For high-risk individuals, the benefits of taking bisphosphonates for 3 to 6 years far outweigh their potential harms.

Overview

- **What is Osteoporosis?** Osteoporosis is a disease that weakens bones, making them likely to break more easily. It affects almost 2.3 million Canadians. Osteoporosis-related fractures cause disability, lower quality of life, and even death.
- **Who is at high risk of osteoporosis-related fractures?** Some factors (previous fractures, family history, sex, age) raise your risk of osteoporosis-related fractures. Your healthcare provider may identify you as high risk based on these factors and other assessments.
- **If I'm at high risk, what are my options?** Medication is strongly recommended. Bisphosphonates are the first line, or main option, in Canada. They strengthen bones and slow down osteoporosis, reducing your risk of a fracture in the future. If they are not available, or might not work with your other medications, desnosumab is the second line option.
- **Can I reduce the high risk with only lifestyle changes?** They are not enough on their own to reduce the risk of fractures. Exercise (functional, balance, resistance), nutrition (Calcium, vitamin D), and fall prevention plans should still be a part of your treatment as they improve overall health. But for those at high risk, bisphosphonates remain strongly recommended.
- **How long do I need to take bisphosphonates?** Recommended treatment period is 3-6 years. After that, a temporary break or "drug holiday" may be considered if your bone health has stabilized or improved.

If you're worried about side effects…

- Most side effects of bisphosphonates, like nausea or flu-like symptoms, are mild if felt at all.
- Serious side effects are extremely rare. They may include unusual thigh bone fractures, known as Atypical Femoral Fractures (AFF), or damage to the jawbone, known as Osteonecrosis of the Jaw (ONJ).
- Risk of AFF or ONJ is related to using bisphosphonates longer than the recommended period of 3-6 years.

Over 5 years: Out of 100,000 on bisphosphonates > 2500 likely avoid a fracture & 25 may experience a serious side effect like AFF or ONJ

You're 100x more likely to avoid a fracture than to experience serious side effects on bisphosphonates. If you are at high risk of fractures, benefits of bisphosphonates far outweigh their potential harms.

Development of this tool was supported by the Canadian Institute for Health Research Institute of Aging Voluntary Sector Outreach Prize (FRN 170350). This tool uses data from Osteoporosis Canada's guideline on Management of Osteoporosis. For full guideline, visit osteoporosis.ca

OSTEOPOROSIS CANADA | CIHR IRSC

Special Thanks!

- Our fellow COPN Executive Committee members past and present who have stood with us, strengthening and authenticating our patient voice
- Dr. Famida Jiwa and staff at OC for their unflinching support
- Our many partners on the Guideline committees and working groups for wholeheartedly championing patient engagement

Presentation
OC Clinical Practice Guideline Update
Session 1: Fracture Risk Assessment

Sid Feldman, MD, CCFP, FCFP

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TOPIC: Fracture Risk Assessment

PRESENTER: Sid Feldman

Disclosure

Relevant relationships with commercial entities:

- None

Potential for conflicts within this presentation:

- None

Steps taken to review and mitigate potential bias:

- Not Applicable

Objectives: At the end of the session, participants will be able to:

1. Identify patients who are most likely to benefit from bone mineral density testing.
2. Utilize fracture risk assessment to identify patients most likely to benefit from therapy.
3. Select an interval for fracture risk reassessment for those patients who are not starting therapy.

Fracture Risk Assessment Working Group

- Neil Binkley
- Steven Burrell
- Angela Cheung
- Sid Feldman (chair)
- Carol Holmes
- George Ioannidis
- Robert Josse
- Aliya Khan
- Virginia MacIntyre
- Suzanne Morin
- Lynn Nash
- Ahmed Negm
- Lianne Tile

Recommendations

- 1 good practice statement
- 7 recommendations

3.1 Good Practice Statement:

A clinical assessment for osteoporosis and fracture includes identifying risk factors and assessing for signs of undiagnosed vertebral fracture(s).

3.1 Good Practice Statement:

A clinical assessment for osteoporosis and fracture includes identifying risk factors and assessing for signs of undiagnosed vertebral fracture(s).

- **Previous fracture**, after age 40 (low trauma; fractures of hands, feet and craniofacial bones are not considered osteoporotic fractures)
- **Glucocorticoids** (> 3months in the last year; prednisone dose ≥5 mg daily)
  - Change from ≥7.5 mg daily (2010)
- **Falls (≥2 in the last year)**
- **Parent fractured hip**
- **Secondary osteoporosis**

  (see table next slide)
- **Current smoking**
- **Alcohol ≥3 drinks/day**
- **Body Mass Index, <20 kg/m^2**
  - Change from low body weight <60kg or >10% weight loss from age 25 (2010)

Secondary causes of osteoporosis

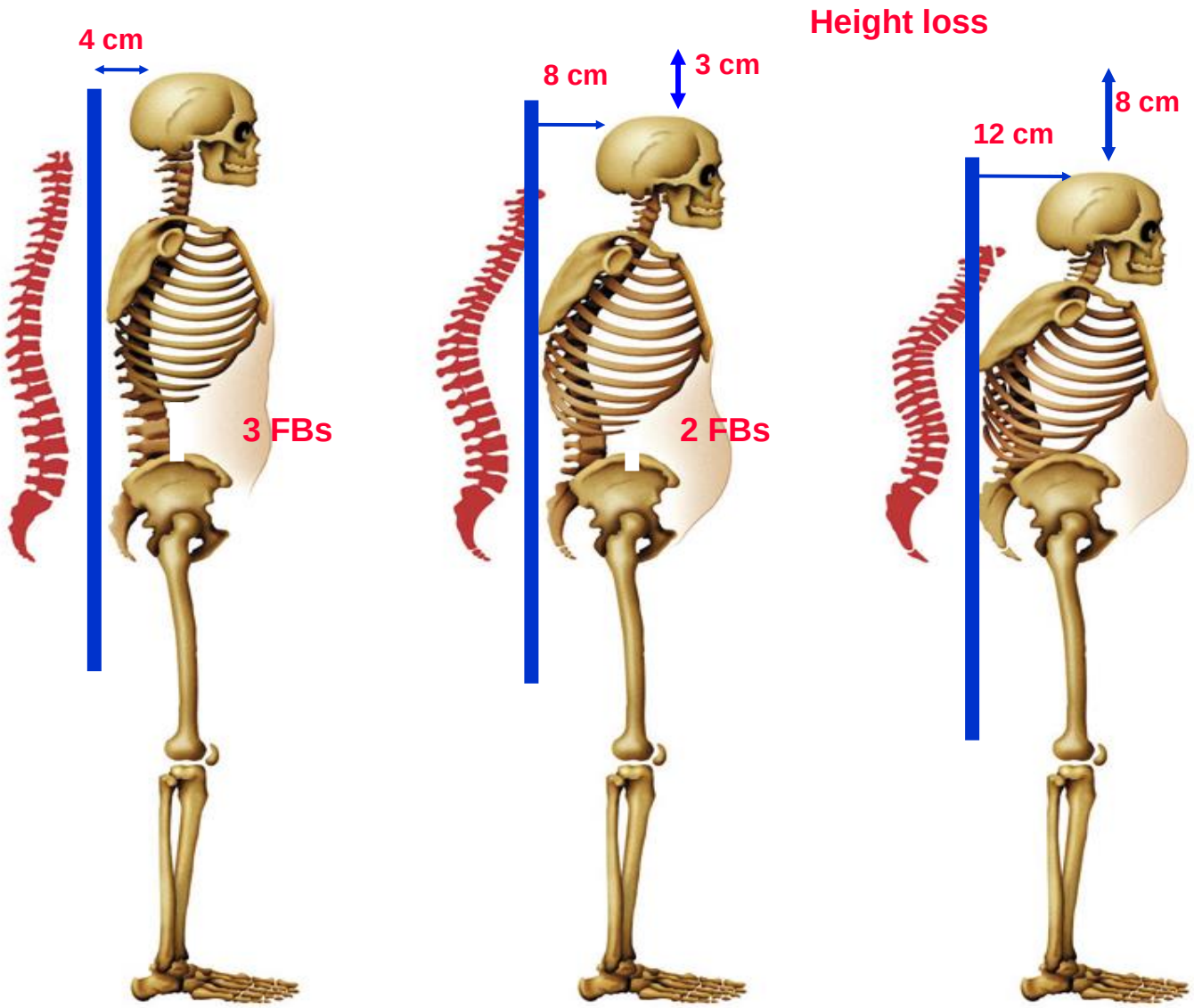
Table 5. Causes of secondary osteoporosis or that have adverse effect on bone health (15, 20-27)

Drugs	Endocrine disorders	Gastrointestinal & Nutritional disorders
Glucocorticoid steroids Aromatase inhibitors Anticonvulsants (particularly phenytoin, phenobarbital) GnRH agonists and antagonists Androgen-deprivation agents Cancer chemotherapy Immunosuppressants (eg. cyclosporine)	Hyperparathyroidism Hyperthyroidism Hypercortisolism/Cushing's syndrome Diabetes mellitus (Type 1 & Type 2) Prolonged premature hypogonadism Acromegaly	Inflammatory bowel disease Celiac disease Bariatric surgery Pancreatic insufficiency Other malabsorptive syndromes Primary biliary cholangitis Chronic liver disease Eating disorder Malnutrition Parenteral nutrition Vitamin D and/or calcium deficiency
Rheumatologic disorders	**Genetic disorders**	**Other disorders**
Rheumatoid arthritis Other inflammatory arthritis disorders Systemic lupus erythematous	Osteogenesis imperfecta Hypophosphatasia Other genetic causes of osteomalacia	Multiple myeloma Other marrow-related disorders Idiopathic hypercalciuria Chronic kidney disease/renal failure Chronic obstructive pulmonary disease Organ transplantation Multiple sclerosis Parkinson's disease Other neuromuscular disorders Prolonged immobilization Paget's disease Acquired causes of osteomalacia

"Conditions known to cause secondary osteoporosis should be sought and referral to specialists with appropriate expertise for co-management considered."

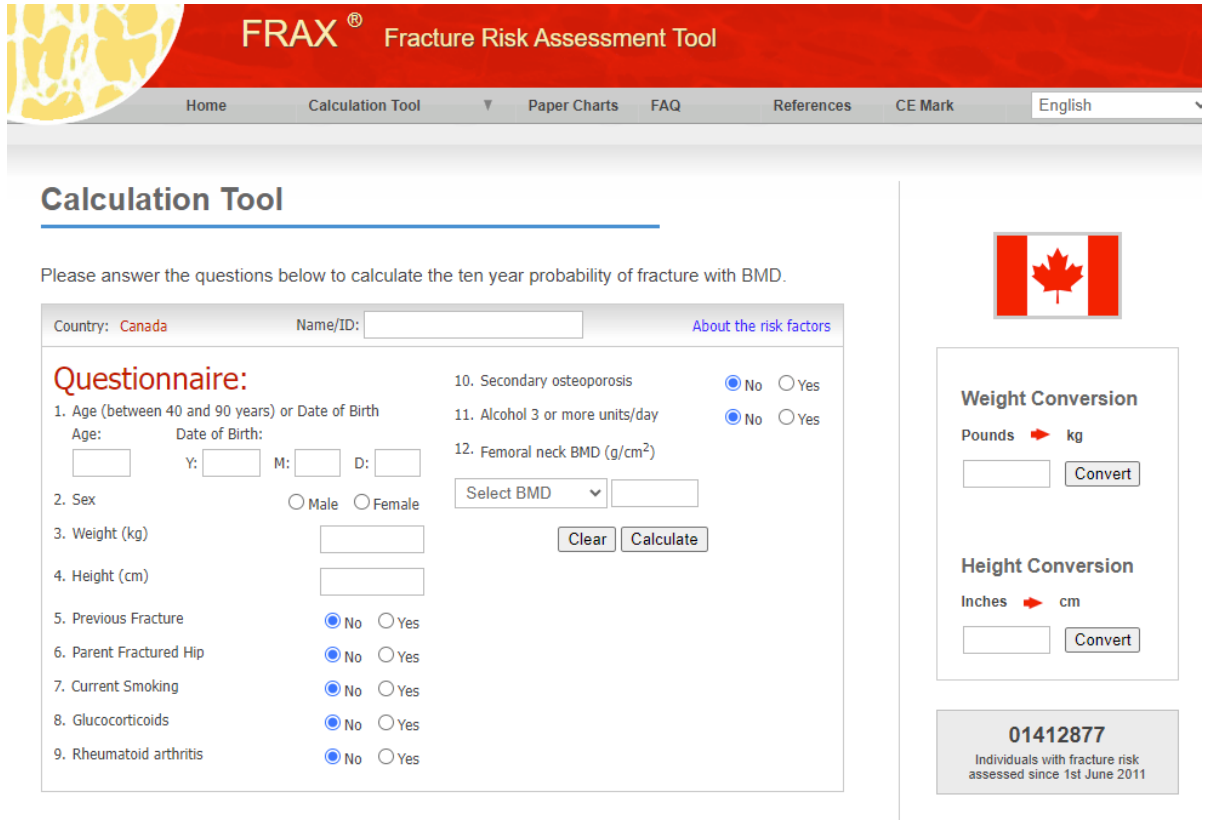
CMAJ 195(39) Appendix 1
www.cmaj.ca/content/195/39/E1333/tab-related-content

Signs of possible vertebral fracture



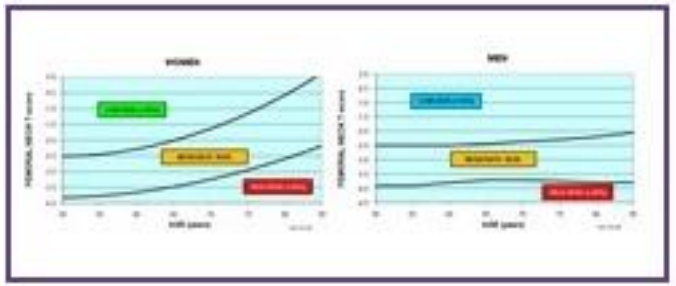
- Prospective height loss >2 cm or historical >6 cm
- Rib-to-pelvis distance ≤2 finger-breadths in mid-axillary line
- Occiput-to-wall distance >5 cm

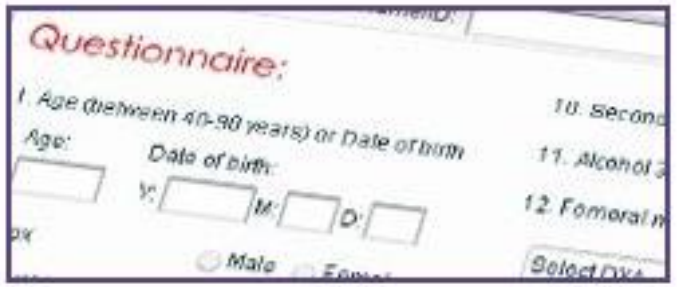
3.2 We *suggest* that the Canada-specific FRAX tool is the preferred tool for fracture risk estimation. CAROC is an alternative FRA tool.



Conditional recommendation, moderate certainty evidence

3.2 We *suggest* that the Canada-specific FRAX tool is the preferred tool for fracture risk estimation. CAROC is an alternative FRA tool





- Both FRAX and CAROC predict fracture well, concordance >90%
- When discordant, the balance of effects favours FRAX (2% net reclassification improvement).
- Less evidence in males
- **Limitations of both tools**:
  - may underestimate fracture risk such as very low BMD at spine or total hip, recency of fractures, recurrent falls, other co-morbidities
- No guidance re FRAX 2

Leslie WD, Majumdar SR. Osteoporos Int 2016;30:721-40

3.3 We *suggest* BMD testing in post-menopausal females and males who:

- a. are aged 50-64 with a previous osteoporosis-related fracture* or ≥2 clinical risk factors

*Fracture after age 40, low-trauma, excluding hands, feet and craniofacial bones

OR

- b. are aged ≥65 yr with 1 clinical risk factor

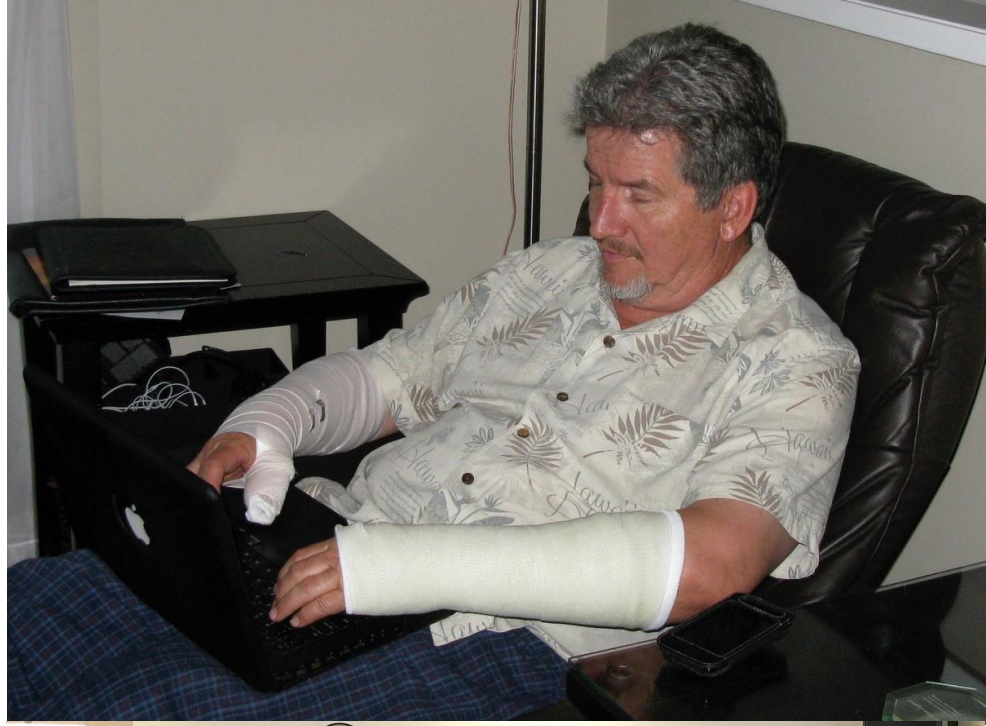
OR

- c. are aged ≥ 70 yr

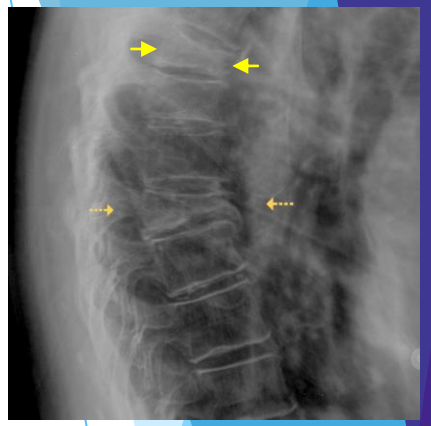
Conditional recommendation;
low-certainty evidence (females), very low certainty evidence (males)

Males

- Highly important to our patient partners to identify fracture risk in both males and females
- Males suffer 1/3 of all fractures worldwide
- Lifetime fracture risk in males 1/5
- Males are less likely to receive interventions to prevent fractures
- Males are 1.3 times more likely to die from any cause following a hip fracture



3.4 We *suggest* vertebral imaging with lateral spine radiograph or VFA in PM females and males without known vertebral fractures who:



- Are aged ≥65 with T-score ≤ -2.5 (FN, TH, LS)
- Have 10-year MOF risk between 15-19.9%

- "Lateral spine imaging can also be considered when there are clinical signs of undiagnosed vertebral fracture. The presence of VF can guide appropriate choice and duration of therapy."

Conditional recommendation; moderate certainty (females), low-certainty (males)

3.5 We *recommend* initiating pharmacotherapy in postmenopausal females and males aged ≥50 yr who:

- a. Have had previous hip, vertebra or ≥2 osteoporosis-related fractures

OR

- b. Have a 10-yr MOF risk ≥20%

OR

- c. Are aged ≥70 and have a T-score ≤-2.5 (FN, TH or LS)

Strong recommendation;
High-certainty evidence (females A, C),
Moderate certainty evidence (females B, males, A, B, C)

3.6 We *suggest* initiating pharmacotherapy in postmenopausal females and males who:

- Have a 10-yr MOF risk between 15% and 19.9%

OR

- Are aged <70 yr and have a T-score ≤ -2.5

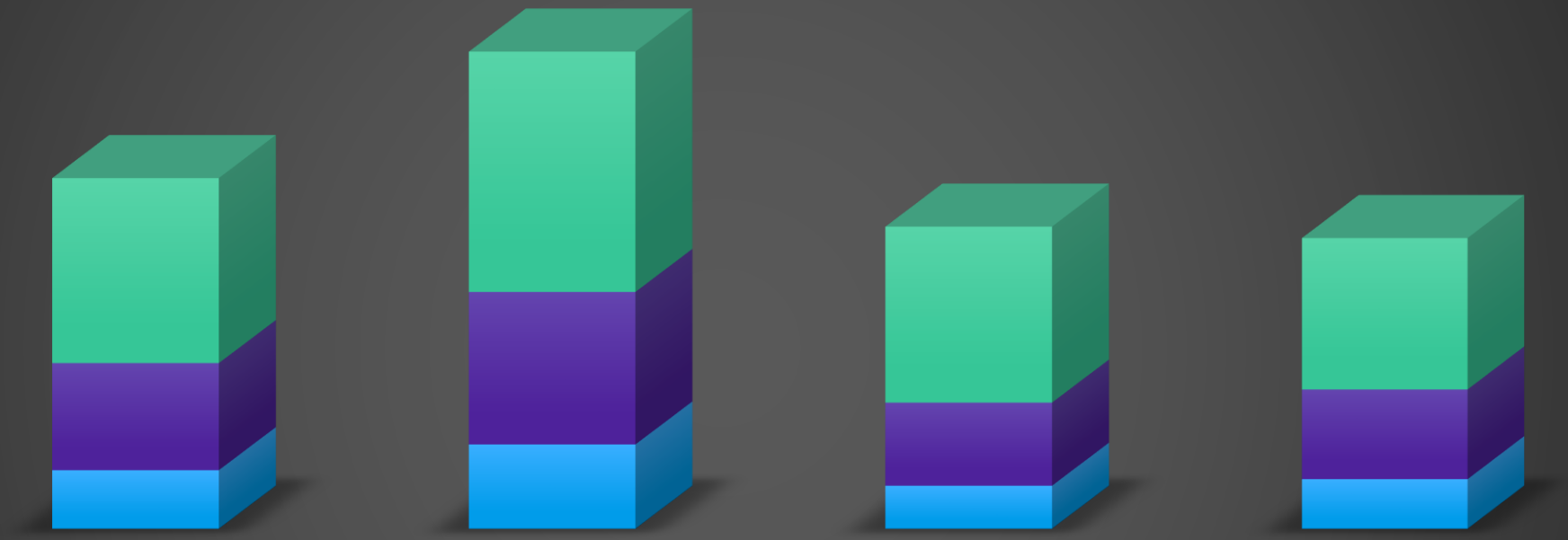
Conditional recommendation;
moderate certainty evidence (females), very low certainty evidence (males)

“The risk of subsequent fracture is greatest shortly after a fracture and greater consideration should be given to a fracture in the last 2 years.”

Risk of subsequent fracture after prior fracture

ONTARIO Osteoporosis Strategy

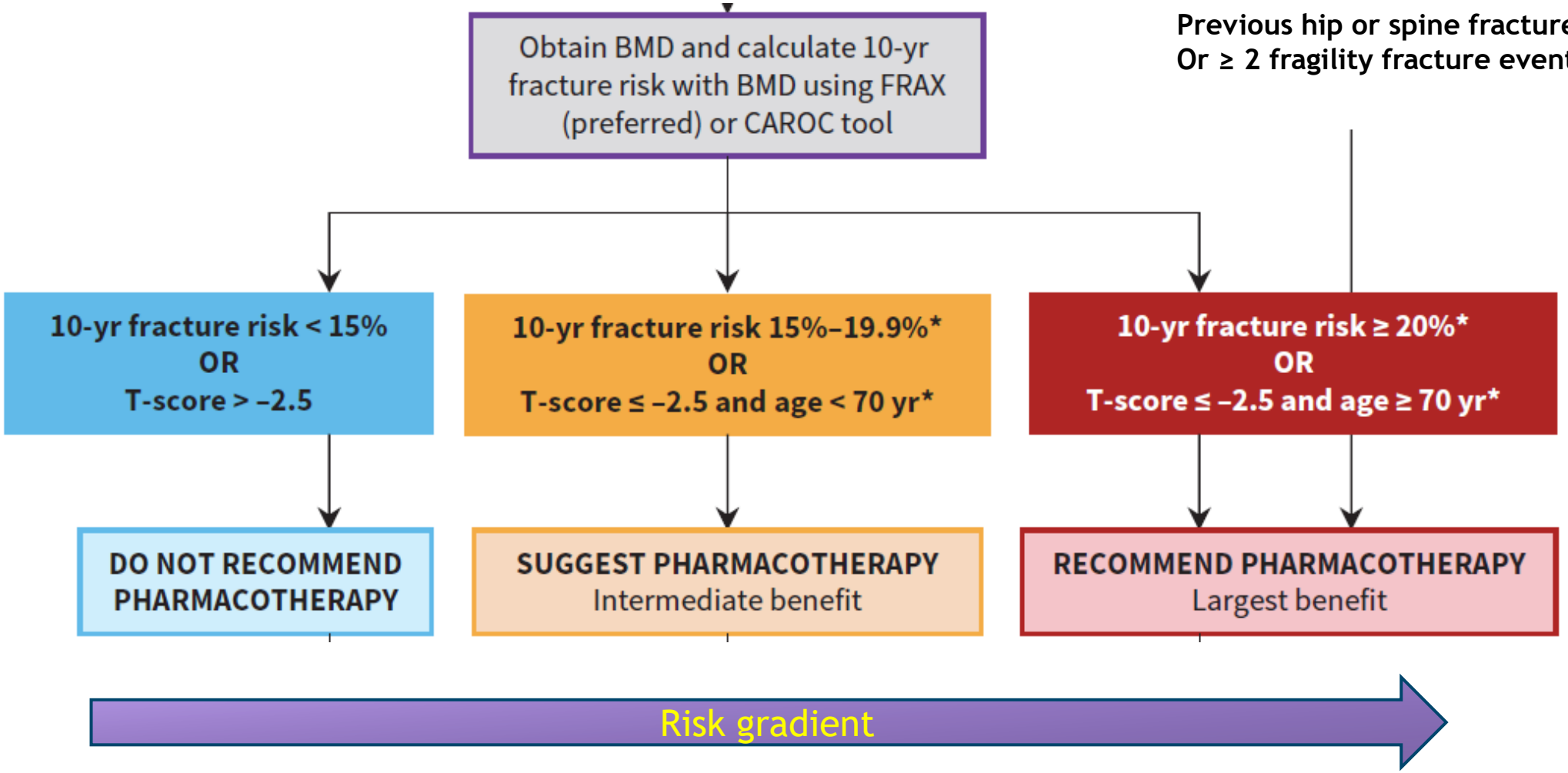
Outcome: Any Fracture



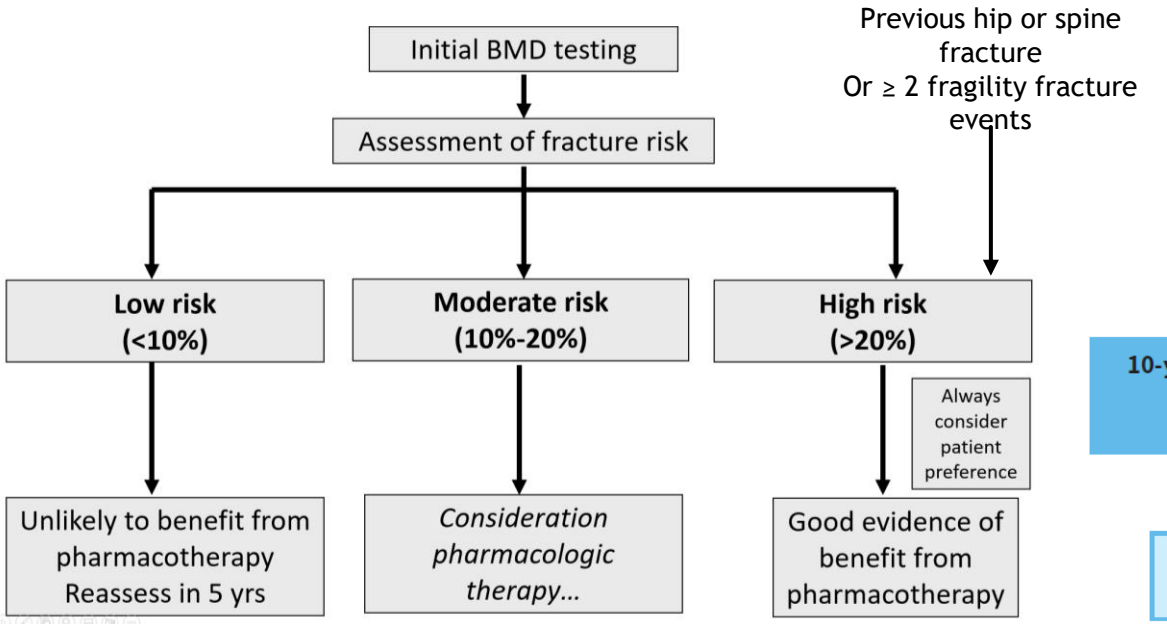
	Any Site	Spine	Radius/Ulna	Hip
5 years	30.9	40.1	29.4	25.3
2 years	17.9	25.5	13.9	15
1 year	9.8	14.1	7.2	8.3

1 year 2 years 5 years

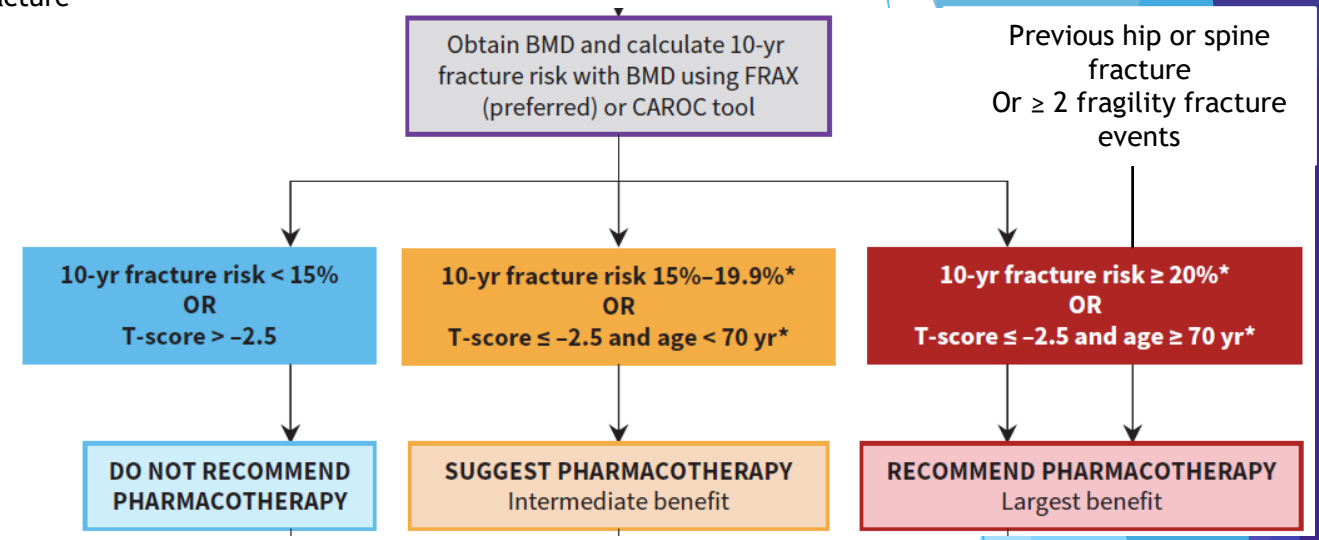
Balasubramanian et al. Osteoporos Int 2019; 30:79-92.


Obtain BMD and calculate 10-yr fracture risk with BMD using FRAX (preferred) or CAROC tool
Previous hip or spine fracture
Or ≥ 2 fragility fracture events
10-yr fracture risk < 15%
OR
T-score > –2.5
10-yr fracture risk 15%–19.9%*
OR
T-score ≤ –2.5 and age < 70 yr*
10-yr fracture risk ≥ 20%*
OR
T-score ≤ –2.5 and age ≥ 70 yr*
DO NOT RECOMMEND PHARMACOTHERAPY
SUGGEST PHARMACOTHERAPY
Intermediate benefit
RECOMMEND PHARMACOTHERAPY
Largest benefit
Risk gradient

2010



2023



<u>2023 Update:</u> Hybrid Approach to treatment threshold:

Strong recommendation to treat if . . .

- **10-yr fracture risk ≥ 20%** *moderate certainty (females and males) – evidence from large cohort registry database*
- *OR if* **T-score ≤ - 2.5* and age ≥ 70yo** *high certainty (females), moderate certainty (males) – evidence from RCTs*

Advantage: accounts for limitations of FRAX (e.g. very low spine BMD) and limitations of BMD (e.g. osteopenia with RFs)

- Previous hip or spine fracture or multiple fractures *high certainty (females), moderate certainty (males)*

T-score at the femoral neck, total hip or lumbar spine

3.7 We *suggest* that for individuals who do not meet the threshold for initiating therapy or choose not to initiate therapy, BMD can be repeated at:

- A. 10 yr if the risk of MOF is <10%
- B. 5 yr if the risk of MOF is 10-15%
- C. 3 yr if the risk of MOF is >15%

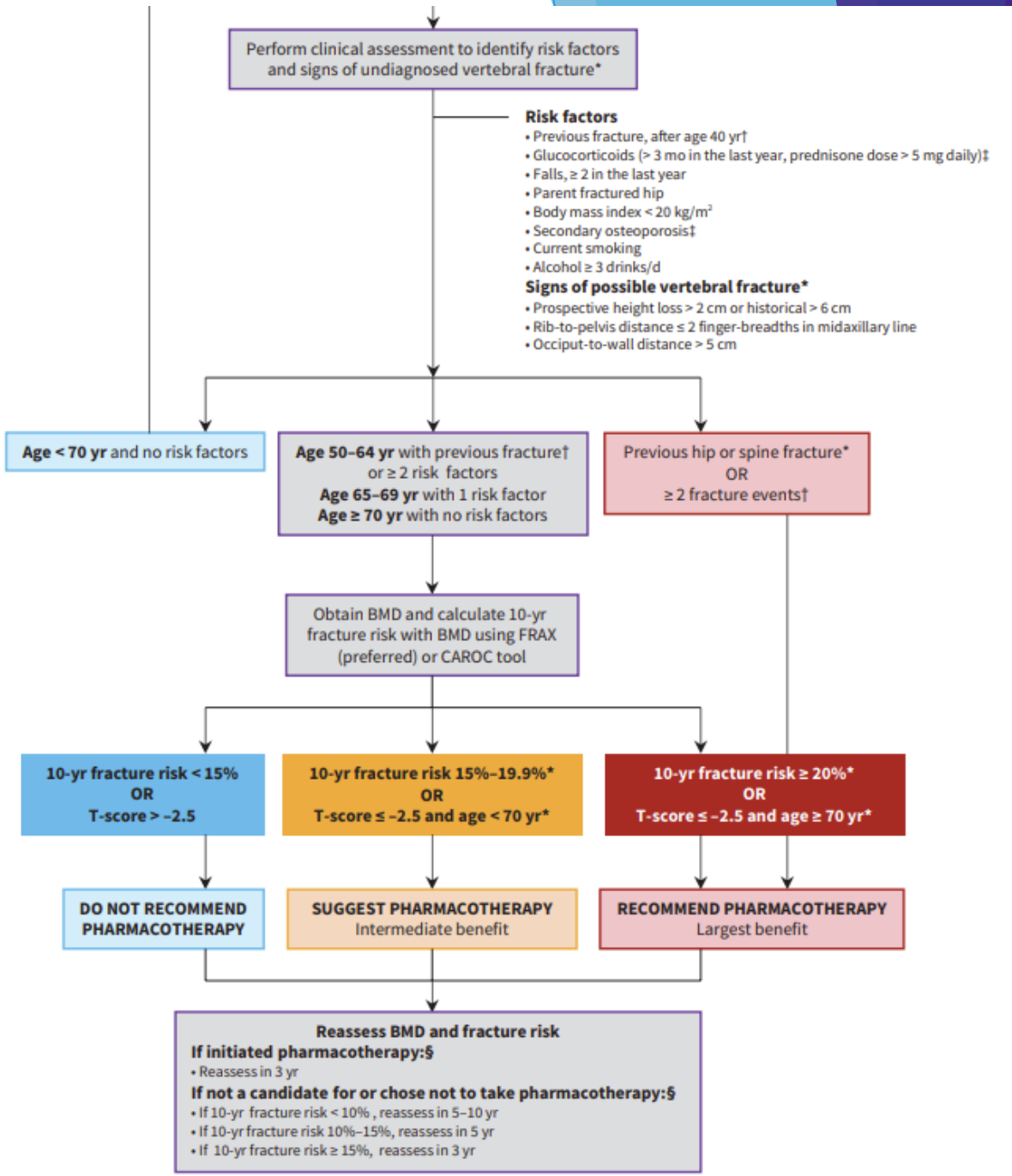
A shorter retesting interval may be appropriate for those with secondary osteoporosis or new clinical risk factors, such as fracture.

Conditional recommendation;

Low-certainty evidence (females), Very low certainty evidence (males)

Summary

- Remember males
- Clinical risk factors are important
- Risk assessment:
  - FRAX (preferred) or CAROC
- Recent fracture at higher risk for repeat fracture
- As risk increases, benefit of therapy increases
- Identify vertebral fractures
- Interval for repeat assessment based on risk assessment



Introduction

Claudia Gagnon, MD, FRCPC

Disclosure

Relevant relationships with commercial entities:

- None

Potential for conflicts within this presentation:

- None

Steps taken to review and mitigate potential bias:

- I will not be discussing any off-label use of medications, and will be adhering to national/international guidelines.

Presentation
OC Clinical Practice Guideline Update Session 2: Pharmacotherapy

Sandra Kim, MD, FRCPC

OSTEOPOROSIS

CMC 2023

A PROFESSIONAL EDUCATIONAL SYMPOSIUM FOCUSED
ON TREATMENT, MANAGEMENT AND PREVENTION

Session 2: Osteoporosis Pharmacotherapy

Sandra Kim, MD, FRCPC
Division of Endocrinology, Department of Medicine
Women's College Hospital
University of Toronto

Disclosure

- **Relevant relationships with commercial entities:**
  - None
- **Potential for conflicts within this presentation:**
  - Board of Directors for Osteoporosis Canada 2017-2020
- **Steps taken to review and mitigate potential bias:**
  - I will not be discussing any off-label use of medications and will be adhering to national/international guidelines

Learning Objectives

- Implement an approach to osteoporosis pharmacotherapy initiation
- Explain the benefits and harms of osteoporosis pharmacotherapy options
- Describe appropriate treatment durations and sequence of therapy

Pharmacotherapy Working Group

Nancy Santesso PhD (Co-Chair) – GRADE methodologist

Suzanne Cadarette PhD

Sheila Dunn MD

Jamie Falk PharmD

Heather Frame MD

Kaleen Hayes PhD

Susan Jaglal PhD

Alexandra Papaioannou MD

Rowena Ridout MD

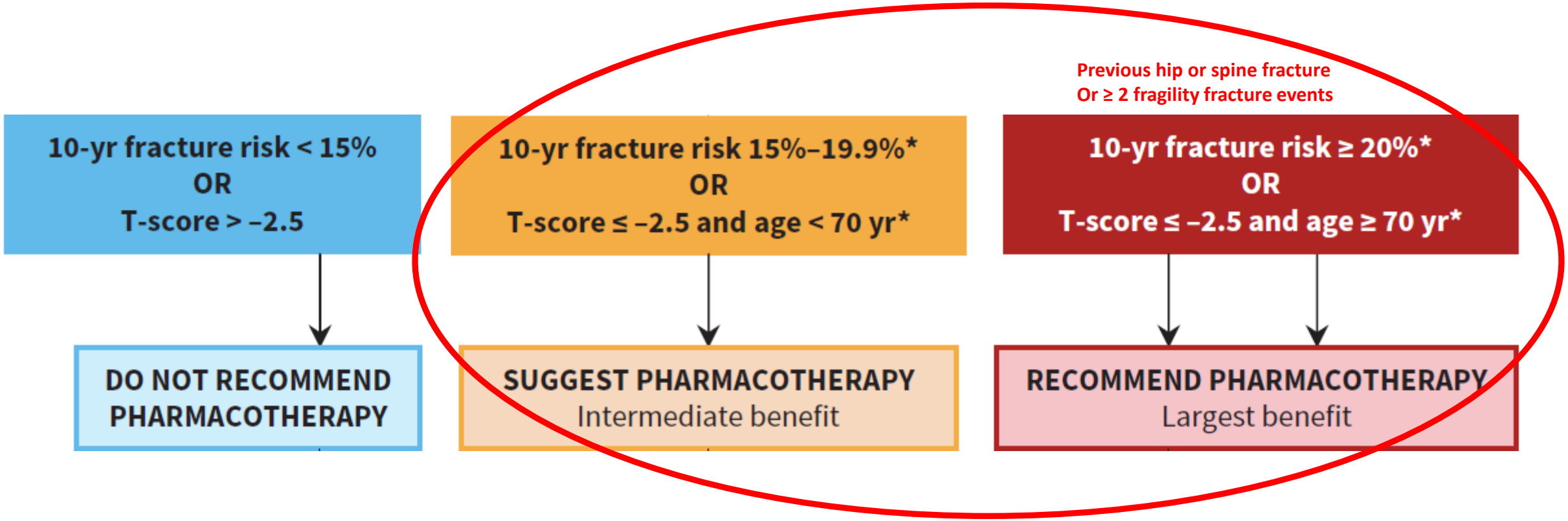
Christine Thomas - patient partner

Pharmacotherapy Recommendations

Pharmacologic Interventions	Duration and Sequence of Therapy	Monitoring of Therapy
• 5 Recommendations • 2 Good practice statements	• 4 Recommendations • 2 Good practice statements	• 4 Recommendations • 2 Good practice statements

Pharmacologic Interventions

Pharmacologic Interventions



Pharmacologic Interventions

Good Practice Statement:

- Before initiating pharmacotherapy, good practice includes assessing for secondary causes of osteoporosis, and for potential limitations when considering specific osteoporosis therapy

Table 3. Biochemical testing for secondary causes of osteoporosis, and for potential limitations when considering specific osteoporosis pharmacotherapy (17)

- Calcium, corrected for albumin
- Phosphate
- Creatinine (eGFR)
- Alkaline phosphatase
- Thyroid-stimulating hormone
- Serum protein electrophoresis (for patients with vertebral fractures)
- 25-hydroxyvitamin D, if risk factors for insufficiency or starting potent antiresorptive therapy

Challenges with Osteoporosis Pharmacotherapy

- Rare risks with long-term potent anti-resorptive therapy (AFF, ONJ)
- Rapid bone loss + risk of rebound VCFs with stopping denosumab
- Cost and feasibility of anabolic agents

Pharmacotherapy Options in Canada

Anti-Resorptive (inhibits osteoclastic activity)	Anabolic (stimulates new bone formation)

• **Bisphosphonates**
  • **Alendronate**
  • **Risedronate**
  • **Zoledronic Acid**
• **Denosumab**
• **Raloxifene**
• **Hormone Therapy (Estrogen)**
	• **Teriparatide**
	• **Romosozumab**

Etidronate: not available (cancelled by all generic manufacturers in Canada)
Calcitonin: 2012 Health Canada restricted use due to increased risk of cancer

Pharmacotherapy Options in Canada

Anti-Resorptive (inhibits osteoclastic activity)	Anabolic (stimulates new bone formation)

• **Bisphosphonates**
  • **Alendronate**
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• **Denosumab**
• **Raloxifene**
• **Hormone Therapy (Estrogen)**
	• **Teriparatide**
	• **Romosozumab**

Potent anti-resorptives

Etidronate: not available (cancelled by all generic manufacturers in Canada)
Calcitonin: 2012 Health Canada restricted use due to increased risk of cancer

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Pharmacotherapy Options in Canada

Anti-Resorptive (inhibits osteoclastic activity)	Anabolic (stimulates new bone formation)

• **Bisphosphonates** ⇨
  • **Alendronate**
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  • **Zoledronic Acid**
• **Denosumab**
• **Raloxifene**
• **Hormone Therapy (Estrogen)**
	• **Teriparatide**
	• **Romosozumab**

- Long skeletal retention
- Efficacy plateau ~ 3-6 yrs
- Longer duration:
  - ↑ risk of AFF + ONJ
  - ↓ benefit/risk ratio

Pharmacotherapy Options in Canada

Anti-Resorptive (inhibits osteoclastic activity)	Anabolic (stimulates new bone formation)

• **Bisphosphonates**
  • **Alendronate**
  • **Risedronate**
  • **Zoledronic Acid**
• **Denosumab** ⇨
  • **No skeletal retention**
  • **Rapid bone loss + vert fx risk with delayed dose or discontinuation**
  • **Risk of AFF + ONJ stable over time**
  • **Benefit/risk ratio favorable at 10 yr**
	• **Teriparatide**
	• **Romosozumab**

Pharmacotherapy Options in Canada

Anti-Resorptive (inhibits osteoclastic activity)	Anabolic (stimulates new bone formation)

• **Bisphosphonates**
  • **Alendronate**
  • **Risedronate**
  • **Zoledronic Acid**
• **Denosumab**
• **Raloxifene**
• **Hormone Therapy (Estrogen)** } For PM females only
	• **Teriparatide**
	• **Romosozumab**

OSTEOPOROSIS

Pharmacotherapy Options in Canada

Anti-Resorptive (inhibits osteoclastic activity)	Anabolic (stimulates new bone formation)

• **Bisphosphonates**
  • **Alendronate**
  • **Risedronate**
  • **Zoledronic Acid**
• **Denosumab**
• **Raloxifene**
• **Hormone Therapy (Estrogen)**
	• **Teriparatide** → 24 mo duration (daily sc); No AFF or ONJ risk
	• **Romosozumab**

Pharmacotherapy Options in Canada

Anti-Resorptive (inhibits osteoclastic activity)	Anabolic (stimulates new bone formation)

• **Bisphosphonates**
  • **Alendronate**
  • **Risedronate**
  • **Zoledronic Acid**
• **Denosumab**
• **Raloxifene**
• **Hormone Therapy (Estrogen)**
	• **Teriparatide**
	• **Romosozumab** ⇨
	  • 12 mo duration (monthly sc)
	  • Dual anabolic + antiresorptive
	  • Rare risk of AFF + ONJ

Pharmacotherapy Options in Canada

Anti-Resorptive (inhibits osteoclastic activity)	Anabolic (stimulates new bone formation)

• **Bisphosphonates**
  • **Alendronate**
  • **Risedronate**
  • **Zoledronic Acid**
• **Denosumab**
• **Raloxifene**
• **Hormone Therapy (Estrogen)**
	• **Teriparatide**
	• **Romosozumab**
	
	• **Rapid benefit seen for ↑ BMD + ↓ fracture**
	• **Subsequent antiresorptive required to maintain BMD gains**
	• **High cost $$$$$**

Network Meta-Analysis 2019

Fracture risk reduction benefits shown in pivotal short-term RCTs of up to 3 years

	Alendronate	Risedronate	Zoledronate	Hormone therapy	Raloxifene	Denosumab	Teriparatide	Romosozum	Placebo risk at 3 yrs	Mod benefit at 3 yrs
Hip	0.61 (0.42,0.90)	0.73 (0.58,0.92)	0.60 (0.45,0.81)	0.72 (0.53,0.98)	0.91 (0.71,1.17)	0.56 (0.35,0.90)	0.64 (0.25,1.68)	0.44 (0.24,0.79)		
	-4	-3	-4	-3	-1	-4	-4	-6	10	-3
	H	H	H	M†	M*	H	M*	H		
Non-vertebral	0.84 (0.74,0.94)	0.78 (0.68,0.89)	0.79 (0.67,0.94)	0.78 (0.68,0.89)	0.94 (0.85,1.05)	0.80 (0.67,0.96)	0.62 (0.47,0.80)	0.67 (0.53,0.86)		
	-8	-11	-11	-11	-3	-10	-19	-17	50	-14
	H	H	H	M†	M*	H	H	H		
Vertebral (All)	0.57 (0.45,0.71)	0.61 (0.48,0.78)	0.38 (0.25,0.58)	0.65 (0.46,0.92)	0.59 (0.46,0.76)	0.32 (0.22,0.45)	0.27 (0.19,0.38)	0.33 (0.22,0.49)		
	-22	-20	-31	-18	-21	-34	-37	-34	50	-14
	H	H	H	M†	H	H	H	H		

Barrionuevo et al, JCEM 2019 May 1;104(5):1623

CMC 2023

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	-22	-20	-31	-18	-21	-34	-37	-34	50	-14
	H	H	H	M†	H	H	H	H		

Bisphosphonates generally similar
Zoledronic acid: better ↓ vertebral fx

Barrionuevo et al, JCEM 2019 May 1;104(5):1623

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	-8	-11	-11	-11	-3	-10	-19	-17	50	-14
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Vertebral (All)	0.57 (0.45,0.71)	0.61 (0.48,0.78)	0.38 (0.25,0.58)	0.65 (0.46,0.92)	0.59 (0.46,0.76)	0.32 (0.22,0.45)	0.27 (0.19,0.38)	0.33 (0.22,0.49)		
	-22	-20	-31	-18	-21	-34	-37	-34	50	-14
	H	H	H	M†	H	H	H	H		

Raloxifene inferior
HRT: similar to bisphosphonates

Barrionuevo et al, JCEM 2019 May 1;104(5):1623

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	-8	-11	-11	-11	-3	-10	-19	-17	50	-14
	H	H	H	M†	M*	H	H	H		
Vertebral (All)	0.57 (0.45,0.71)	0.61 (0.48,0.78)	0.38 (0.25,0.58)	0.65 (0.46,0.92)	0.59 (0.46,0.76)	0.32 (0.22,0.45)	0.27 (0.19,0.38)	0.33 (0.22,0.49)		
	-22	-20	-31	-18	-21	-34	-37	-34	50	-14
	H	H	H	M†	H	H	H	H		

Denosumab: similar to bisphosphonates
(in particular ↓ vertebral fx to zoledronic acid)

Barrionuevo et al, JCEM 2019 May 1;104(5):1623

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	-8	-11	-11	-11	-3	-10	-19	-17	50	-14
	H	H	H	M†	M*	H	H	H		
Vertebral (All)	0.57 (0.45,0.71)	0.61 (0.48,0.78)	0.38 (0.25,0.58)	0.65 (0.46,0.92)	0.59 (0.46,0.76)	0.32 (0.22,0.45)	0.27 (0.19,0.38)	0.33 (0.22,0.49)		
	-22	-20	-31	-18	-21	-34	-37	-34	50	-14
	H	H	H	M†	H	H	H	H		

Anabolics: greater benefits for vertebral fx (similar to zol and dmab) and for non-vertebral fractures

Barrionuevo et al, JCEM 2019 May 1;104(5):1623

OSTEOPOROSIS

Initial Treatment Choice

Bisphosphonates – first line therapy for most people

Assess adherence and tolerance - *Rec 6.5-6.6*

People initiating therapy

↓

Bisphosphonates*
(Alendronate, Risedronate, Zoledronic acid)
Rec 4.3

Strong recommendation
High-certainty evidence (females)
Moderate-certainty evidence (males)

Remark: *Oral bisphosphonates may be preferred, as drug coverage, costs and access to an infusion centre may be barriers to zoledronic acid*

Initial Treatment Choice

Bisphosphonates – first line therapy for most people

Assess adherence and tolerance - *Rec 6.5-6.6*

People initiating therapy

Bisphosphonates*
(Alendronate, Risedronate, Zoledronic acid)
Rec 4.3

Strong recommendation
High-certainty evidence (females)
Moderate-certainty evidence (males)

Remark: *Oral bisphosphonates may be preferred, as drug coverage, costs and access to an infusion centre may be barriers to zoledronic acid*

MHT - alternative for some postmenopausal females

***Menopausal hormone therapy is a suggested alternative for females younger than 60 years or within 10 years after menopause who prioritize alleviation of substantial menopausal symptoms (*Rec 4.4*).**

Conditional recommendation
Moderate-certainty evidence

Remark: *The choice will also depend on individualized risks of menopausal hormone therapy, which consists of an estrogen dose equivalent of conjugated equine estrogens of 0.625 mg daily (plus progestogen in those with an intact uterus)*

OSTEOPOROSIS

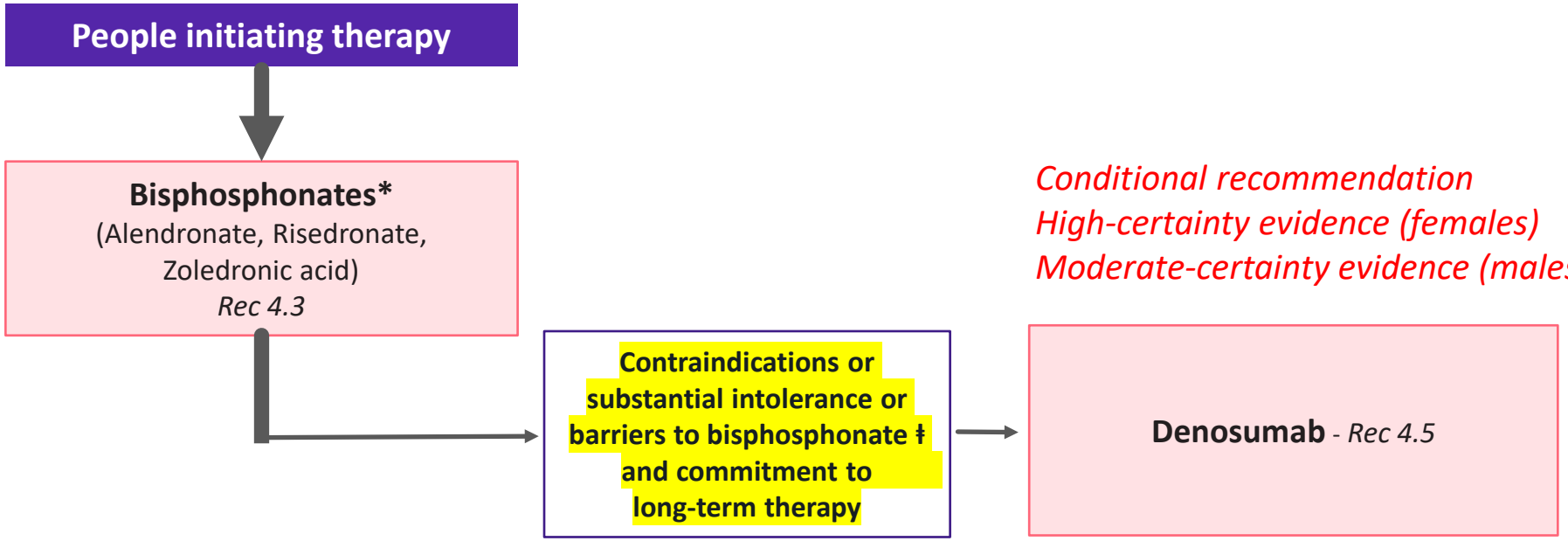
Bisphosphonates

Drug	Route and dosing	Potential adverse effects	Contraindications	Other considerations	Cost†
Antiresorptive agents					
Bisphosphonates					
Alendronate	Oral: 70 mg weekly *or* 10 mg daily	• Esophageal or GI intolerance • MSK discomfort • Rare: AFF, ONJ	• CrCl < 30–35 mL/min • Esophageal abnormalities • Inability to be upright > 30 min • Hypocalcemia	• Foods, drinks (except plain water), other drugs should be avoided for > 30–60 min • Minerals and dairy impair absorption if taken close together	$
Risedronate	Oral: 35 mg weekly *or* 150 mg monthly *or* 5 mg daily	• Esophageal/GI intolerance • MSK discomfort • Rare: AFF, ONJ	• CrCl < 30–35 mL/min • Esophageal abnormalities • Inability to be upright > 30 min • Hypocalcemia	• Foods, drinks (except plain water), other drugs should be avoided for > 30–60 min • Minerals and dairy impair absorption if taken close together • Delayed-release formulation available (taken with food)	$
Zoledronic acid	Intravenous: 5 mg yearly	• Transient flu-like symptoms • Hypocalcemia • Renal toxicity • Rare: AFF, ONJ	• CrCl < 35 mL/min • Hypocalcemia	• Inadequate vitamin D increases risk for hypocalcemia • Less frequent dosing than yearly may be considered	$$

Initial Treatment Choice

Denosumab – second line option

Assess adherence and tolerance - *Rec 6.5-6.6*



Conditional recommendation
High-certainty evidence (females)
Moderate-certainty evidence (males)

Remark: *Despite the benefits of denosumab, a* ***careful assessment of indications*** *is required because of the risk of rapid bone loss and vertebral fractures with delayed dosing or discontinuation of denosumab. It is important to* ***communicate the need for commitment to long-term therapy and the need to transition to alternative antiresorptive therapy if discontinuing denosumab****. Denosumab may be preferred when there is a high burden of oral medications, gastrointestinal intolerance, contraindication to oral bisphosphonates or barriers to accessing intravenous zoledronic acid*

OSTEOPOROSIS

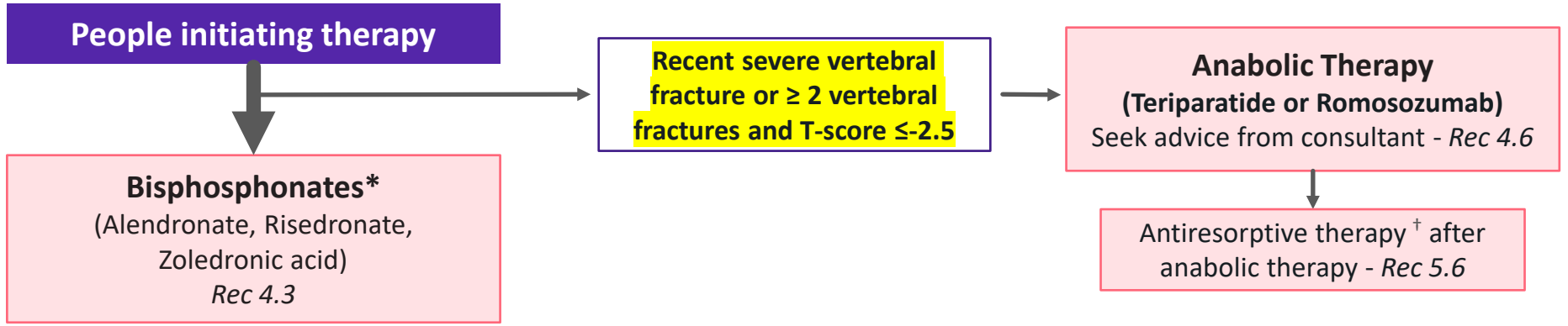
Denosumab

Drug	Route and dosing	Potential adverse effects	Contraindications	Other considerations	Cost†
RANK-ligand inhibitor (monoclonal antibody)					
Denosumab	Subcutaneous: 60 mg every 6 mo	• Hypocalcemia • Dermatitis, infections • MSK discomfort • Rare: AFF, ONJ	• Hypocalcemia	• Inadequate vitamin D increases risk for hypocalcemia • Caution warranted in severe renal impairment • Rapid bone loss and risk of vertebral fractures if delayed dose or with discontinuation	$$$

Initial Treatment Choice

Anabolic therapy – upfront treatment in selective patients

Assess adherence and tolerance - *Rec 6.5-6.6*



Conditional recommendation
High-certainty evidence (females)
Moderate-certainty evidence (males)

Remark: *"Recent fracture" is defined as a fracture occurring within the past 2 yr, and "severe vertebral fracture" as vertebral body height loss of > 40%. Clinicians may seek advice from radiologists to clarify the degree of severity of the vertebral fracture.* ***The choice of anabolic therapy may depend on affordability and feasibility of injection schedule****.*

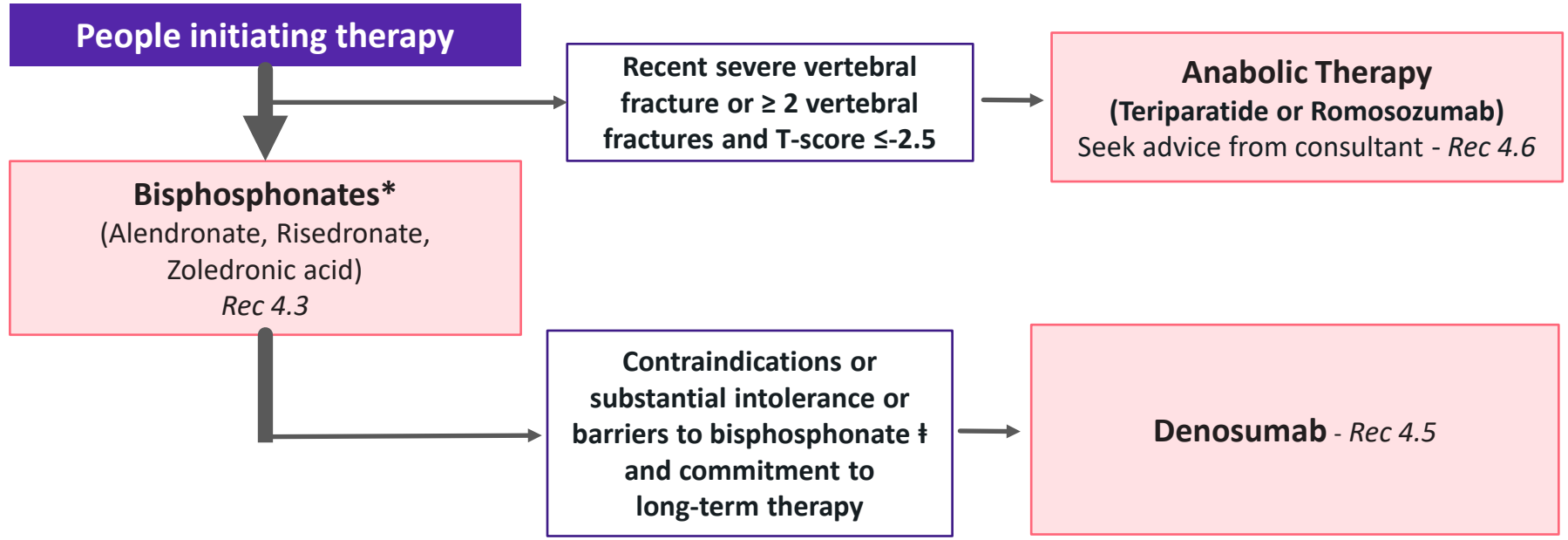
Anabolic Agents: Teriparatide and Romosozumab

Drug	Route and dosing	Potential adverse effects	Contraindications	Other considerations	Cost†
Anabolic agents					
Parathyroid hormone analog					
Teriparatide	Subcutaneous: 20 µg daily for 24 mo	• Orthostatic hypotension, nausea • Hypercalcemia, hypercalciuria • MSK discomfort	• CrCl < 30 mL/min • Bone malignancy, Paget disease, previous skeletal radiation • Hypercalcemia disorder • Unexplained elevated ALP	• Caution warranted with active or previous kidney stone disease	$$$$$
Sclerostin inhibitor (monoclonal antibody)					
Romosozumab	Subcutaneous: 210 mg monthly for 12 mo	• Myocardial infarction, stroke • Hypocalcemia • MSK discomfort • Rare: AFF, ONJ	• Previous myocardial infarction or stroke • Hypocalcemia	• Inadequate vitamin D increases risk for hypocalcemia • Caution warranted in severe renal impairment	$$$$$

Initial Treatment Choice

Raloxifene – last resort than no treatment for PM females

Assess adherence and tolerance - *Rec 6.5-6.6*



ǂRaloxifene is suggested rather than no treatment for females who have contraindications or substantial intolerance to, or who choose not to take, other suggested therapies (Rec. 4.7).

***Remark*:** *Raloxifene should be used only in those who are not at high risk of VTE.*

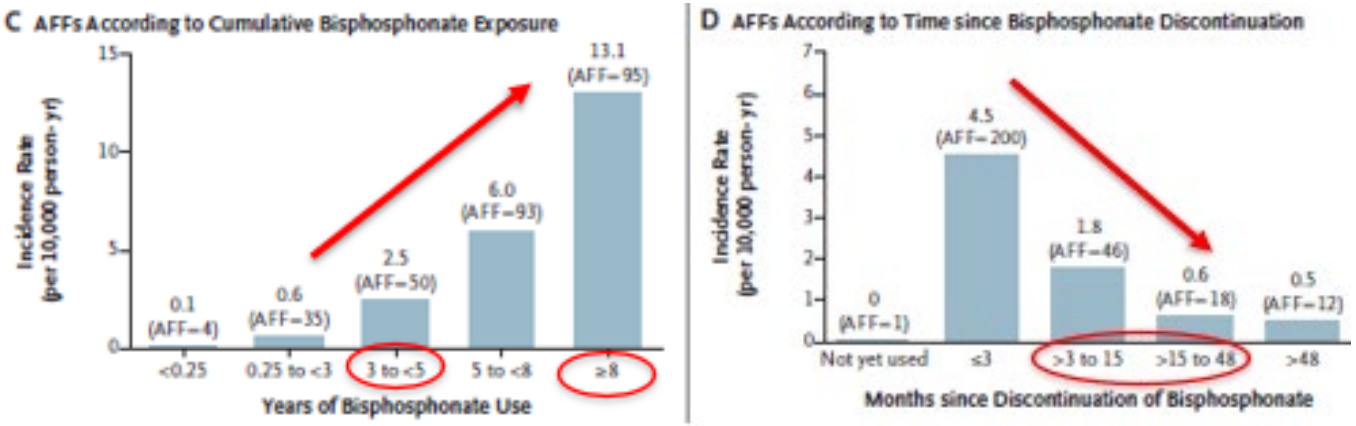
Conditional, moderate-certainty evidence

OSTEOPOROSIS

Duration and Sequence of Therapy

Bisphosphonates - Long-term Safety and Efficacy

- ↑ AFF with longer duration :
  - **3-5 yrs**: 25 AFF per 100,000 person-yrs
  - **>6 yrs**: 39-131 AFF per 100,000 person-yrs
  - Asian females: 4-5x higher risk
  - Rapid ↓ AFF risk with discontinuation
- ONJ with longer duration:
  - 5 yrs: 25 ONJ per 100,000 person-yrs
  - >5 yrs: 50 ONJ per 100,000 person-yrs
- Anti-fracture efficacy plateau ~ 3-6 yrs
- Benefit to risk ratio wanes with prolonged duration
- **Concept of bisphosphonate drug holiday**: supported by extension trials
  - FLEX (Aln 5 vs 10 yrs) → no diff hip + overall fractures (small-moderate ↓ clinical VCFs)
  - HORIZON Extension (ZA 3 yrs vs 6 yrs) → no diff in hip + nonvert fractures (possible ↓ radiological VCFs)



Black et al, NEJM 2020
Eiken et al, OI 2017
Black et al, JAMA 2006
Black et al, JBMR 2012
Fink et al, Ann Intern Med 2019

OSTEOPOROSIS

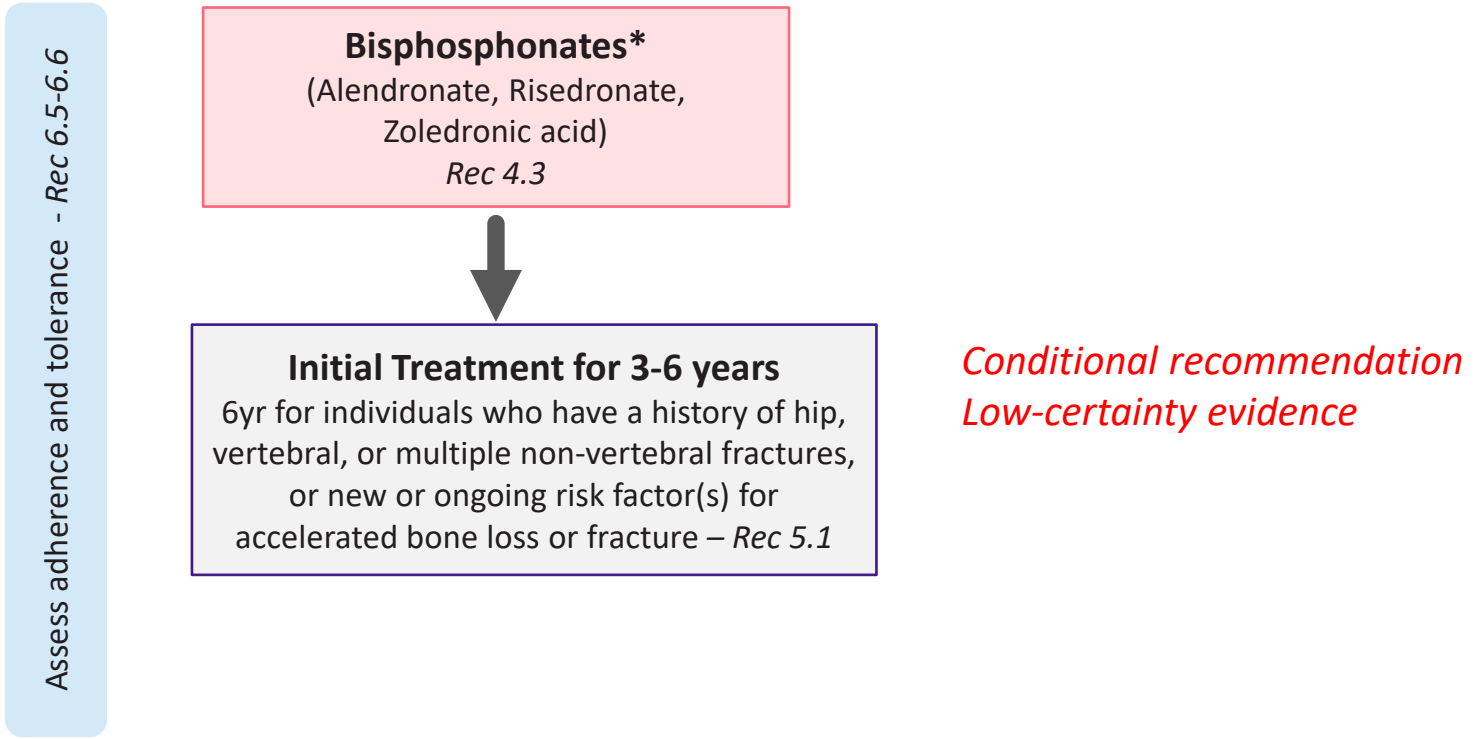
Denosumab – Long-term Safety and Efficacy

- Risk of AFF and ONJ relatively stable over 10 years:
  - AFF: 8 per 100,000 person-yrs
  - ONJ: 52 per 100,000 person-yrs
- FREEDOM extension trial
  - BMD and anti-fracture benefits persists at 10 yrs
- Benefits to risk ratio favorable at 10 yrs
- However, uncertain beyond 10 yrs
- No skeletal retention → No drug holiday
- If stopping, need transition to another agent (only partial protection)

Bone et al, Lancet Diabetes Endocrinol, 2017
Fink et al, Ann Intern Med 2019

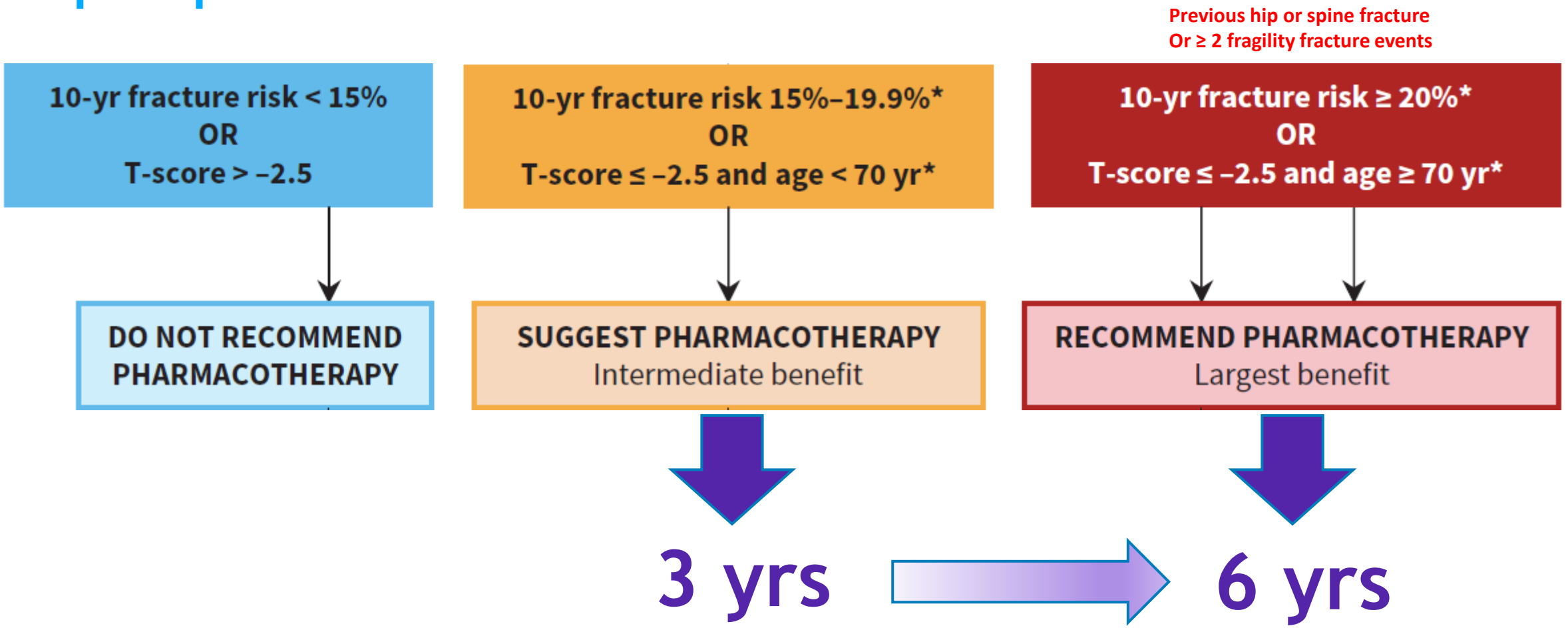
Bisphosphonates - Duration and Sequence

Initial duration 3-6 yrs based on history of high-risk fractures and active risk factors



Conditional recommendation
Low-certainty evidence

Bisphosphonates Duration



Bisphosphonates - Duration and Sequence: Drug Holiday

Drug holiday – need reassessment for resumption of therapy

Interval of intermittent therapy based on active risk factors and fracture risk

Assess adherence and tolerance - *Rec 6.5-6.6*

Bisphosphonates*
(Alendronate, Risedronate, Zoledronic acid)
Rec 4.3

↓

Initial Treatment for 3-6 years
6yr for individuals who have a history of hip, vertebral, or multiple non-vertebral fractures, or new or ongoing risk factor(s) for accelerated bone loss or fracture – *Rec 5.1*

↓

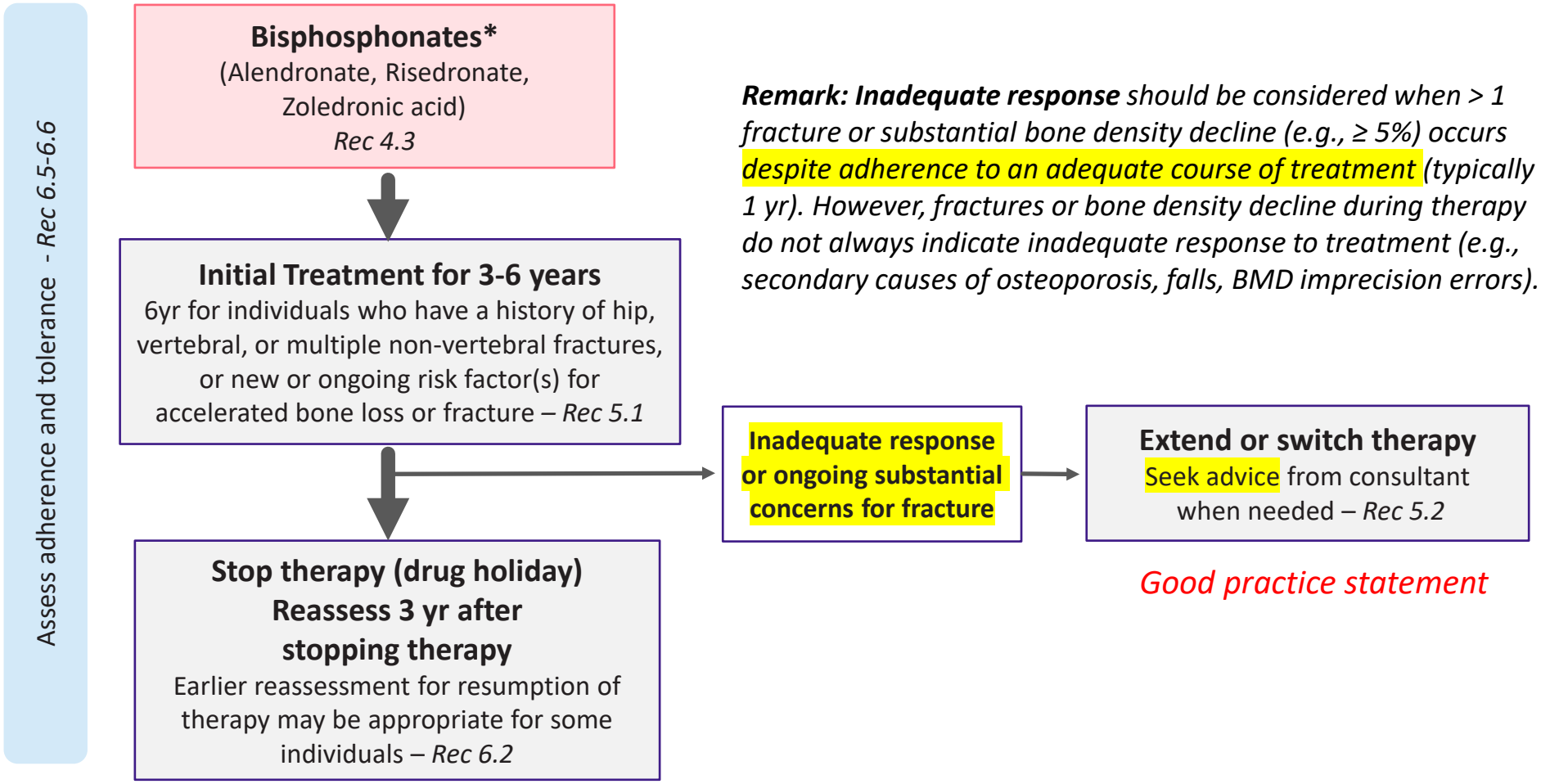
Stop therapy (drug holiday)
Reassess 3 yr after stopping therapy
Earlier reassessment for resumption of therapy may be appropriate for some individuals – *Rec 6.2*

Conditional recommendation
Very low-certainty evidence

Remark: *Earlier reassessment in those with higher risk of fracture (e.g. previous hip fracture, high FRAX score), secondary causes, new fracture or new clinical risk factors associated with rapid bone loss.*

Bisphosphonates - Duration and Sequence

Extend or switch therapy if inadequate response or ongoing substantial concerns



Remark: Inadequate response *should be considered when > 1 fracture or substantial bone density decline (e.g., ≥ 5%) occurs despite adherence to an adequate course of treatment (typically > 1 yr). However, fractures or bone density decline during therapy do not always indicate inadequate response to treatment (e.g., secondary causes of osteoporosis, falls, BMD imprecision errors).*

Good practice statement

OSTEOPOROSIS

Denosumab - Duration and Sequence

Long-term uninterrupted therapy

Assess adherence and tolerance - *Rec 6.5-6.6*

Denosumab - *Rec 4.5*
Long-term uninterrupted therapy - *Rec 5.3*

Conditional recommendation
Low-certainty evidence

Remark: *The injection schedule of every 6 mo should* ***not be delayed by more than 1 mo*** *because of the risk of rapid bone loss and vertebral fractures. Duration of therapy may be assessed after 6–10 yr and may be dependent on previous bisphosphonate therapy and individualized risk for atypical femoral fracture and osteonecrosis of the jaw.*

Denosumab - Duration and Sequence: Transitioning Off

Transition to alternative therapy when stopping denosumab

Associated risks dependent on denosumab duration

Assess adherence and tolerance - *Rec 6.5-6.6*

Denosumab - *Rec 4.5*
Long-term uninterrupted therapy - *Rec 5.3*

Remark: *Discontinuation of denosumab may be appropriate for people for whom treatment with denosumab is no longer warranted or for those who develop intolerance or contraindications to denosumab*

IF discontinuing denosumab, transition to alternative therapy:

If after ≤ 4 doses, we suggest transitioning to a bisphosphonate 6 mo after the last dose of denosumab to reduce the risk of rapid bone loss. We suggest bisphosphonate therapy for 1 yr and then reassessing the need for ongoing transition therapy. *Rec 5.4*

Conditional recommendation
Low-certainty evidence

If after ≥ 5 doses where the risk of rapid bone loss or vertebral fractures is high (e.g., those with prevalent vertebral fractures), good practice includes seeking advice from a consultant with expertise in osteoporosis on how to transition to an alternative therapy. *Rec 5.5*

Good practice statement

Tsourdi et al, JCEM 2020

OSTEOPOROSIS

Anabolic Therapy - Duration and Sequence

Transition to antiresorptive to maintain BMD gains

Assess adherence and tolerance - *Rec 6.5-6.6*

Anabolic Therapy
(Teriparatide or Romosozumab)
Seek advice from consultant - *Rec 4.6*

↓

Antiresorptive therapy † after anabolic therapy - *Rec 5.6*

Conditional recommendation
Low-certainty evidence

Monitoring of Therapy

Monitoring of Therapy

Good Practice Statements:

- Good practice includes regular clinical assessment for new fractures and new or active risk factors such as falls, as well as adherence to therapy, tolerability and adverse effects
  - Remark: Adherence to osteoporosis medications is known to be low and may be lower in people who have multiple comorbidities or medications, adverse effects, no drug coverage or misconceptions about osteoporosis therapy

- Good practice includes counselling on and monitoring for symptoms of AFF and ONJ with bisphosphonates or denosumab therapy
  - Risk factors for AFF include glucocorticoid use, longer duration of therapy. The risk is also higher in females who self-report Asian race or ethnicity. Unexplained thigh or groin pain should be evaluated.
  - Poor dental health, invasive dental surgery and glucocorticoid use are risk factors for ONJ; oral cavity lesions should be evaluated by a dentist

Monitoring of Therapy: Interval of BMD and FRA

Reassess BMD and fracture risk

If initiated pharmacotherapy:§

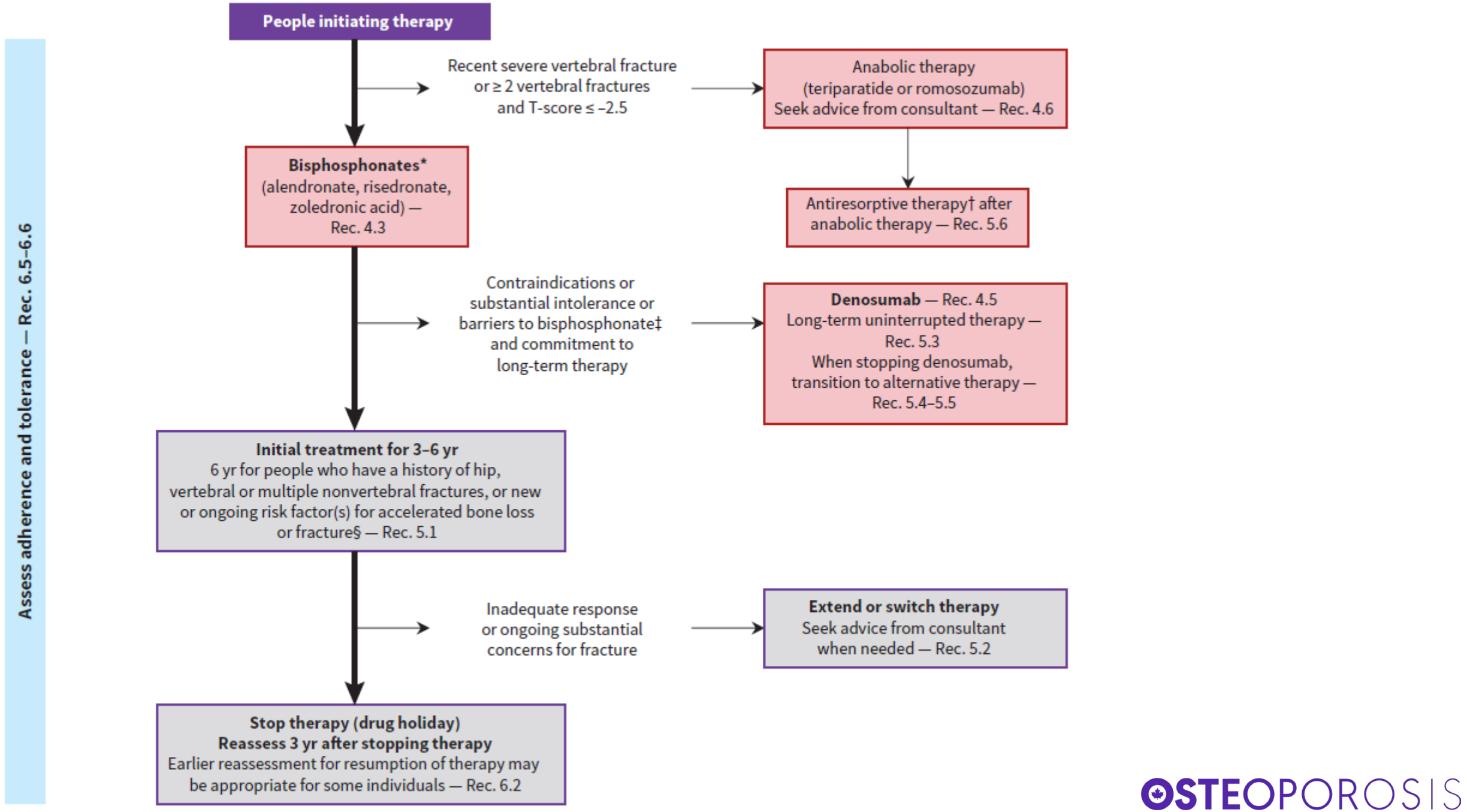
- Reassess in 3 yr

If not a candidate for or chose not to take pharmacotherapy:§

- If 10-yr fracture risk < 10% , reassess in 5–10 yr
- If 10-yr fracture risk 10%–15%, reassess in 5 yr
- If 10-yr fracture risk ≥ 15%, reassess in 3 yr

Remark: *BMD in may be repeated at shorter interval if secondary causes, new fracture or new clinical risk factors associated with rapid bone loss*

Conditional recommendation
Very low-certainty evidence



OSTEOPOROSIS

Summary of Pharmacotherapy Approach

- Bisphosphonates - first line for most
  - Initial duration for 3-6 yrs
  - Intermittent bisphosphonate therapy → drug holiday + reassess to resume
  - Likely ↑ uptake to therapy, ↑ adherence, ↓ over-treatment, ↓ rare risks
- Denosumab – alternative option
  - For appropriate patients committed to long-term therapy
  - Uninterrupted long-term therapy
  - Transition to anti-resorptive agent if discontinuing
- Anabolic agents – upfront therapy for selective patients
  - Greatest benefit for higher risk patients (recent VCF with osteoporosis)
- Monitoring of Therapy
  - Regularly assess adherence and tolerability, and for new risk factors
  - Reassess BMD and Fracture risk in 3 yrs (earlier if secondary causes, new fracture, new risk factors)

Presentation
OC Clinical Practice Guideline Update Session 3: Nutrition

Wendy Ward, BASC, MSC, PhD

OSTEOPOROSIS

CMC 2023

A PROFESSIONAL EDUCATIONAL SYMPOSIUM FOCUSED ON TREATMENT, MANAGEMENT AND PREVENTION

OC Clinical Practice Guideline Update Session 3: NUTRITION

Chair, Nutrition Working Group
Wendy Ward, PhD, Brock University

Members, Nutrition Working Group:
Bill Gittings, PhD, Brock University
Ina Ilse, Patient Partner
Lynn Nash, MD, McMaster University

Disclosures

- **Relevant relationships with commercial entities:**

  None

- **Potential for conflicts within this presentation:**

  None

- **Steps taken to review and mitigate potential bias:**

  Not applicable

Objectives

At the conclusion of this presentation, participants will

- know the new recommendations about the use of calcium, vitamin D and protein supplements to support bone health.
- understand the gaps in knowledge for use of other nutrient supplements such as magnesium and vitamin K to support bone health.
- understand what nutrition knowledge translation tools are currently available.

Approach

- Self-administered online survey → closed- & open-ended questions
- Patient Partner, Family Physician
  - ✓ Focus on supplements
  - ✓ Move beyond calcium and vitamin D supplements, to assess other potential bone-supporting nutrients, though at supplemental levels
    - Protein → muscle health, falls
    - Magnesium
    - Vitamin K

"For people consuming a balanced diet and not receiving pharmacotherapy for osteoporosis, supplementation with calcium, vitamin D and protein is likely to have little to no beneficial or detrimental effect on fractures."

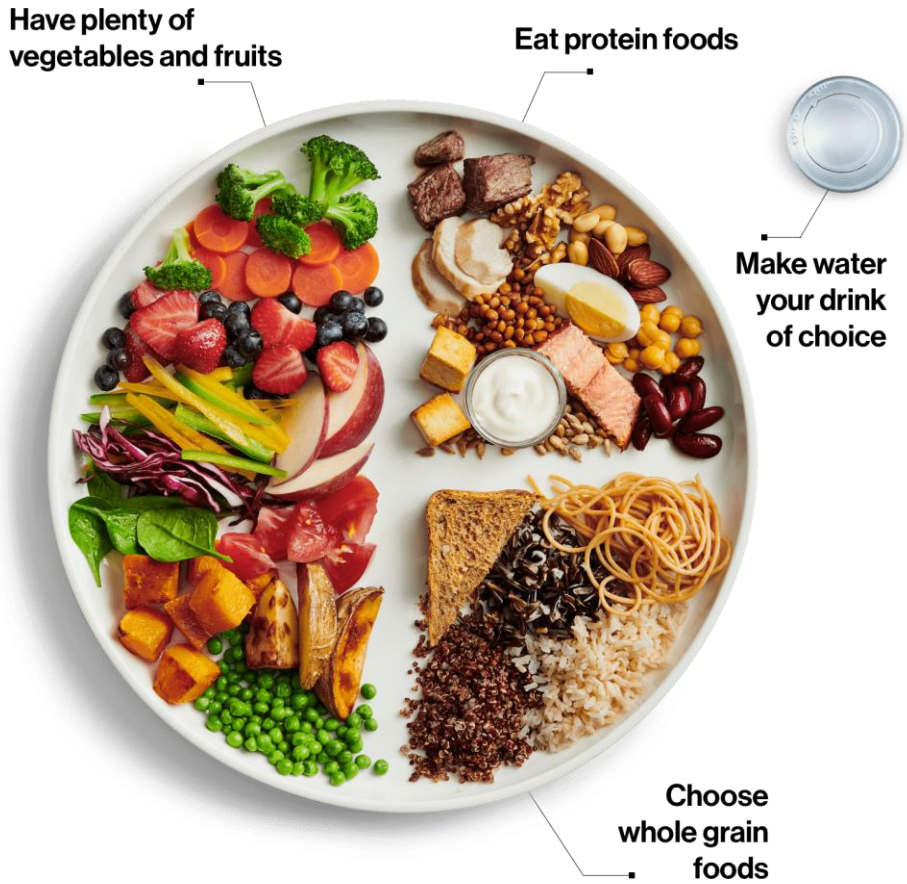
A balanced diet → 'Eat Well':

- Have plenty of fruits & vegetables
- Eat protein foods
- Choose whole grain foods

Eating for bone health 'foods first':

- Calcium
- Vitamin D + supplement
- Protein
- Magnesium
- Vitamin K

Canada's Food Guide "Eat Well Plate"

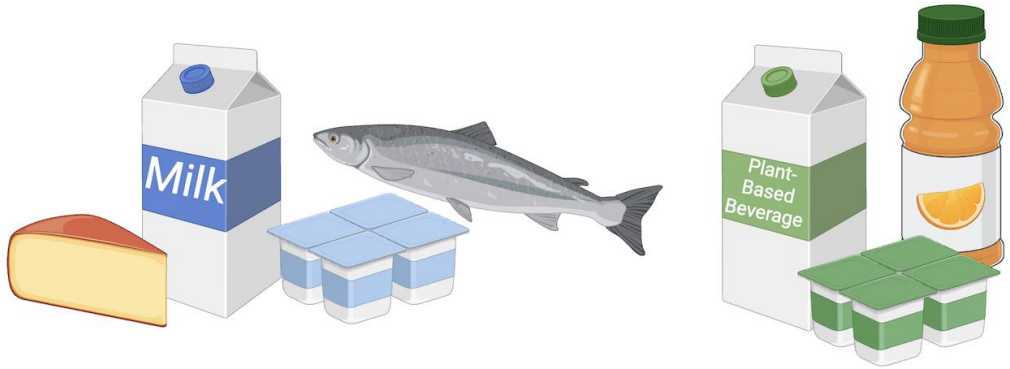


https://food-guide.canada.ca/en/

2.1 For people who meet the recommended dietary allowance for calcium with a variety of calcium-rich foods, we suggest no supplementation to prevent fractures.

- Moderate to high certainty evidence that calcium supplementation provides trivial benefits for fracture prevention (hip, vertebral or total)
- Supported by high certainty BMD evidence at multiple skeletal sites (femur neck, vertebra, total body, forearm)
- Individuals not receiving pharmacotherapy for osteoporosis

2.1 For people who meet the recommended dietary allowance for calcium with a variety of calcium-rich foods, we suggest no supplementation to prevent fractures.



Dairy, Fortified Plant Beverages, Fortified Orange Juice
Tofu (made with calcium), Salmon (with crushed bones)
~ 300 mg calcium

Many foods contain small amounts: nuts (almonds), greens, cooked beans

Calcium Calculator (OC website)

Recommended Dietary Allowance (RDA)

Men

51-70 y	1000 mg/day
>70 y	1200 mg/day

Women

51-70 y	1200 mg/day
>70 y	1200 mg/day

Upper Limit: 2000 mg/day

Images from Biorender

2.2 We suggest following Health Canada's recommendation of vitamin D for bone health.

- High certainty evidence that vitamin D supplementation provides trivial benefits for fracture prevention (hip, vertebral or total) or a decrease in falls
- Supported by BMD evidence at multiple skeletal sites (total hip, total body, lumbar spine, femur neck, forearm)
- Individuals not receiving pharmacotherapy for osteoporosis

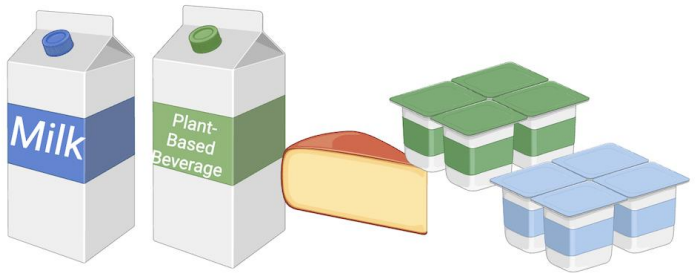
2.2 We suggest following Health Canada's recommendation of vitamin D for bone health (400 IU/day + food sources)

- Few foods contain vitamin D
- Don't rely on sunlight!

Natural Sources

Rainbow Trout, Salmon: >500 IU
Egg: 80 IU

Fortified Foods & Beverages



Cow's Milk: 200 IU
Fortified Plant Beverages: 200 IU
Variable levels:
-dairy yogurt & some cheeses
-plant based foods: yogurts, cheeses

Images from Biorender

Recommended Dietary Allowance (RDA)

Men & Women

51-70 y	**600 IU/day**
>70 y	**800 IU/day**

Health Canada recommends 400 IU vitamin/day plus dietary sources over age 50 as few foods contain vitamin D.

Type of supplement?
D3 (animal) or D2 (plant)
-> benefits from both sources

Upper Limit: 4000 IU/day

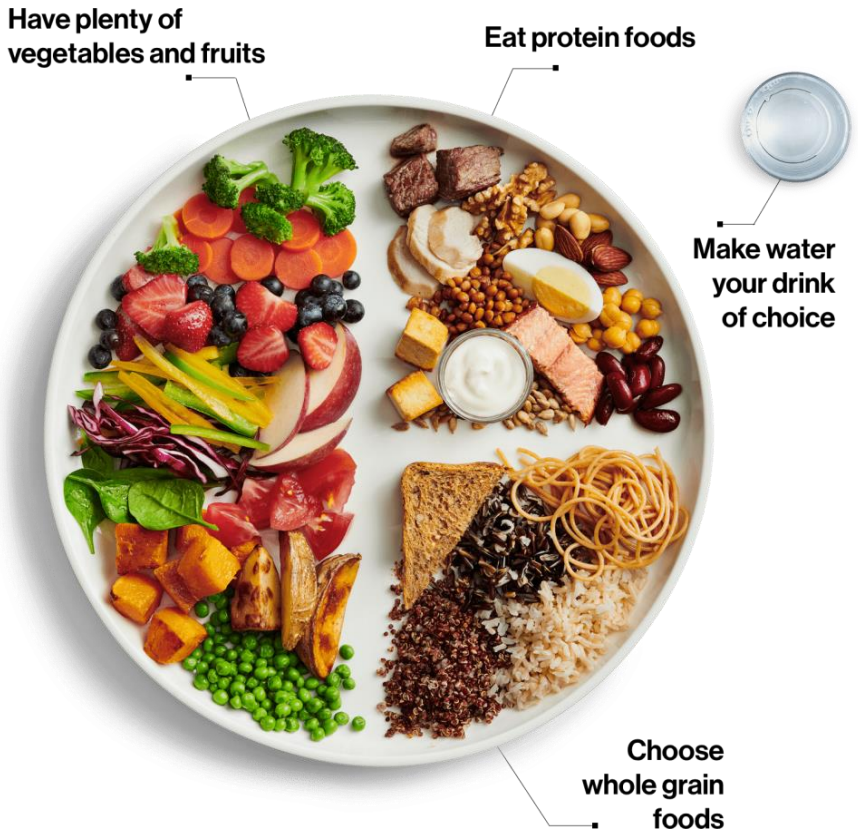
OSTEOPOROSIS

2022-2025 Stepwise vitamin D fortification strategy

- improve vitamin D intakes of Canadians
- Improve bone health of Canadians

• **Milk** (mandatory vit D fortification)	**2.3 ug → 5 ug (200 IU)/250 mL serving**
• **Margarine** (mandatory vit D fortification)	**1.3 ug → 2.6 ug (104 IU)/10 g serving**
• **Fortified Plant-based beverages**	**2.3 ug → 5 ug (200 IU)/250 mL serving**
• **Consultation 2023….** addition to yogurts	**0.8 ug → 5 ug (200 IU)/175 g serving**

https://www.gazette.gc.ca/rp-pr/p2/2022/2022-01-19/html/sor-dors278-eng.html



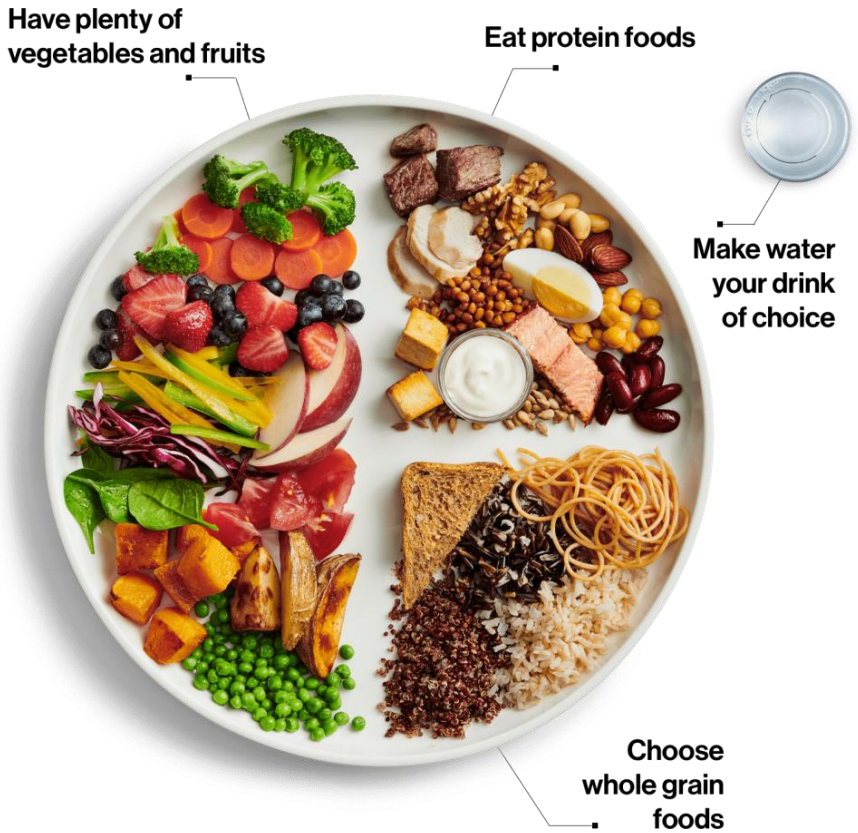
- **Water only?**

Other healthy drink choices:

-white milk (unsweetened, lower fat)
-fortified soy or almond beverages (unsweetened)
-tea, coffee (unsweetened)

https://food-guide.canada.ca/en/

CMC 2023



- **Water only?**

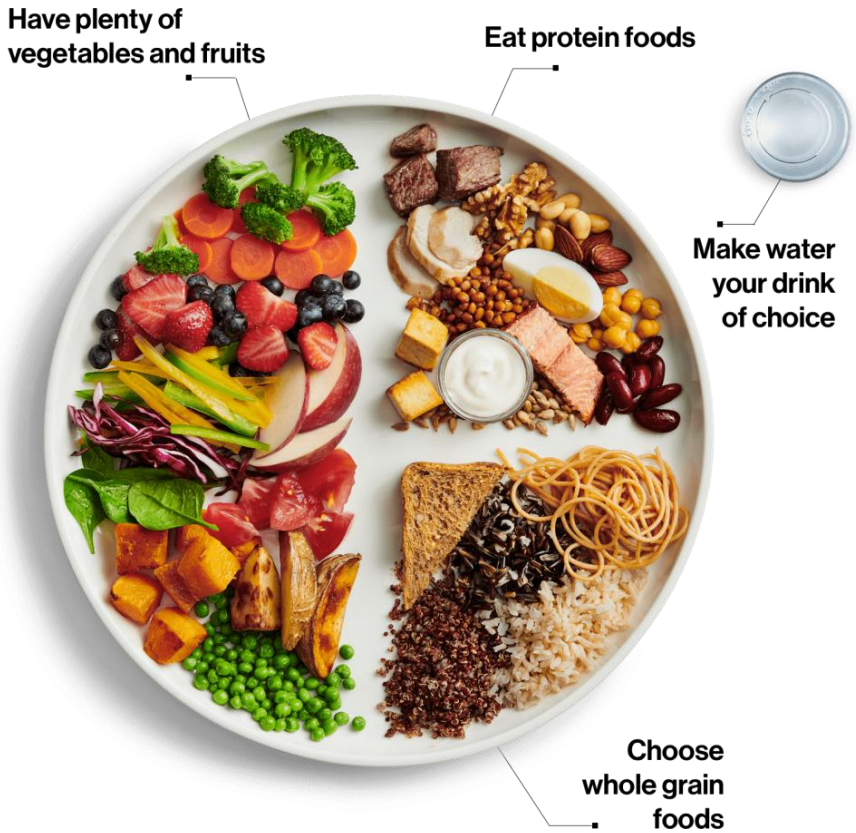
Other healthy drink choices:

-white milk (unsweetened, lower fat)
-fortified soy or almond beverages (unsweetened)
-tea, coffee (unsweetened)

184 IU/serving

https://food-guide.canada.ca/en/

OSTEOPOROSIS



https://food-guide.canada.ca/en/

- **Water only?**

Other healthy drink choices:

-white milk (unsweetened, lower fat)
-fortified soy or almond beverages (unsweetened)
-tea, coffee (unsweetened)

184 IU/serving

240 IU/bottle

OSTEOPOROSIS

2.3 For people who follow Canada's Food Guide, we suggest no supplementation of protein, vitamin K or magnesium.

Protein:

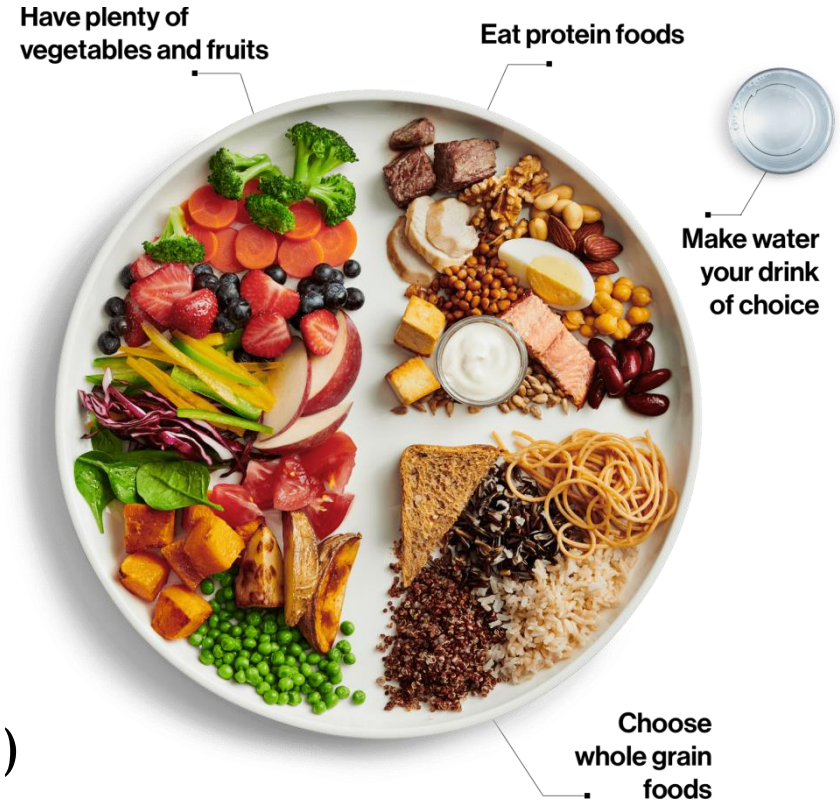
- Reduction in hip fracture with protein supplementation may be minimal
- Trivial effect on functional outcomes with higher dietary protein intakes
- Evidence is uncertain:
  - Dietary, not supplemental levels studied
  - Usual intake at or above RDA (0.8-1.3 g/kg body weight/day)
  - Well nourished subjects
  - Low levels of plant protein intake
  - No evidence for harm to bone at levels studied
- Individualized approach
- Consider muscle function
- Physical activity

2.3 For people who follow Canada's Food Guide, we suggest no supplementation of protein, vitamin K or magnesium.

Protein: at every meal

- Source of protein?
  - animal, plant, mixed sources
  - consider that foods contain more than protein
- Animal sources: Some foods with highest levels of protein per serving may also have higher levels of bone supporting nutrient such as calcium & vitamin D

  dairy, fatty fish, salmon with crushed bones
- Plant sources: fiber, fatty acid profile (omega-3 fatty acids) bioactives (polyphenols)

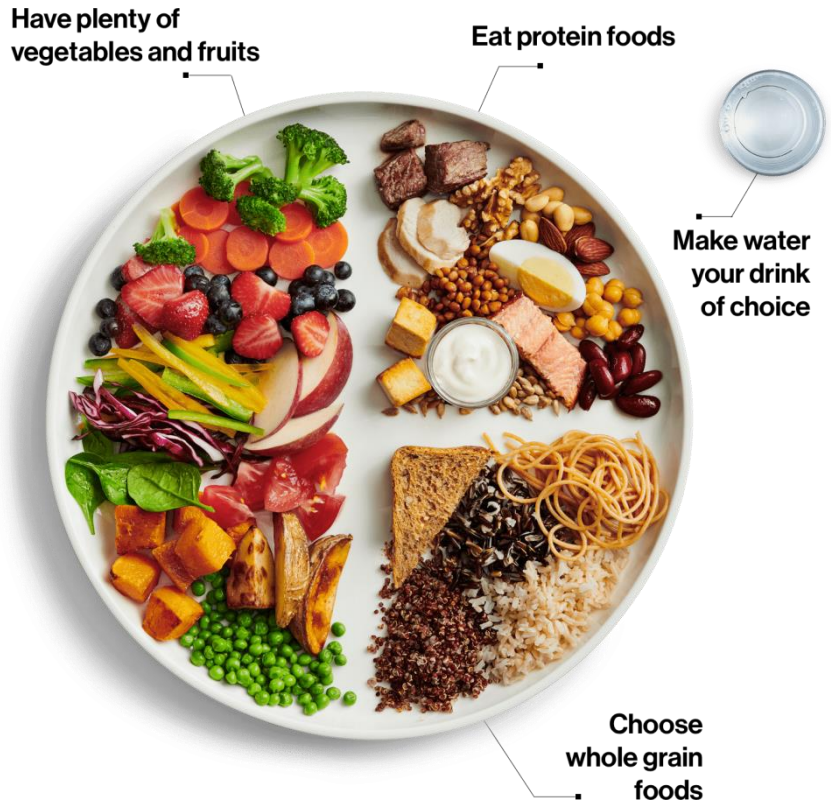


https://food-guide.canada.ca/en/

2.3 For people who follow Canada's Food Guide, we suggest no supplementation of protein, vitamin K or magnesium.

Magnesium

- Very low certainty of evidence for trivial to no differences in benefits or harms of magnesium supplementation for fracture prevention
- Evidence for supplementation is limited



https://food-guide.canada.ca/en/

2.3 For people who follow Canada's Food Guide, we suggest no supplementation of protein, vitamin K or magnesium.

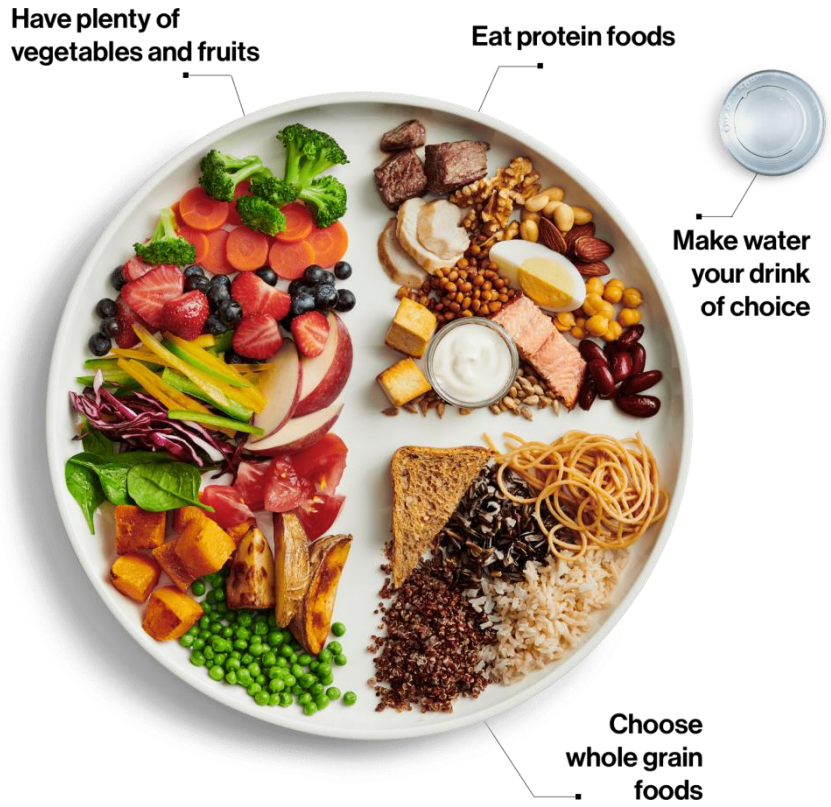
Magnesium

- Abundant in diet → Eat Well Plate

✓ Fruits & vegetables
green leafy vegetables

✓ Protein foods
beans, nuts, seeds, legumes, milk, yogurt

✓ Whole grains
various whole grain foods

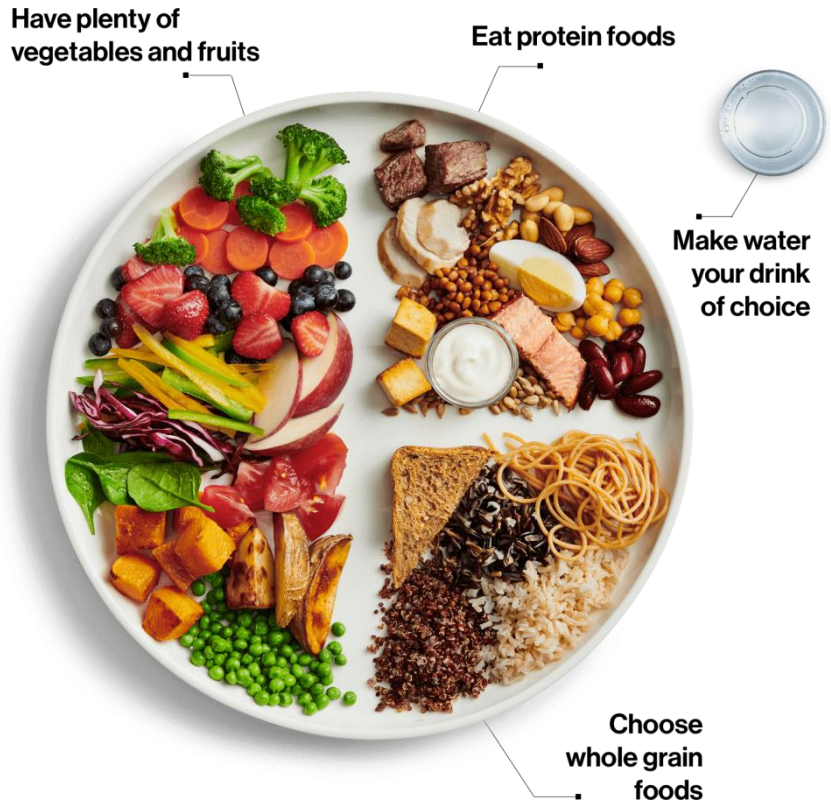


https://food-guide.canada.ca/en/

2.3 For people who follow Canada's Food Guide, we suggest no supplementation of protein, vitamin K or magnesium.

Vitamin K

- There is very low to low certainty evidence for small benefits of dietary or vitamin K supplementation for hip or total factures.
- Evidence for supplementation is limited



https://food-guide.canada.ca/en/

2.3 For people who follow Canada's Food Guide, we suggest no supplementation of protein, vitamin K or magnesium.

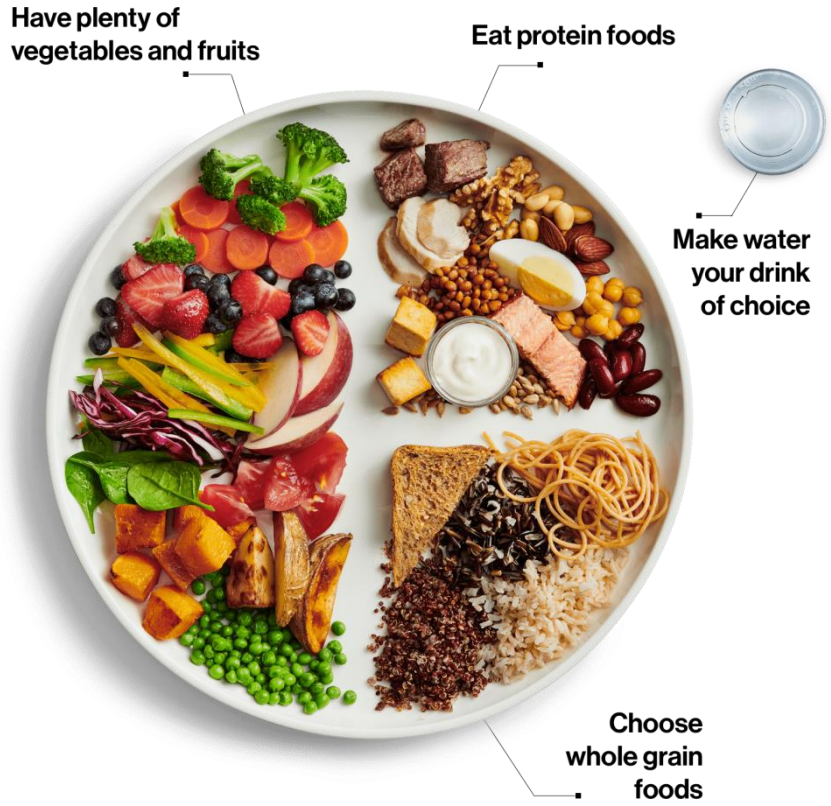
Vitamin K

- Abundant in diet → Eat Well Plate

✓ Fruits & vegetables - K1, Phylloquinone
green leafy vegetables, kale, spinach, broccoli, soybeans

✓ Protein foods - K2, Menaquinone
egg yolk, meats, dairy foods

- Both K1 and K2 help meet vitamin K requirement



https://food-guide.canada.ca/en/

2.4 For people initiating pharmacotherapy, it is good practice to individualize calcium and vitamin D.

Although most pharmacotherapy trials received a minimum of 400 IU vitamin D per day and up to 1000 mg calcium per day, food sources or supplementation should be individualized according to risk factors of insufficiency.

- Calcium: Estimate intake
  Calcium Calculator Tool (OC website)
- Vitamin D: Risk factors for insufficiency/deficiency (Appendix 1, Supp Table 4)
- Clinical cases

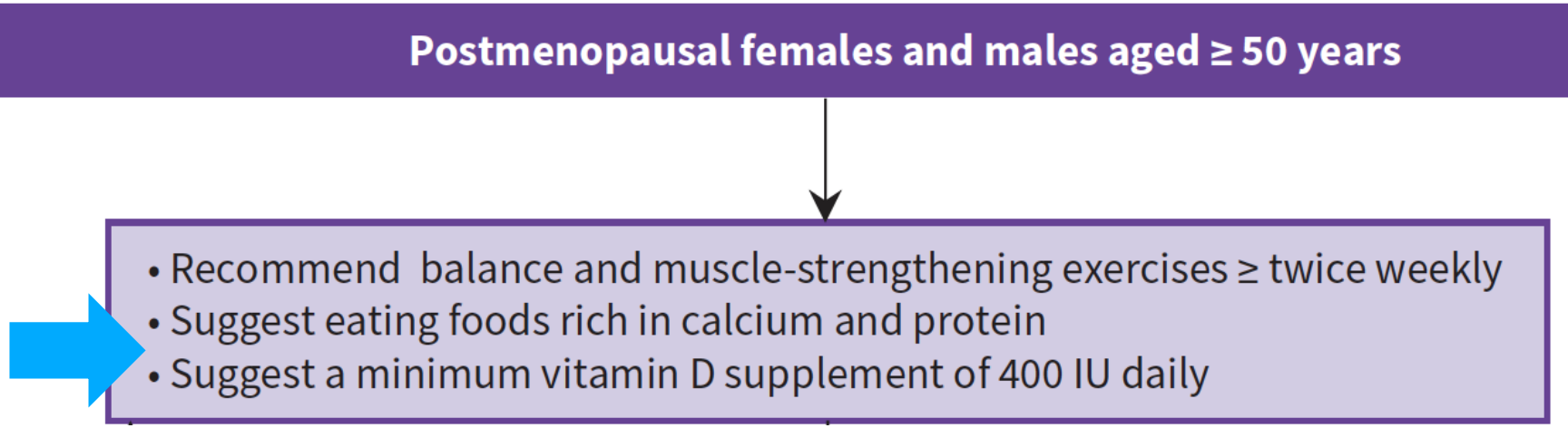
2.4 For people initiating pharmacotherapy, it is good practice to individualize calcium and vitamin D.

Table 4. Risk factors for vitamin D insufficiency/deficiency* (11-16)

- Malabsorption syndromes (e.g. inflammatory bowel disease, celiac disease, bariatric surgery, gastrectomy)
- Reduced skin synthesis (e.g. limited sun exposure, increased skin pigmentation)
- Liver failure/cirrhosis
- Nephrotic syndrome
- Chronic kidney disease/renal failure
- Medication affecting vitamin D metabolism (e.g. anticonvulsants, glucocorticoids, antiretroviral agents)
- Parathyroid disorders (e.g. hypoparathyroidism, hyperparathyroidism)

*Vitamin D sufficiency is estimated by measuring serum 25-hydroxyvitamin D (25OHD).
The optimal serum 25-hydroxyvitamin level for bone health is uncertain, however the following definitions are widely accepted (18):

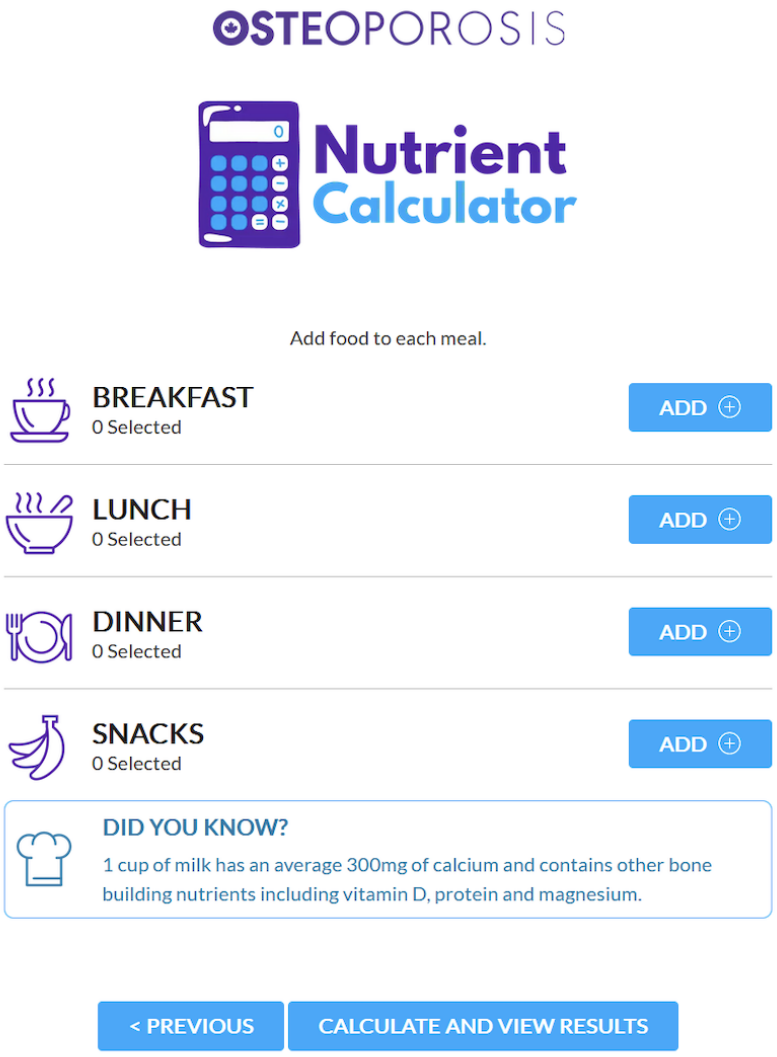
- <30 nmol/L - high risk of vitamin D deficiency
- 30 to <50 nmol/L - potential risk of inadequacy for bone health
- ≥50 nmol/L - generally considered adequate for bone and overall health in healthy individuals
- >125 nmol/L - linked to potential adverse effects

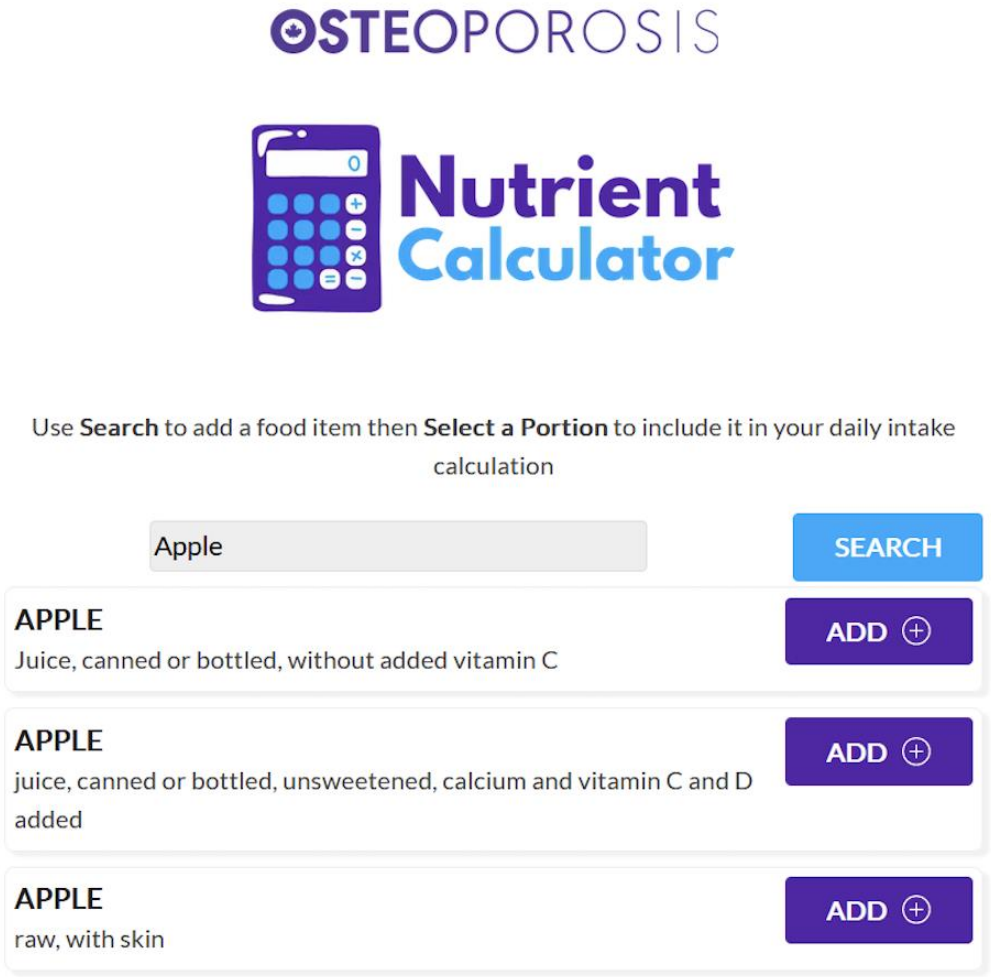


- A Balanced Diet – Foods First Approach
- Individualized approach may be needed
- Consult a dietitian

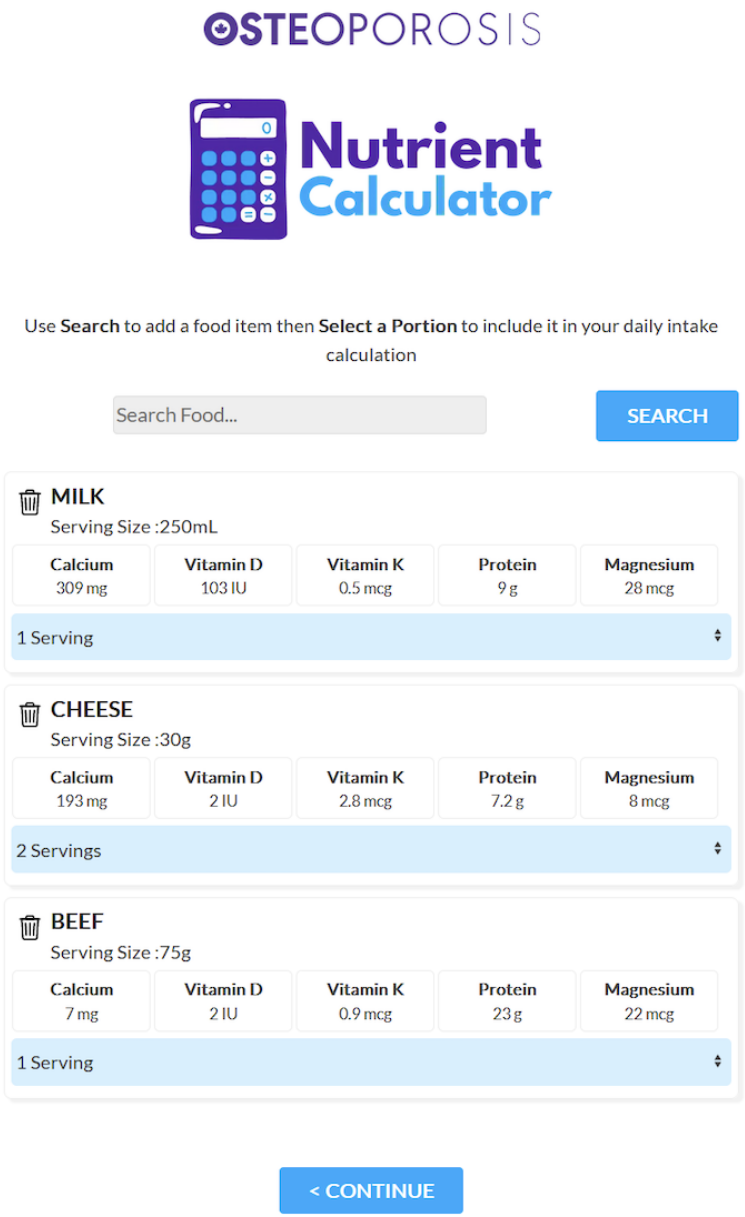
Figure 1: Integrated approach to the management of bone health and fracture prevention in postmenopausal females and males aged 50 years and older.

Resources


OSTEOPOROSIS
Nutrient Calculator
Add food to each meal.
BREAKFAST
0 Selected
ADD
LUNCH
0 Selected
ADD
DINNER
0 Selected
ADD
SNACKS
0 Selected
ADD
DID YOU KNOW?
1 cup of milk has an average 300mg of calcium and contains other bone building nutrients including vitamin D, protein and magnesium.
< PREVIOUS
CALCULATE AND VIEW RESULTS


OSTEOPOROSIS
Nutrient Calculator
Use Search to add a food item then Select a Portion to include it in your daily intake calculation
Apple
SEARCH
APPLE
Juice, canned or bottled, without added vitamin C
ADD
APPLE
juice, canned or bottled, unsweetened, calcium and vitamin C and D added
ADD
APPLE
raw, with skin
ADD

CMC 2023



- 5 nutrients

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OSTEOPOROSIS

Nutrient Calculator

YOUR RESULTS

GOOD WORK! YOU USED THE OSTEOPOROSIS CANADA NUTRIENT CALCULATOR TO TRACK YOUR NUTRIENT INTAKE TODAY.

CALCIUM DAILY INTAKE

Recommended	Your Intake	Needed
1000 mg	723 mg	277 mg

YOU ARE NOT GETTING THE DAILY RECOMMENDED AMOUNT OF CALCIUM.

Add or increase the amount of foods with calcium you eat. If you cannot consume enough through your diet, you may need to take a calcium supplement. Talk to your doctor. Milk products including yogurt and cheese, fortified beverage alternatives, beans, almonds and canned fish - including the bones all contain differing amounts of calcium.

PROTEIN DAILY INTAKE

Recommended	Your Intake	Needed
63.50 g	47 g	17 g

YOU ARE NOT GETTING THE DAILY RECOMMENDED AMOUNT OF PROTEIN.

It is always best to get your protein from food. There are many different animal and plant-based protein options. Try adding skim milk powder to your smoothies or baked goods, add protein to snacks with cheese and nuts or add some chickpeas or lean cuts of meat to salads and soups to increase your intake.

OSTEOPOROSIS

Resources

Osteoporosis Canada

You can determine how much calcium you consume in your daily diet by using the "Calcium Calculator". https://osteoporosis.ca/calcium-calculator/

Also, there information about bone supporting nutrients (calcium, vitamin D, protein) in a variety of foods, and information on living with osteoporosis including useful information on medications. http://www.osteoporosis.ca

Dietitians of Canada

This website is full of useful, practical information about nutrition and health for the public.

Some recipes are included. https://www.unlockfood.ca/en/default.aspx

There is an online menu planning tool to make customized meal plans.

https://www.unlockfood.ca/en/MenuPlanner.aspx

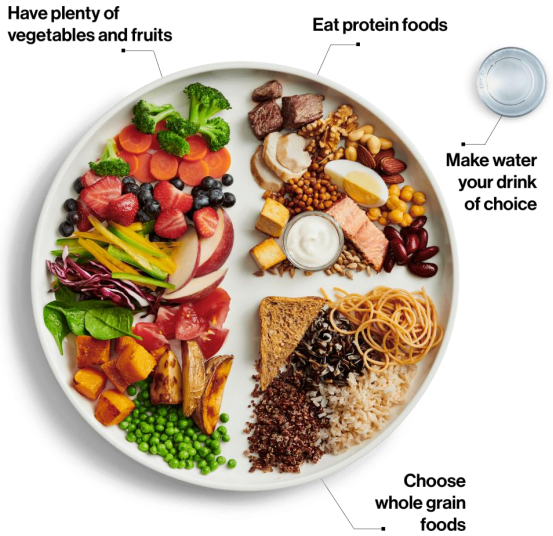
Sign up for a newsletter at https://www.unlockfood.ca/en/NewsletterSignUpCASL.aspx.

Resources

Canada's Food Guide - Health Canada

The "Food Guide Snapshot" (the picture of the plate) provides a guide to eat a variety of healthy foods each day. This website provides detailed guidance about healthy food choices and healthy eating habits, essentially 'what to eat' and 'how to eat'.
https://food-guide.canada.ca/en/

Subscribe to e-mail updates about Canada's Food Guide at:
https://www.canada.ca/en/health-canada/services/canada-food-guide/subscribe.html



- **Be mindful of your eating habits**
- **Cook more often**
- **Enjoy your food**
- **Eat meals with others**

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CMC 2023

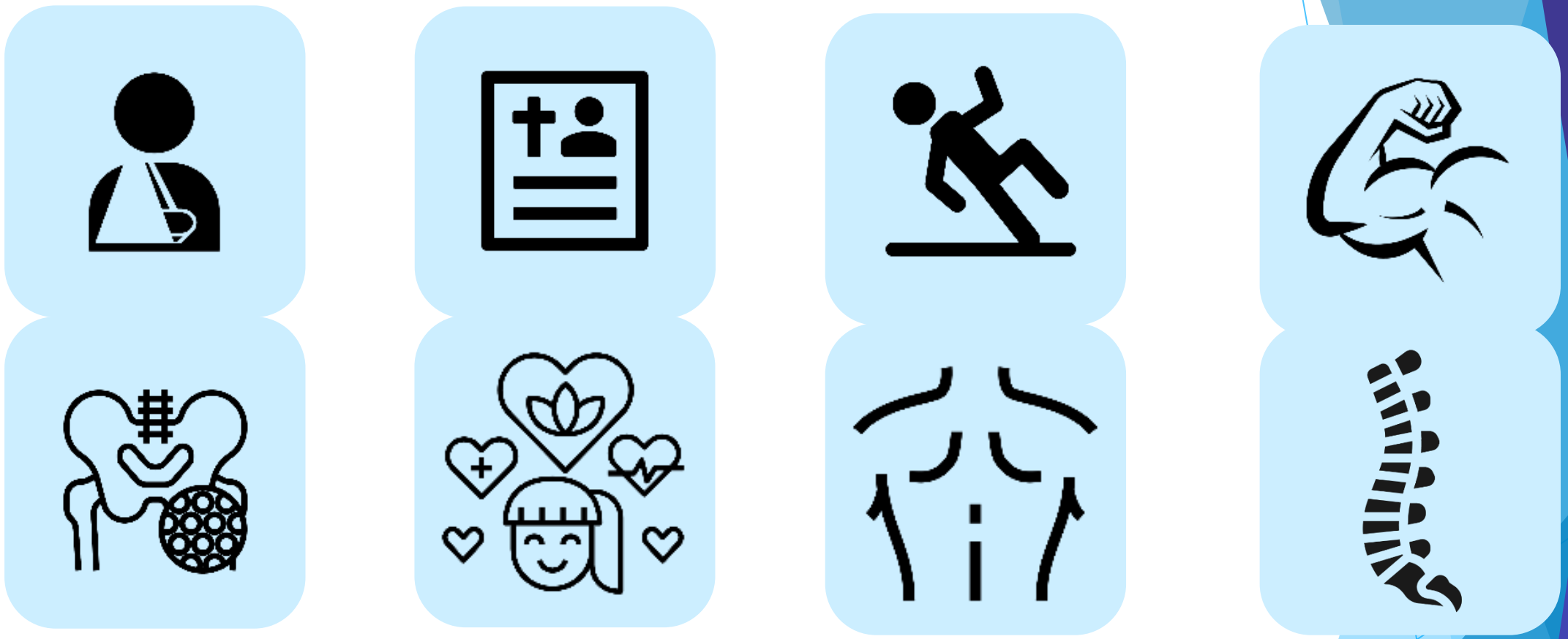
A PROFESSIONAL EDUCATIONAL SYMPOSIUM FOCUSED ON TREATMENT, MANAGEMENT AND PREVENTION

TOPIC: Exercise

PRESENTER: Dr. Lora Giangregorio

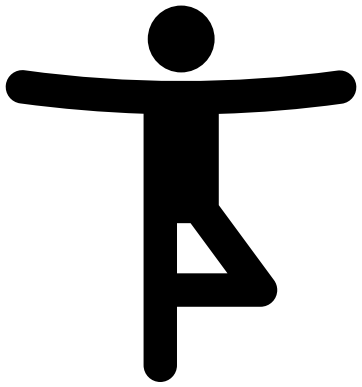
Exercise Working Group

Should we recommend _____ compared to no intervention in men and postmenopausal women aged 50 years and older at increased risk of fracture?



Outcomes used for decision-making

What types of exercise prevent fractures?



Gait, balance, co-ordination or functional task training

↓ fall-related fractures by 56% compared with control
RR 0.44, 95% CI 0.25 to 0.76; 2139 participants, 7 studies, I^2 = 0%; low-certainty evidence

?

Effects of other types of exercise e.g., walking, Tai Chi, resistance training, multimodal, are uncertain.

Sherrington C et al, Cochrane Database of Systematic Reviews 2019

What types of interventions prevent falls?

Multicomponent (balance, functional, resistance):

↓ rate 34%, ↓ risk 22%, moderate certainty

Balance and functional training:

↓ rate 24%, ↓ risk 13%, high certainty

Tai chi:

↓ rate 19%, ↓ risk 20%, low/high certainty

Uncertain: Dance, Resistance exercise, walking

Sherrington C et al, Cochrane Database of Systematic Reviews 2019

Effects of Exercise on BMD in People at Risk of Fracture

Activity	Change in Hip BMD, g/cm^2 (95%CI, certainty)	Change In Spine BMD, g/cm^2 (95%CI, certainty)
Impact - combo (2 studies, n=174, 5 studies)	FN 0.04 (0.02, 0.07, low)	0.03 (0.01, 0.05, low)
Impact alone (2 studies, n=104, n=117)	FN not estimable TH 0.04 (0.01, 0.07, low)	0.04 (0.02, 0.06 low)
Walking (1 study, n=97, 1 study, n=139)	FN 0.01 (0, 0.03, low)	0.02 (0, 0.03, low)
Resistance training – combination (5 studies, n=521, 4 studies, n=435, 4 studies, n=209)	FN 0.02 (0.01, 0.03, very low) TH 0.00 (0.00, 0.01, very low)	0.02 (-0.01, 0.05, very low)
Resistance training only (2 studies, n=183)	FN 0.03 (0, 0.05, very low) TH 0.01 (-0.02, 0.05, very low)	Not estimable
Balance and functional training (2 studies, n=123)	FN 0 (-0.03, 0.02, very low)	Not available
Pilates (1 study, n=21)	Not estimable	0.06 (0.01, 0.11, very low)
Yoga (3 observational studies)	Not estimable	Not estimable

FN = femoral neck, TH = total hip, BMD=bone mineral density

What types of exercise improve physical functioning?

Activity	Change in Timed Up and Go, sec (95%CI, certainty)
Impact (2 studies, n=255)	MD -0.95 (-1.09 to -0.81, low)
Walking (2 studies, n=86)	MD -1.39 (-1.78 to -1, very low)
Resistance training (5 studies, n=241)	MD -1.24 (-1.67 to -0.82, very low)
Balance & functional training (10 studies, n=871)	MD -1.08 (-1.21 to -0.95, low)
Pilates (4 studies, n=143)[1]	MD -1.23 (-2.3 to -0.15, low)
Yoga (5 studies, n=400)	SMD[2] 0.38 (-0.02 to 0.78, low)
Back extensor and core exercise (4 studies, n=257)	MD -0.28 (-0.48 to -0.08, very low)

[1]population is older adults
[2]assessed with walking speed

MD = mean difference

- Statistically significant effects for all types except yoga
- Low to very low certainty evidence → small effects, RoB, heterogeneity

What exercise types improve quality of life?

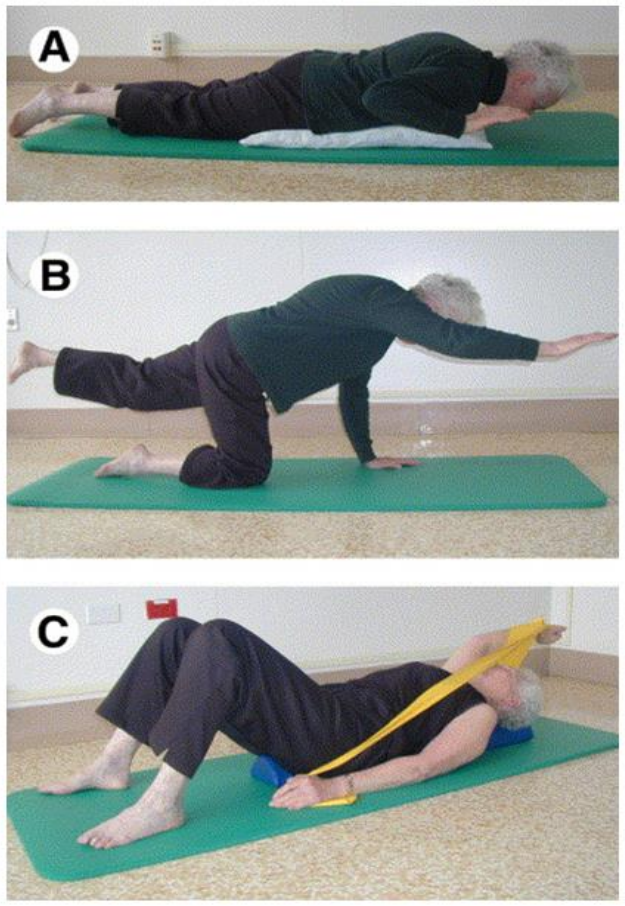
Activity	Change in QoL outcomes, sec (95%CI, certainty)[1]
Impact (4 studies, n=365)	MD -0.06 (-2.18 to 2.3, moderate)
Walking (2 studies, n=211)	MD 1.25 (-0.28 to 2.77, very low)
Resistance training (8 studies, n=412)	SMD 0.75 (0.54 to 0.95, moderate)
Balance & functional training (7 studies, n=864)	MD -2.48 (-3.64 to -1.31, low)
Pilates (2 studies, n=100)	MD -13.8 units (-26.16 to -1.44, low)
Yoga (9 studies, n=408)[2]	SMD 0.6 (0.33 to 0.87, moderate)
Back extensor and core exercise (5 studies, n=613)	SMD 0.26 (0.1 to 0.42, moderate)

[1]MD is for QUALEFFO, lower is better
[2]Population is older adults

MD = mean difference

- Statistically significant effect for all types except impact, walking
- Moderate certainty + benefit: resistance, back extensor, yoga

Figure 1. Spinal extensor muscle strengthening
A: prone trunk extension; B: quadruped arm/leg lift; C: supine theraband arm flexion and extension



Exercise in Individuals with Hyperkyphosis

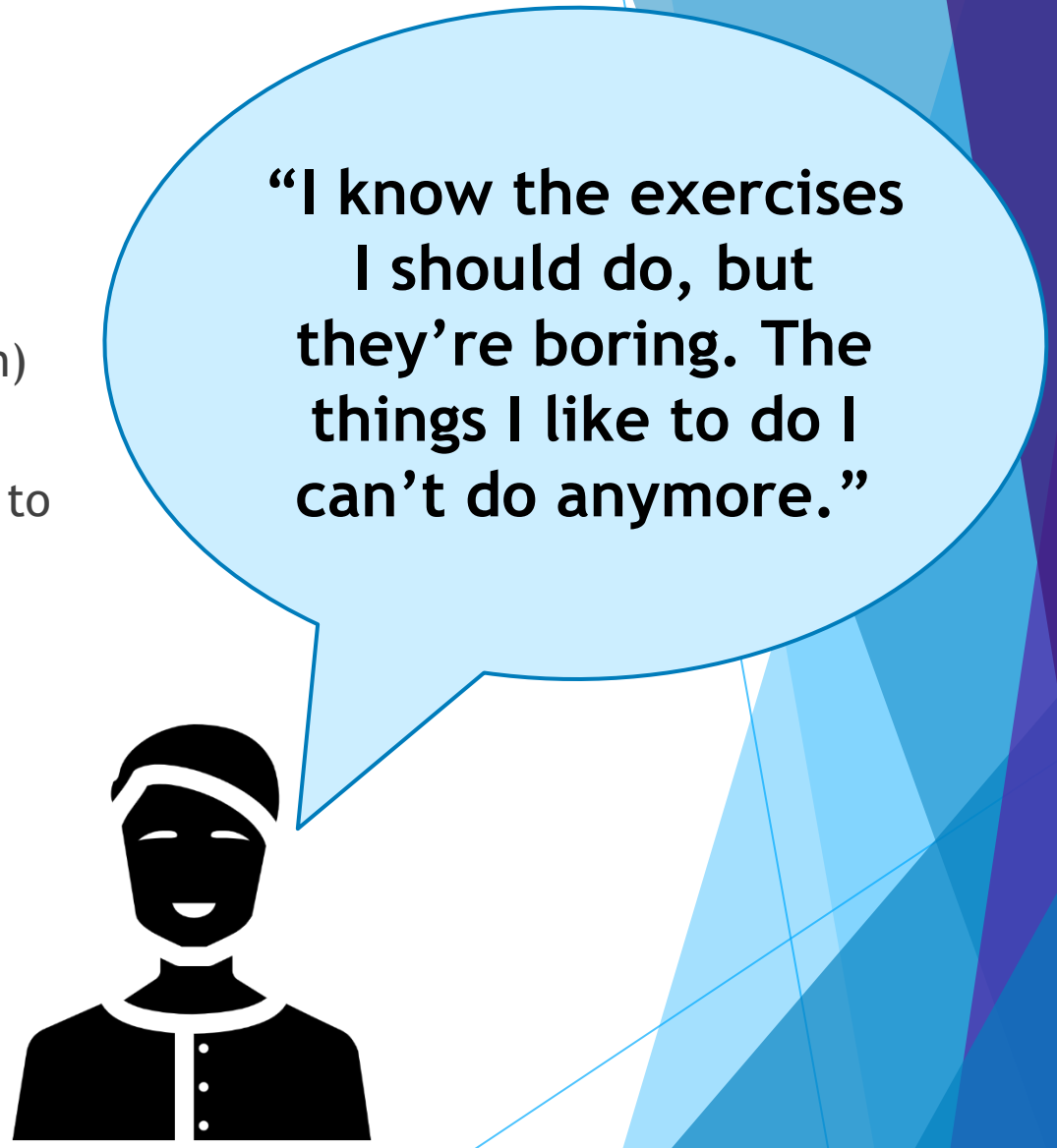
Outcome	Effect Estimate (95% confidence intervals)	Certainty
Back extensor strength	MD 10.51 N (6.65, 14.38)	Very low
Back extensor endurance	MD 9.76 s (6.40, 13.13)	Low
Kyphosis outcome	SMD -0.31 (0.46, -0.16)	Moderate
HR QoL	SMD 0.21 (0.06, 0.37)	Moderate
Timed up and Go	MD -0.28 s (-0.48, -0.08)	Very low
Pain	MD -0.26 (– 0.39, – 0.13)	Low
Falls	IRR 1.29 (0.95, 1.74)	Low

MD = mean difference

Ponzano et al, Archives of Osteoporosis, 2021

Do no harm

- Minor adverse events (e.g., muscle soreness, pain) may occur
- Serious adverse events are infrequent (moderate to very low certainty evidence)
- Inadequate adverse event reporting
- Interventions are often supervised



El-Kotob et al, 2020, 2022, 2023

Key points from systematic reviews of exercise in people at risk of fractures:

- Balance and functional training, with or without resistance training can prevent falls (high certainty) and may prevent fractures (low certainty);
- Resistance and impact exercise may improve BMD (low/very low certainty); include exercises to improve posture if that is a goal;
- Many exercise modes may improve physical functioning or quality of life (very low/low/moderate certainty);
- Adverse events seem to be rare → need better reporting and more research.

Exercise Recommendations

We recommend balance and functional training ≥ twice weekly to reduce the risk of falls.

Strong recommendation; moderate-certainty evidence

Exercise Recommendations

We suggest progressive resistance training ≥ twice weekly, including exercises targeting abdominal and back extensor muscles.

Conditional recommendation; low-certainty evidence

Exercise Recommendations

We suggest that people who want to participate in other activities for enjoyment or other benefits be encouraged to do them, if they can be done safely or modified for safety.

Other activities should be encouraged in addition to, not instead of, balance, functional, and resistance training.

If participating in impact exercise, progress to moderate-impact or high-impact exercise only if appropriate for fracture risk or physical fitness level.

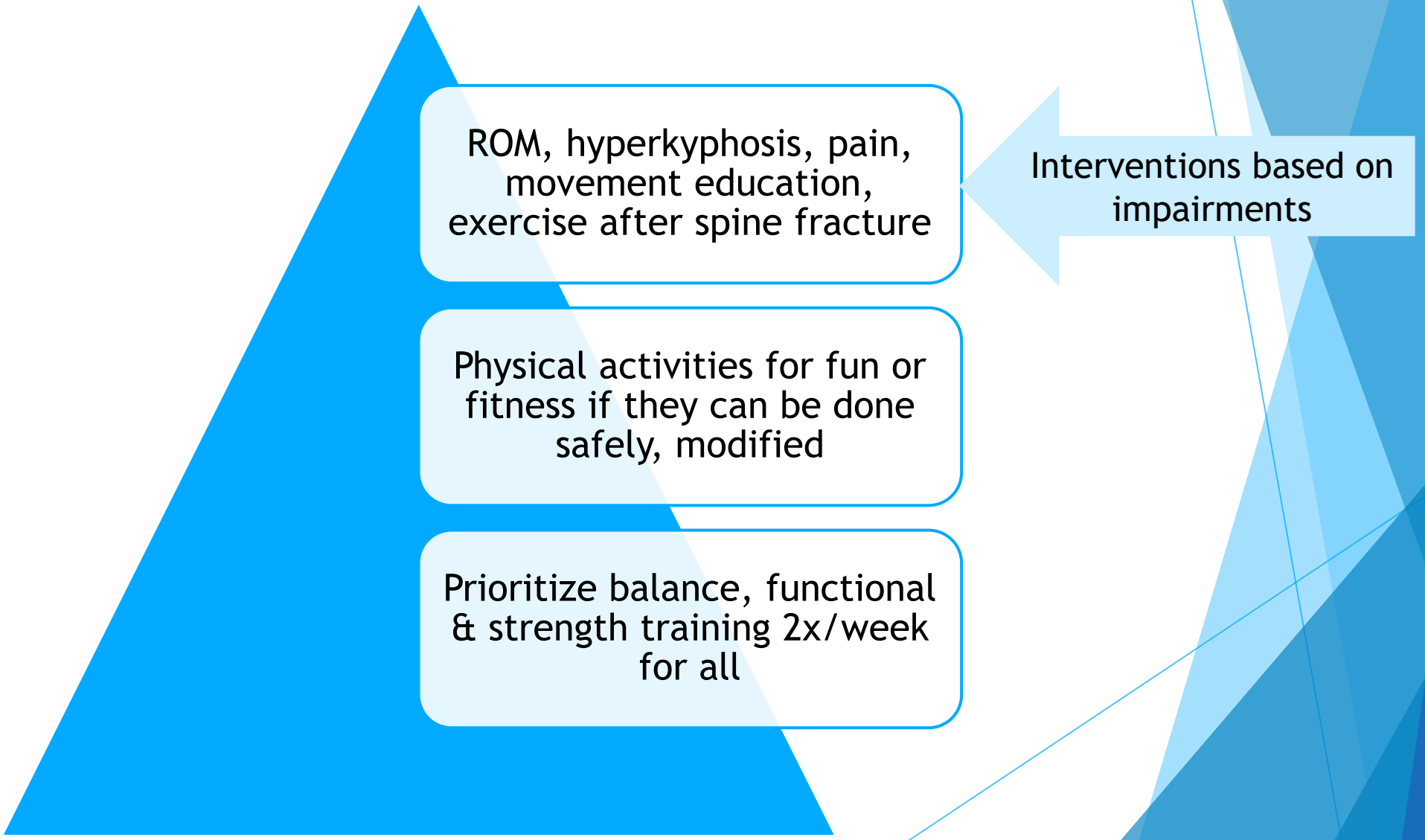
Conditional recommendation; very low-certainty evidence

Good Practice Statements

Activities that involve rapid, repetitive, sustained, weighted or end range-of-motion twisting or flexion of the spine may need to be modified, especially in people at high risk of fracture.

When available, seek advice from exercise professionals who have training on osteoporosis for exercise selection, intensity and progression, and activity modification, especially after recent fracture or if there is high risk of fracture. When not available, refer to Osteoporosis Canada resources.

Putting it all together



The need for implementation science…

<50% of older adults, and 53% of adults 18-64 self-report any muscle strengthening activities

16% of older adults do activities to challenge balance

Prince SA, Strength-training and balance activities in Canada: historical trends and current prevalence. Health Promot Chronic Dis Prev Can. 2023 May;43(5):209-221.

What types of balance training are most effective?

Anticipatory control:

Proactively adjust body position or movement before making a movement that might cause instability

Dynamic control:

Have control of centre of mass position when changing position

Functional stability limits:

Move centre of mass as far as possible in any direction, stay stable

Reactive balance control:

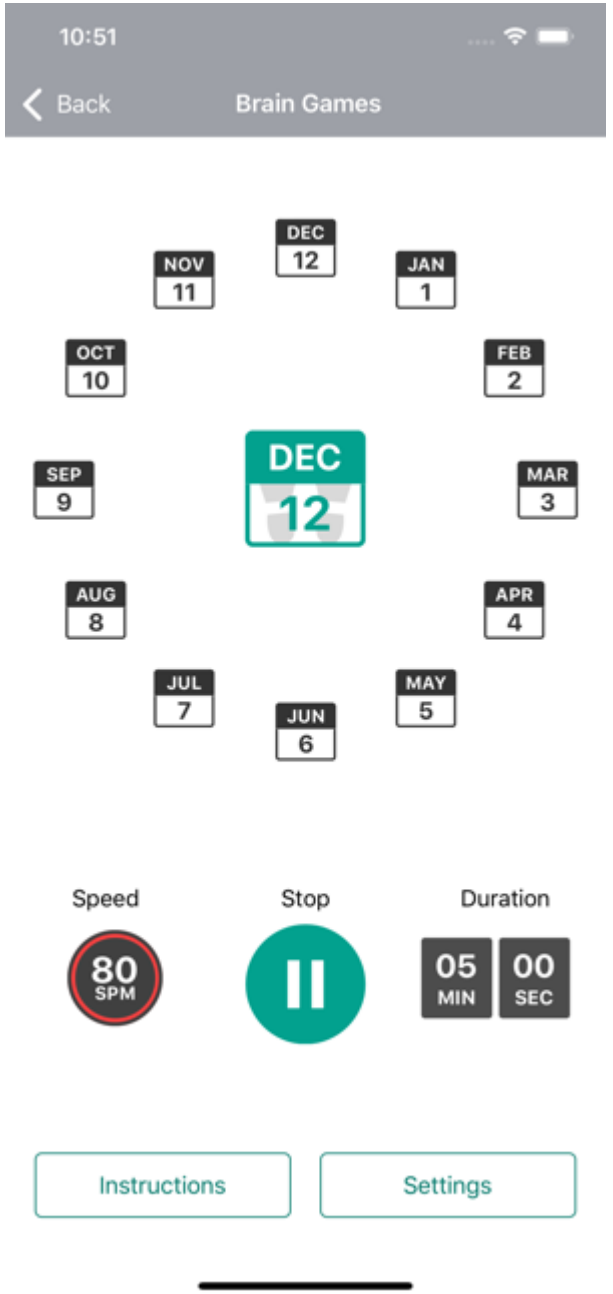
Ability to re-establish stability in face of internal or external instability

Sibley et al, Exp Gerontol, 2021

Example Balance Exercises:

Anticipatory control and dynamic stability	Heel raises, walk on toes or heels, toe taps on a step, Clock Yourself app, Agility ladder
Functional stability limits	Reaching or weight shifting in all directions standing or on one foot, one or two-legged hinge or Romanian deadlift
Reactive control	Moving while standing on unstable surface Catching and throwing a ball External push/pull on part of body while doing activity

http://clockyourself.com.au/



Resistance training doesn't have to be complicated. But it should be hard.

Start with one exercise per movement category.

PUSH: chest and arms

PULL: upper back and arms

SQUAT: upper legs and lower legs

HINGE: upper legs and lower legs

CARRY: whole body, including abdominals and back extensors, and forearm muscles

REACH or PRESS: arms, shoulders, upper back

Example approach: Pick one exercise per category

Movement	Beginner	Moderate	Hard
Push	Wall push-up	Counter push-up	Floor push-up Bench press
Pull	Elastic band row	Supported dumbbell row Band or cable row Lat pull down	Pull-up
Squat	Sit-to-stand	Bodyweight squat Lunge	Goblet or back squat Weighted Lunge or Split squat
Hinge	Bridge	Hip hinge with resistance band or kettlebell	Deadlift
Carry	Farmer's carry	Suitcase carry	Bottom's up carry
Reach/ Press	Elastic band press	Landmine press	Pike push-up Overhead press

How to design your resistance training program

≥ 2x /week, 2 sets per exercise

Pick a version you can do 6-10 times, but it feels hard. Practice form first.

Progress to a version of the exercise where you can do 6-10 reps but requires **high effort**

Lower for 4 seconds, lift for 2 seconds.

Progress:

Reps→ to 12

Sets → to 3-5

Then choose a harder version of the exercise!

https://www.instagram.com/p/Cz1JComPIuz/?utm_source=ig_web_copy_link&igshid=MzRlODBiNWFlZA==

Instagram: meghancalloway

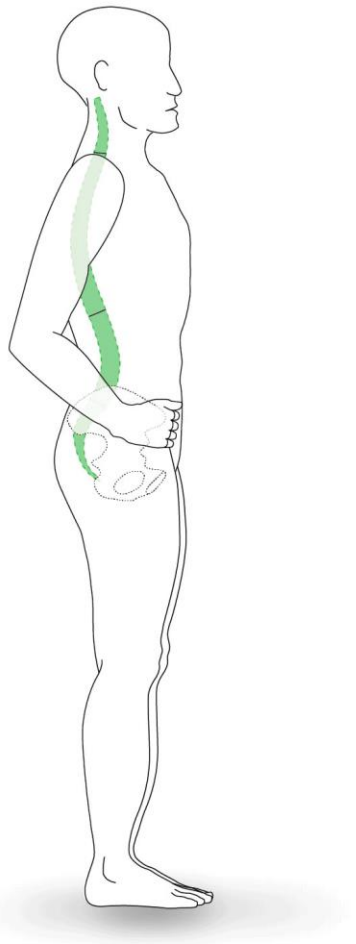
Encourage activities if they can be done safely or modified. For some patients or some activities, the risk may outweigh the benefit.

DON'T: Avoid all bending and twisting

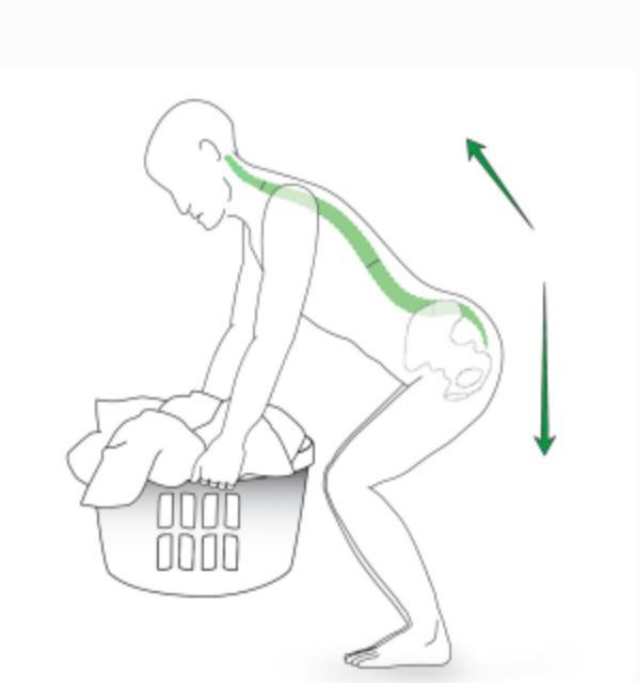
DO: Consider modifying/avoiding activities if you do not feel you can do them safely

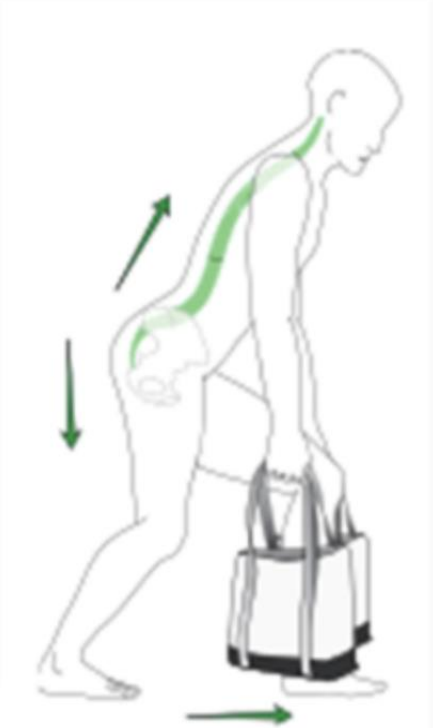
High risk - may need to avoid/modify:

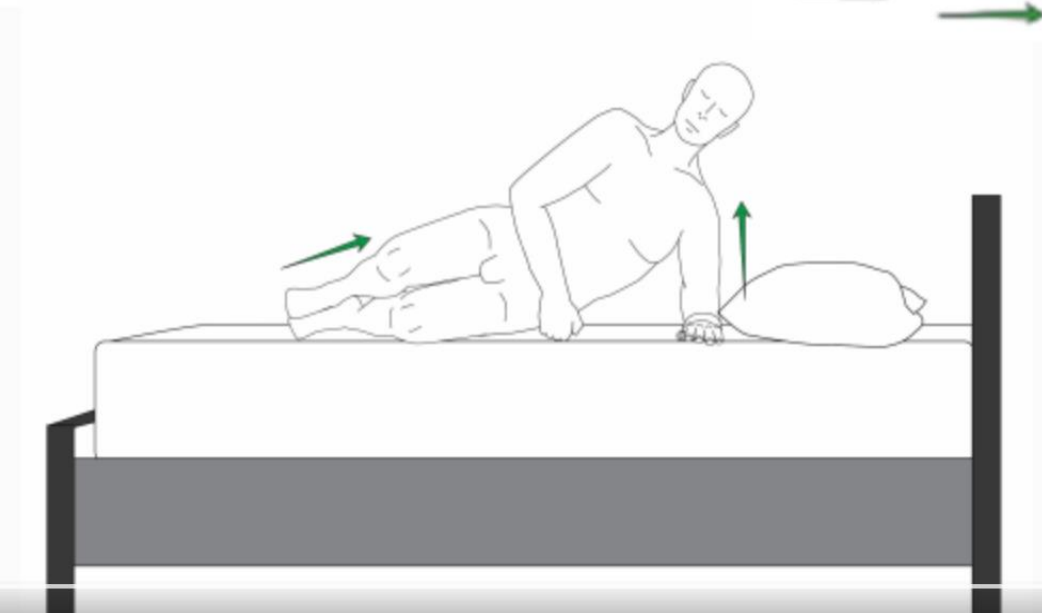
- Twisting spine quickly, over and over, or all the way.
- Bending spine forward quickly, over and over, or all the way.
- Combined spine twisting & bending.
- Twisting or bending the spine while holding something heavy.



Safe movement tips for people with osteoporosis.







Bend at hips, knees & ankles, not by rounding the back.

Hold things close to body or divide weight evenly in each hand.

Use a log roll & arm strength to get out of bed.

Use a step-to turn to move around --> trunk, knees & toes face same direction.

Use slow & controlled movements.

Look for resources from a national osteoporosis society, or see a physical or occupational therapist.

ACTIVITY	SAFETY TIPS
 Bending all the way forward when you pick up an object from, or lower an object to the floor.	→ Bend with your knees and hips, not the spine. Use a grabber tool.
 Rotating or twisting the spine when you get out of a car or sweep the floor.	→ Step and turn with your feet. Twist slowly and in control. Don't over twist.
 Standing on an unstable footstool, chair or ladder, like to change a lightbulb.	→ Use a wide step stool with non-slip grips on the steps and on the feet.
 Lifting heavy objects into high cupboards.	→ Hold the object close to your body. Stand on a step stool.
 Lifting objects into low cupboards.	→ Store heavy things at waist height. Bend at hips, knees and ankles, keep object close to body. Or, get assistance.
 Lowering bags from overhead storage areas on a plane.	→ Ask someone to do it for you, or check your bags.
 Lifting or moving furniture.	→ Get someone else to do it.
 Rotating your body but not moving your feet while you vacuum or rake.	→ Step to turn. Your leading foot and trunk should face the same direction.
 Walking or stepping into a room or pool area that has a slippery or wet floor.	→ Wear shoes or slippers with good traction. Walk slowly and check the floor. Take a test step before you walk.
 Twisting or bending and lifting when you shovel snow.	→ Bend with your knees and hips, not the spine. Step to turn. Your leading foot and trunk should face the same direction. Get help if too heavy for you.
 Twisting or bending and lifting when you make your bed.	→ Bend with your knees and hips, not the spine. Stand close to the bed.
 Moving from lying in bed to getting out of bed.	→ Slide your arm out alongside your ear. Roll your whole body onto its side. Bend your knees to 90 degrees. Use your arms to push yourself up.
 Twisting during golf swing Bending to retrieve ball Carrying bag	→ See a physical/occupational therapist to learn a modified swing Use modified golfer's reach Use golf push cart or trolley

Patient Tip Sheet on Activities that Involve Bending, Twisting or Lifting

Giangregorio and Ponzano, 2022
Best Practices Clin Endo Metab Review

What's in your toolbox?

Identify a variety resources in your community that you can refer people to.

- Osteoporosis Canada Too Fit To Fracture handouts and videos: https://osteoporosis.ca/exercise-recommendations/
- BoneFit™: https://bonefit.ca/bonefit-map-locator/
- Find a CSEP Certified Exercise Physiologist (CEP): https://csep.ca/membership-overview/directory/
- GLA:D™ Canada for arthritis: https://gladcanada.ca/how-to-participate-in-glad-canada/
- Otago Exercise Program for fall prevention (people at risk of falls): https://www.physio-pedia.com/Otago_Exercise_Programme
- Falls prevention exercise programs in community
- Tai Chi for fall prevention

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Matteo Ponzano (UBC)

Isabel Rodrigues (Mac)

Ellen Wang (UBC)

Emily McLaughlin (UW)

And many more!

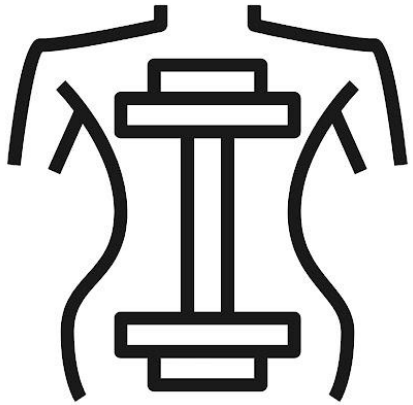
Thank you to the BonES lab team, collaborators, funders, and partners.

Bone health and Exercise Science lab Social Media:

Facebook: UWBonESLab

Find us at BonES lab YouTube

X/Twitter: @l_giangregorio



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CIHR IRSC Canadian Institutes of Health Research / Instituts de recherche en santé du Canada

NAR AT THE UNIVERSITY OF WATERLOO NETWORK FOR AGING RESEARCH

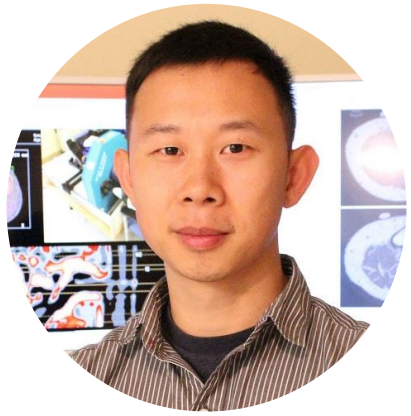
RIA Research Institute for Aging Schlegel • UWaterloo • Conestoga Enhancing Life

OSTEOPOROSIS

4th Canadian Musculoskeletal Conference

A PROFESSIONAL EDUCATIONAL SYMPOSIUM FOCUSED ON TREATMENT, MANAGEMENT & PREVENTION

Introducing Osteoporosis Canada's 2023 Clinical Practice Guideline (CPG)



Young Investigator Award Presentation

Presenter: Andy Kin On Wong, PhD

Young Investigator Award Winner

Lindsie Blencowe

Lindsie Blencowe is currently a Ph.D. student in the Institute of Medical Science at the University of Toronto under the supervision of Dr. Angela Cheung. Lindsie is a biochemist and clinical researcher by training. She received her Honours Bachelor of Science from Queen's University where she completed an undergraduate thesis in Vitamin D metabolism. Lindsie completed her Master of Science degree and Clinical Research training at McMaster University where she studied glucose metabolism. Lindsie has also spent several years working with Dr. Cathy Craven, studying osteoporosis and bone biomarkers in patients with spinal cord injury. Lindsie's PhD thesis is exploring the biomarker utility of serum pentosidine and its potential relationship to osteoporosis and fracture.

Serum Pentosidine And Atypical Femur Fracture

a case control study

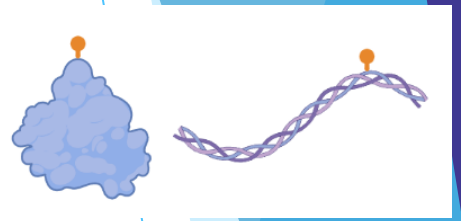
Canadian Musculoskeletal Conference

November 24, 2023

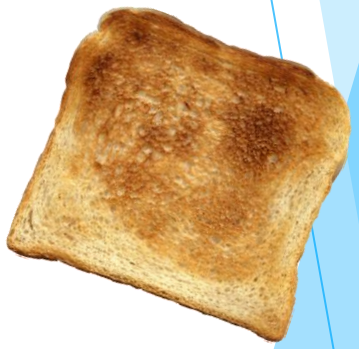
Lindsie Blencowe MSc, CCRA, PhD(c)
Lindsie.Blencowe@uhn.ca
University of Toronto, Institute of Medical Science
University Health Network

UHN
Toronto General
Toronto Western
Princess Margaret
Toronto Rehab
Michener Institute

Advanced Glycation End Products (AGEs)

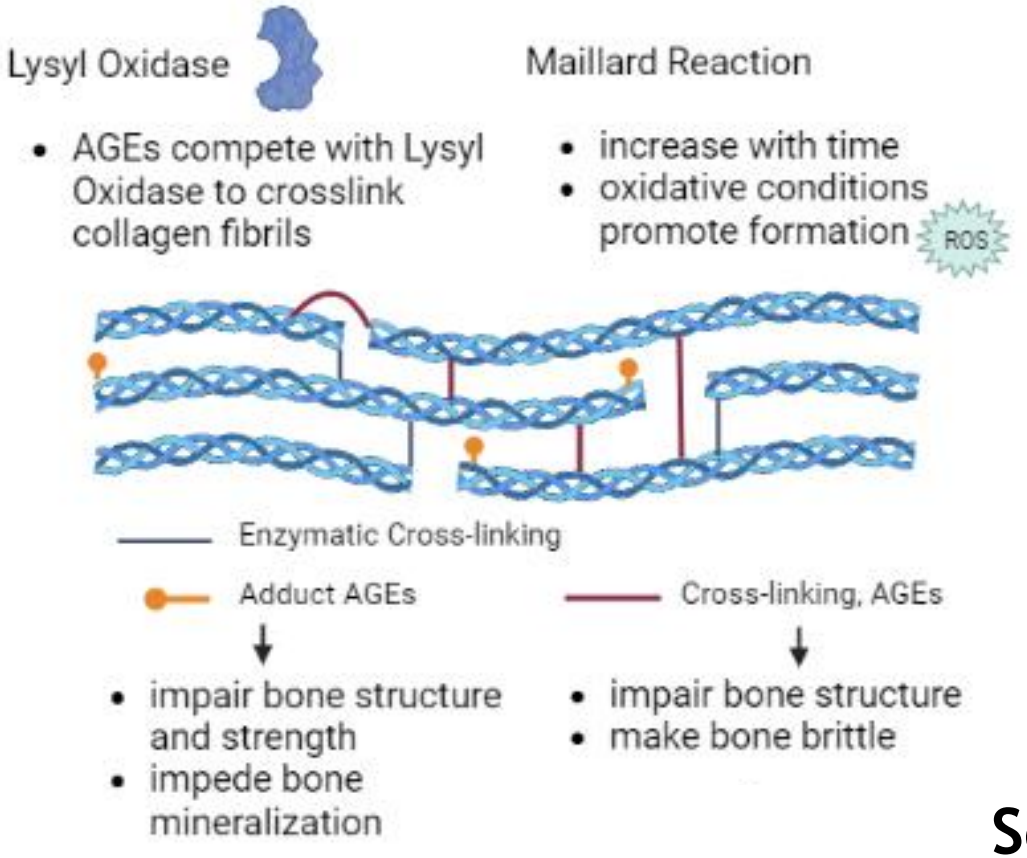


- AGEs are the product of a reaction between protein (amino acid) and sugar
- Non-Enzymatic reaction (Maillard reaction)
  - Occurs when cooking food - “Browning” is the hallmark of the reaction
  - Reaction occurs rapidly from 140-165^{o}C
  - Oxidative conditions promote formation of some AGEs



- Occur in the body
  - We eat them
  - Can occur between sugar and protein in the bodily tissues → Reaction is much slower, but over time, AGEs accumulate
  - Oxidative stress promotes formation
- Associated with complications in many diseases and aging

Pentosidine



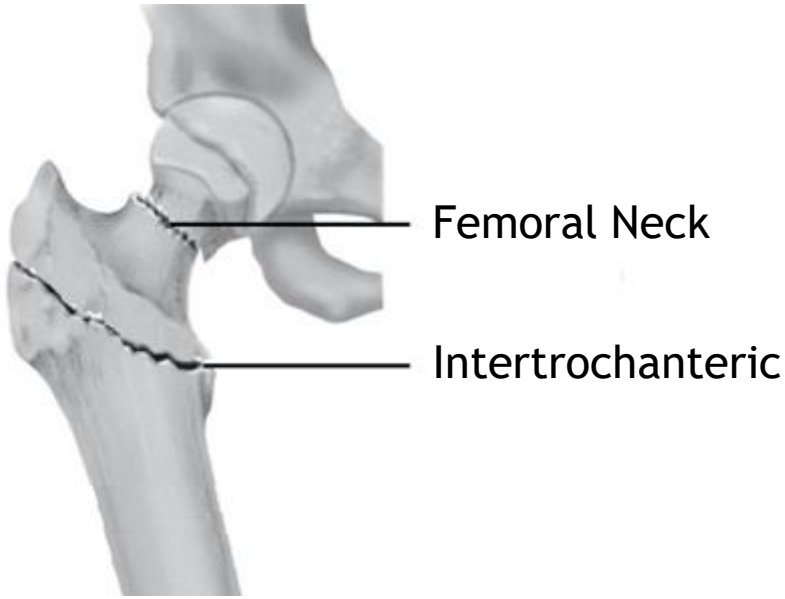
- PEN is a known AGE biomarker – PEN levels correlate with other AGEs
- Serum PEN levels are correlated with the PEN content of Bone
- Accumulation of AGEs in bone results in bone microdamage and makes the tissue more likely to fracture

Serum PEN is surrogate marker for Bone PEN but also provides insight on systemic AGE burden

Created with Biorender.com

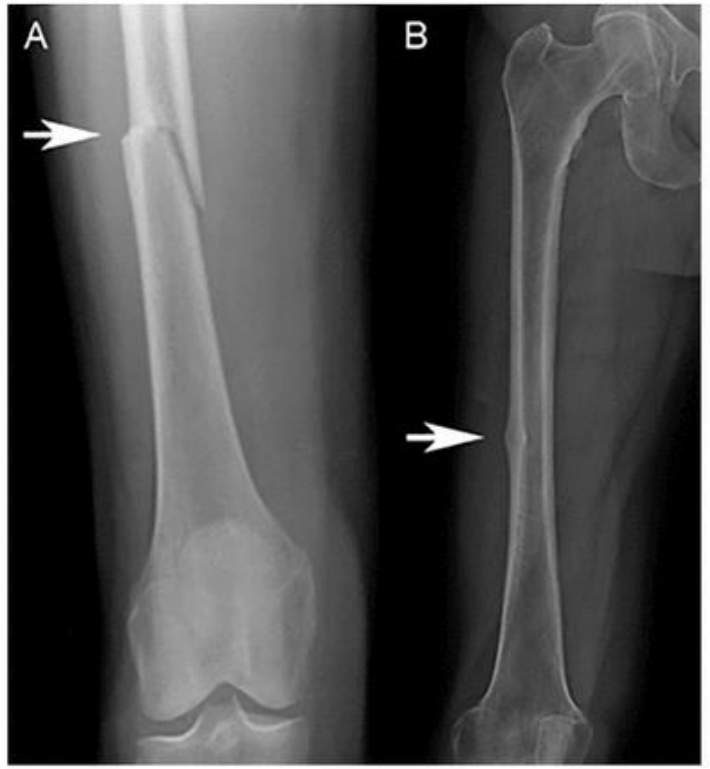
Atypical femur fracture

"Typical" Femur Fracture



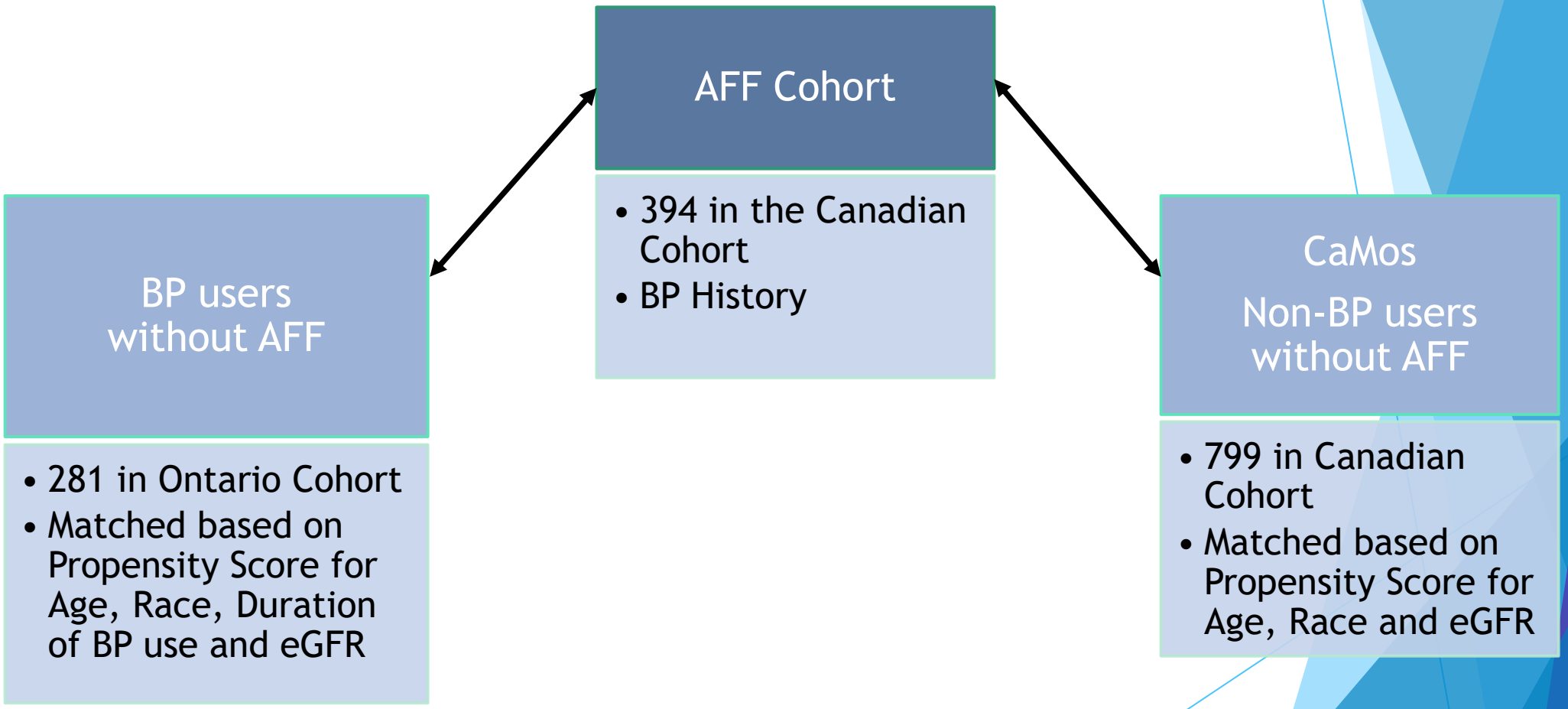
Bone and Joint Health Strategic Clinical Network, Alberta Health Services, 2018

"Atypical" Femur Fracture



Khan, AA, *et al*. 2017

CASE Control Study



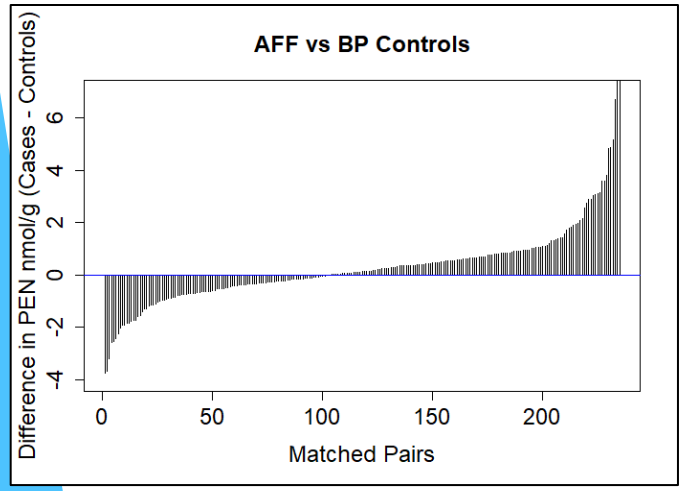
Results

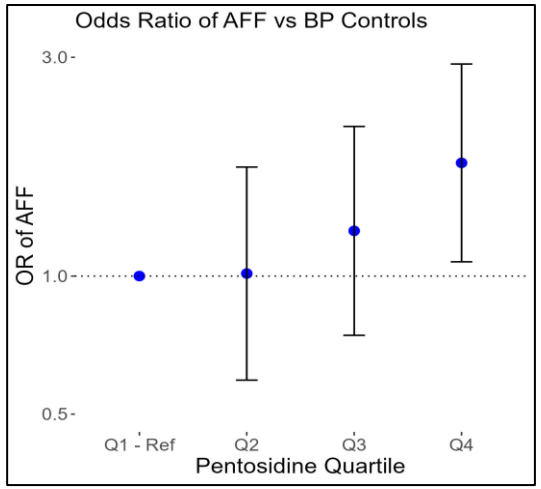
AFF and BP CONTROLS

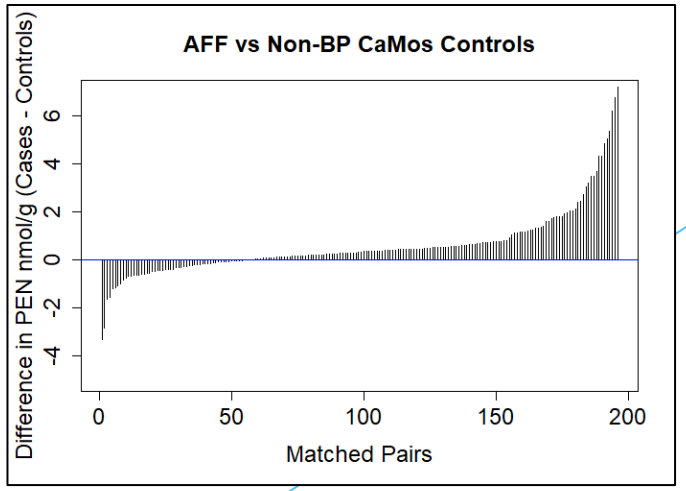
Participant Characteristics	Controls n=235	AFF n=235	Paired t-test *P*
Age (Years) (mean (SD))	71.91 (9.38)	70.49 (10.38)	0.120
Race (%)			1.000
White	164 (69.8)	164 (69.8)	
Chinese/S-E Asian	61 (26.0)	61 (26.0)	
Black	1 (0.4)	1 (0.4)	
Other	9 (3.8)	9 (3.8)	
Weight (kg) (mean (SD))	60.88 (12.17)	64.44 (12.76)	0.003
Height (cm) (mean (SD))	157.59 (7.12)	154.78 (6.69)	<0.001
BMI (kg/m$^{2)}$ (mean (SD))	24.48 (4.44)	26.86 (4.85)	<0.001
PEN nmol/g(mean (SD))	1.27 (0.76)	1.60 (1.71)	0.007
eGFR (ml/min/1.73m^2)(mean (SD))	89.59 (7.40)	90.78 (8.39)	0.105
Menopause Status = Yes (%)	222 (94.5)	229 (97.9)	0.094
Diabetes = Yes (%)	13 (5.5)	21 (8.9)	0.213
Smoking (%)			0.962
Never	171 (72.8)	171 (73.4)	
Past	57 (24.3)	56 (24.0)	
Present	7 (3.0)	6 (2.6)	
BP Use (Years) (mean (SD))	9.07 (5.64)	10.28 (5.54)	0.020
Femoral Neck BMD (mean (SD))	0.64 (0.10)	0.64 (0.10)	0.990
Total Hip BMD (mean (SD))	0.75 (0.10)	0.78 (0.11)	0.008
Spine BMD (mean (SD))	0.87 (0.18)	0.89 (0.17)	0.317

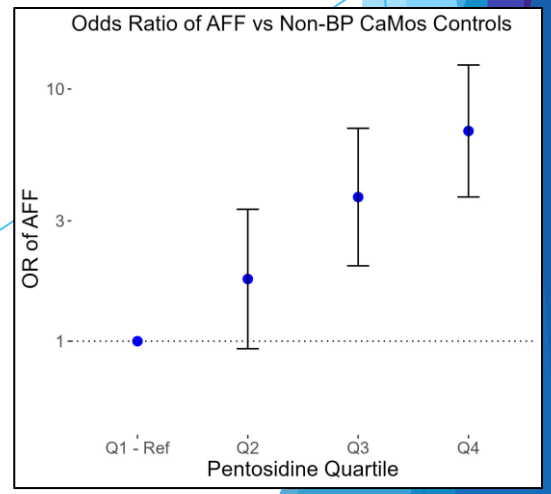
AFF and NON-BP CaMos CONTROLS

Participant Characteristics	CaMos n=196	AFF n=196	Paired t-test *P*
Age (Years) (mean (SD))	67.96 (9.98)	70.41 (11.29)	0.023
Race (%)			1.000
White	174 (88.8)	174 (88.8)	
Chinese/S-E Asian	5 (2.6)	5 (2.6)	
Black	3 (1.5)	3 (1.5)	
Other	14 (7.1)	14 (7.1)	
Weight (kg) (mean (SD))	69.22 (13.03)	65.91 (12.80)	0.013
Height (cm) (mean (SD))	159.52 (6.18)	155.23 (7.34)	<0.001
BMI (kg/m$^{2)}$ (mean (SD))	27.20 (4.93)	27.36 (5.00)	0.748
PEN nmol/g(mean (SD))	0.99 (0.61)	1.57 (1.25)	<0.001
eGFR (ml/min/1.73m^2)(mean (SD))	92.44 (10.15)	90.57 (8.83)	0.052
Menopause Status = Yes (%)	177 (90.3)	190 (96.9)	0.013
Diabetes = Yes (%)	17 (8.7)	18 (9.2)	1.000
Smoking (%)			0.147
Never	111 (56.6)	127 (65.8)	
Past	76 (38.8)	61 (31.6)	
Present	9 (4.6)	5 (2.6)	
BP Use (Years) (mean (SD))	0	10.90 (5.84)	<0.001
Femoral Neck BMD (mean (SD))	0.71 (0.11)	0.64 (0.10)	<0.001
Total Hip BMD (mean (SD))	0.86 (0.13)	0.78 (0.12)	<0.001
Spine BMD (mean (SD))	0.95 (0.16)	0.90 (0.18)	0.004









Limitations

- Serum PEN is a surrogate marker of bone PEN and systemic AGE burden.
- AFF, BP Control and Non-BP CaMos Control groups differed in recruitment, data collection protocols, study sites, timeframes and length of serum sample storage
  - may impact the comparability of these cohorts and the generalizability of the results.
- Sensitivity analyses
  - Matching AFF and Control group for;
    - Exact race
    - Age within 5 years
    - eGFR within 5 ml/min/1.73m^2
    - BP use within 3 years (if relevant) led to the same conclusions
  - Led to same conclusions

Conclusions

- Serum PEN was higher in AFF cases than matched controls, independent of bisphosphonate use.
- Further research into the utility of serum PEN as an AFF biomarker is warranted.

Acknowledgements

- Dr. Angela Cheung & Team
- Dr. Andrea Bozovic and Dr. Vathany Kulasingam in the LMP
- PAC members Dr. Vathany Kulasingam and Dr. George Tomlinson
- AFF Cohort, Control Cohort and CaMos Participants & Investigators

CaMos

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4th Canadian Musculoskeletal Conference

A PROFESSIONAL EDUCATIONAL SYMPOSIUM FOCUSED ON TREATMENT, MANAGEMENT & PREVENTION

Introducing Osteoporosis Canada's 2023 Clinical Practice Guideline (CPG)

Introduction

Heather McDonald-Blumer, MD, FRCPC

Disclosure

Relevant relationships with commercial entities:

- None

Potential for conflicts within this presentation:

- None

Steps taken to review and mitigate potential bias:

- Not Applicable

Clinical Case Presentations

Presenter: Heather Frame, MD, CCFP

Disclosure

Relevant relationships with commercial entities:

- None

Potential for conflicts within this presentation:

- Member Osteoporosis Canada's Scientific Advisory Council
- Co-author 2023 Clinical Practice Guideline Update for Management of Osteoporosis and Fracture Prevention in Canada

Steps taken to review and mitigate potential bias:

- I will not be discussing any off-label use of medications and will be adhering to national/international guidelines.

Case 1:

55-year-old female

- Menopause at age 50, no HRT
- No significant past medical history
- No fracture history, no height loss, physical exam unremarkable
- Family history of osteoporosis – mother fractured her hip 2 years ago
- BMI of 24 kg/m^2
- She is vegan and drinks one cup of fortified soy milk daily. She mentions she wants to lose weight and would like some advice on how to optimise her nutrition for osteoporosis prevention
- She has osteoarthritis and is reluctant to walk for prolonged periods as she experiences bilateral knee pain with stair climbing and uphill walking

Medications:

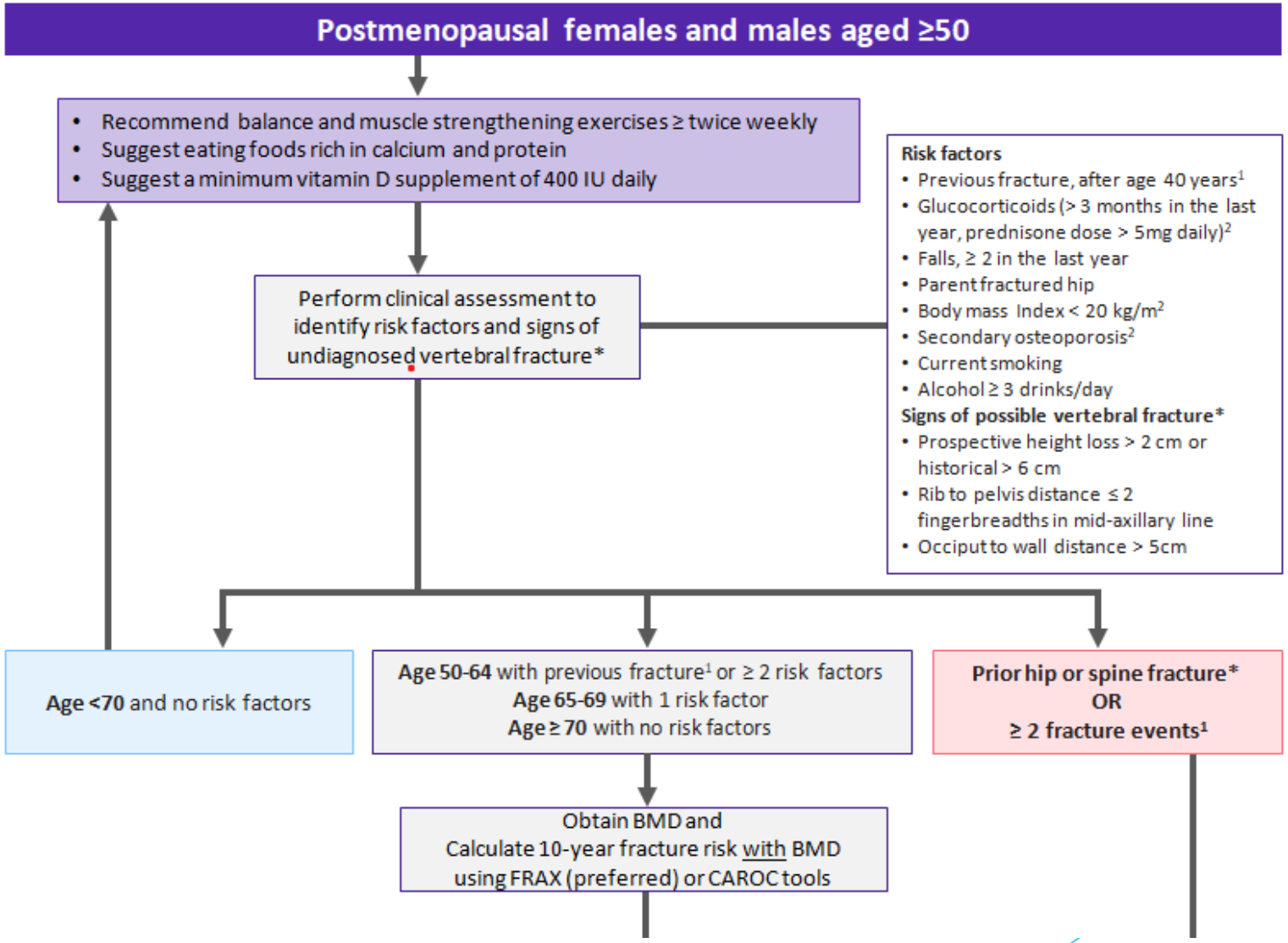
- Women's 50+ multivitamin containing 800 IU of vitamin D and 300 mg of calcium

Case 1: Poll Questions

1. Would you order a BMD test?
   a) Yes
   b) No

2. Vegan food sources of dietary calcium include the following:
   a) Baked beans
   b) Edamame (boiled or steamed)
   c) Almonds
   d) All of the above

Case 1:


Postmenopausal females and males aged ≥50
• Recommend balance and muscle strengthening exercises ≥ twice weekly
• Suggest eating foods rich in calcium and protein
• Suggest a minimum vitamin D supplement of 400 IU daily
Perform clinical assessment to identify risk factors and signs of undiagnosed vertebral fracture*
Risk factors
• Previous fracture, after age 40 years[1]
• Glucocorticoids (> 3 months in the last year, prednisone dose > 5mg daily)[2]
• Falls, ≥ 2 in the last year
• Parent fractured hip
• Body mass Index < 20 kg/m²
• Secondary osteoporosis[2]
• Current smoking
• Alcohol ≥ 3 drinks/day
Signs of possible vertebral fracture*
• Prospective height loss > 2 cm or historical > 6 cm
• Rib to pelvis distance ≤ 2 fingerbreadths in mid-axillary line
• Occiput to wall distance > 5cm
Age <70 and no risk factors
Age 50-64 with previous fracture[1] or ≥ 2 risk factors
Age 65-69 with 1 risk factor
Age ≥ 70 with no risk factors
Prior hip or spine fracture*
OR
≥ 2 fracture events[1]
Obtain BMD and
Calculate 10-year fracture risk with BMD
using FRAX (preferred) or CAROC tools

Case 1: Would you order a bone density?

- Age 55- for 50-64 yo, need a previous fracture or ≥2 RFs to proceed with BMD
- No previous fracture
- Clinical assessment to identify risk factors and signs of undiagnosed VF:
  - Parent fractured hip
  - Need more information:
    - Current smoker?
    - Alcohol intake?
    - Signs of possible vertebral fracture such as height loss?
- Assuming additional information is negative, no need for a BMD.

Case 1: Nutrition

55-year-old female

- **She is vegan and drinks one cup of fortified soy milk daily. She mentions she wants to lose weight and would like some advice on how to optimise her nutrition for osteoporosis prevention**
- **Women's 50+ multivitamin containing 800 IU of vitamin D and 300 mg of calcium**

- BMI is in healthy range – encourage maintenance of this body weight rather than loss
- Recognize that vegan diet presents challenges to meet needs for calcium, vitamin D and protein
- Nutrients from animal products must be replaced with other sources
- Continue with multivitamin:

Vitamin D intake should be 600 IU/day →	800 IU in multivitamin
Calcium intake should be 1200 mg/day →	300 mg in multivitamin; 300 mg in 1 cup of fortified soy milk many foods have low levels of calcium: nuts, seeds, beans, vegetables *Use calcium calculator to measure intakes*

- Protein foods at every meal: tofu, nuts, seeds, beans, new vegan products (cheeses, yogurts, meats made with textured vegetable protein), veg protein powder with a shake
- Refer to a dietitian (& consult nutrition resources on OC website)

Case 2:

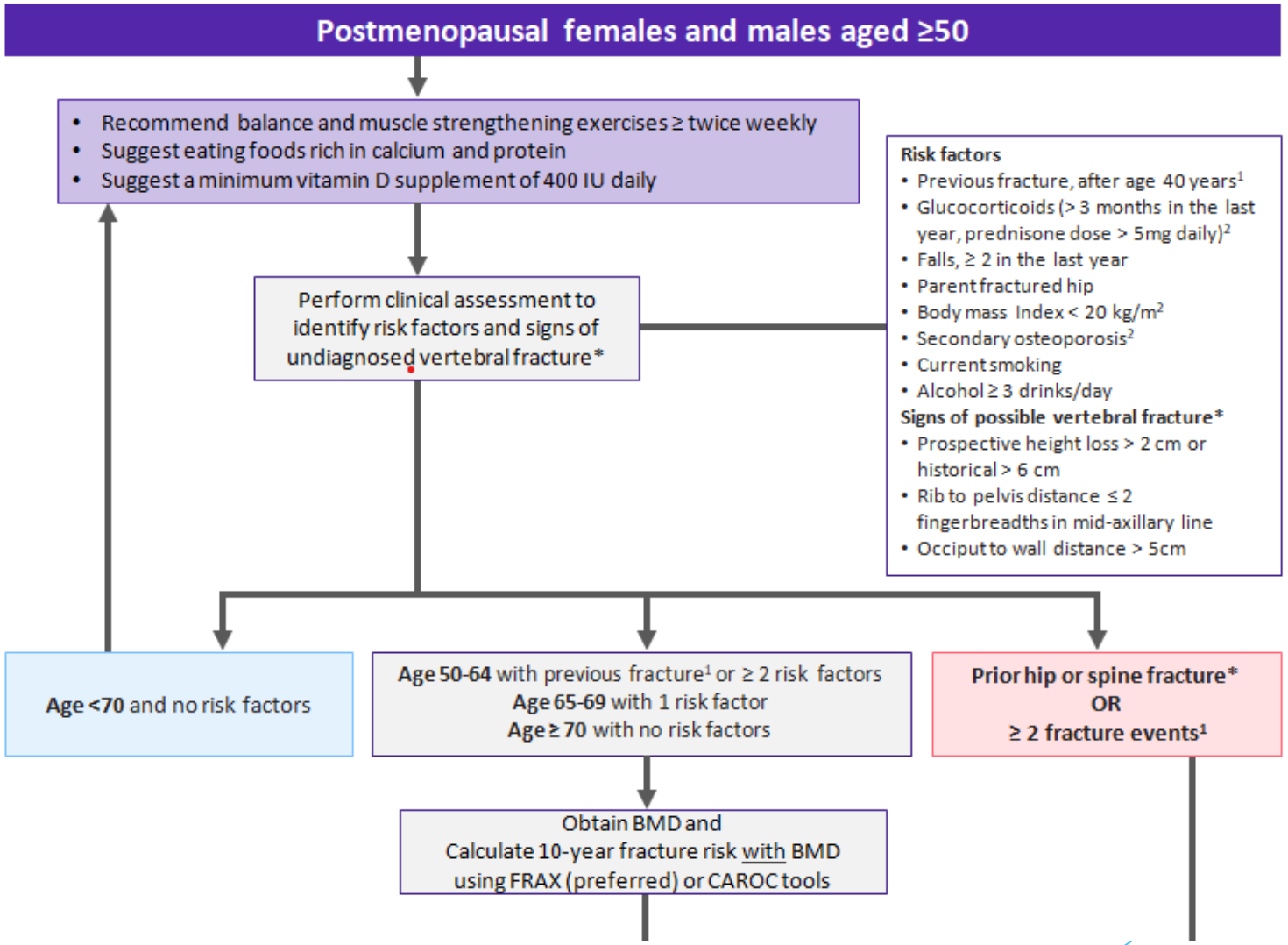
Her 63-year-old sister

- Menopause at age 48, no HRT
- Hypertension and dyslipidemia
- Smokes 1ppd
- BMI 21.8 kg/m^2
- No fracture history, no height loss, physical exam unremarkable
- Family history of osteoporosis – mother fractured her hip 2 years ago
- She is lactose intolerant and cannot afford lactose-free dairy, does not like plant-based food
- Swims twice a week

Medications:

- Amlodipine 10 mg
- Rosuvastatin 10 mg

Case 2:


Postmenopausal females and males aged ≥50
• Recommend balance and muscle strengthening exercises ≥ twice weekly
• Suggest eating foods rich in calcium and protein
• Suggest a minimum vitamin D supplement of 400 IU daily
Perform clinical assessment to identify risk factors and signs of undiagnosed vertebral fracture*
Risk factors
• Previous fracture, after age 40 years[1]
• Glucocorticoids (> 3 months in the last year, prednisone dose > 5mg daily)[2]
• Falls, ≥ 2 in the last year
• Parent fractured hip
• Body mass Index < 20 kg/m²
• Secondary osteoporosis[2]
• Current smoking
• Alcohol ≥ 3 drinks/day
Signs of possible vertebral fracture*
• Prospective height loss > 2 cm or historical > 6 cm
• Rib to pelvis distance ≤ 2 fingerbreadths in mid-axillary line
• Occiput to wall distance > 5cm
Age <70 and no risk factors
Age 50-64 with previous fracture[1] or ≥ 2 risk factors
Age 65-69 with 1 risk factor
Age ≥ 70 with no risk factors
Prior hip or spine fracture*
OR
≥ 2 fracture events[1]
Obtain BMD and
Calculate 10-year fracture risk with BMD
using FRAX (preferred) or CAROC tools

Case 2:

DXA:

- L1-L4: T=-2.6
- FN: T=-2.2
- Total Hip: T=-2.1

Case 2: FRAX calculation

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: Canada Name/ID: About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: 63 Date of Birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg): 61
4. Height (cm): 167
5. Previous Fracture — No / Yes
6. Parent Fractured Hip — No / Yes
7. Current Smoking — No / Yes
8. Glucocorticoids — No / Yes
9. Rheumatoid arthritis — No / Yes
10. Secondary osteoporosis — No / Yes
11. Alcohol 3 or more units/day — No / Yes
12. Femoral neck BMD (g/cm^2)

T-Score: -2.2

Clear Calculate

BMI: 21.9

The ten year probability of fracture (%)

with BMD

Major osteoporotic	17
Hip Fracture	2.8

If you have a TBS value, click here: Adjust with TBS

Case 2: Poll Questions

1. Although this patient is very concerned that her bone health will continue to deteriorate, she refuses to consider pharmacotherapy. What options would you discuss with her?
    a) Beneficial lifestyle choices
    b) Being alert to new risk factors
    c) Repeating BMD test in three years
    d) All of the above

2. What would you emphasize when it comes to exercise?
    a) Continue the swimming
    b) Resistance training twice a week
    c) Balance training
    d) All of the above

3. Would you order vertebral imaging to rule out an undiagnosed spine fracture?
    a) Yes
    b) No

Case 2: Nutrition

Her 63-year-old sister

- **She is lactose intolerant and cannot afford lactose-free dairy, does not like plant-based food**
  - In small amounts: yogurts and hard cheese
  - Lactase enzyme supplements to help tolerate lactose (less expensive than lactose-free dairy)
  - Food sources of higher amounts of calcium: tinned salmon with crushed bones, calcium-fortified orange juice; almonds
  - Check calcium intake with calcium calculator to determine a level of calcium supplementation needed in addition to food sources
  - Vitamin D: 400 IU vitamin D as per Health Canada recommendation and may need additional supplementation if not consuming vitamin D rich foods such as fluid milk or fortified plant beverage
  - Refer to dietitian

Case 2: Exercise

Movement	Example (moderate difficulty)
Push	Counter push-up
Pull	Supported dumbbell row
Squat	Dumbbell goblet squat
Hinge	Hip hinge with kettlebell
Carry	Suitcase carry
Press	Landmine press
Balance	Body weight lunge Agility ladder

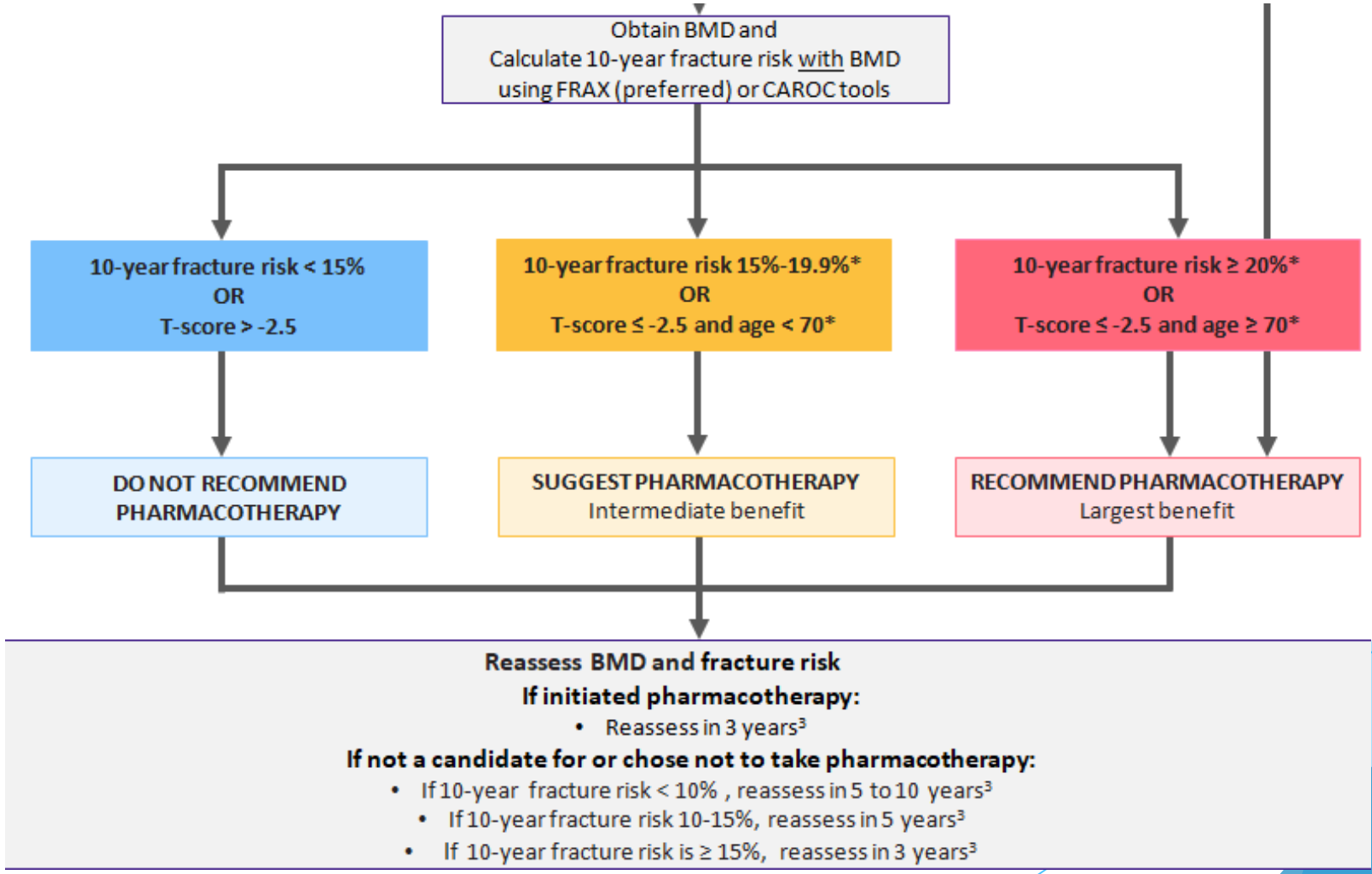
≥ 2x /week
Learn form first, then choose weight or difficulty level that requires high effort

Start with:
2 sets
6-12 reps → high effort
Lower for 4 seconds, Lift 2 seconds

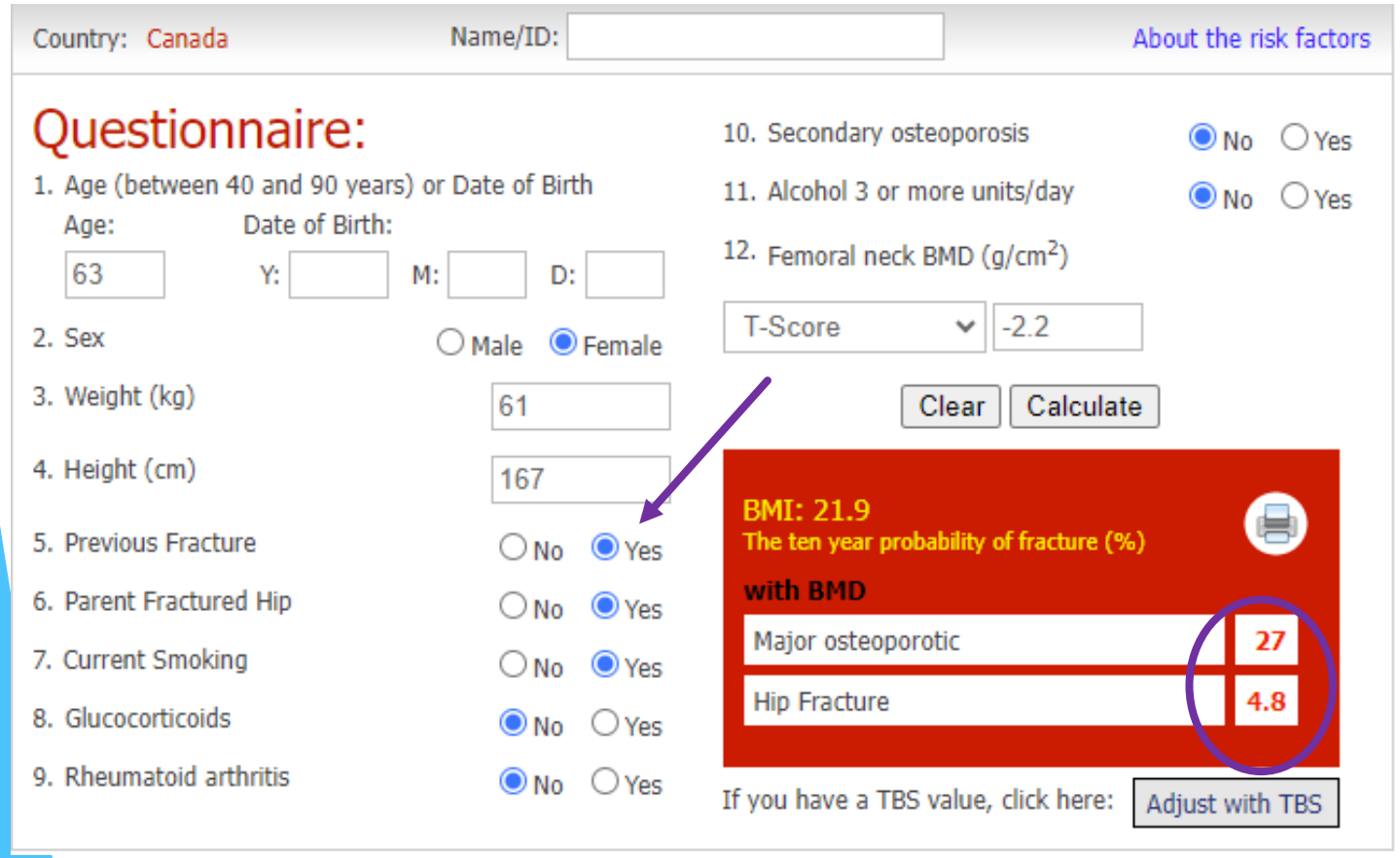
Progress:
Reps→
Sets →
Exercise difficulty

Encourage her to continue swimming, but not instead of resistance and balance training.

Case 2:


Obtain BMD and
Calculate 10-year fracture risk with BMD
using FRAX (preferred) or CAROC tools
10-year fracture risk < 15%
OR
T-score > -2.5
10-year fracture risk 15%-19.9%*
OR
T-score ≤ -2.5 and age < 70*
10-year fracture risk ≥ 20%*
OR
T-score ≤ -2.5 and age ≥ 70*
DO NOT RECOMMEND
PHARMACOTHERAPY
SUGGEST PHARMACOTHERAPY
Intermediate benefit
RECOMMEND PHARMACOTHERAPY
Largest benefit
Reassess BMD and fracture risk
If initiated pharmacotherapy:
• Reassess in 3 years[3]
If not a candidate for or chose not to take pharmacotherapy:
• If 10-year fracture risk < 10% , reassess in 5 to 10 years[3]
• If 10-year fracture risk 10-15%, reassess in 5 years[3]
• If 10-year fracture risk is ≥ 15%, reassess in 3 years[3]

Case 2, part 1: Role of vertebral imaging



- From FRAX notes: "A special situation pertains to a prior history of vertebral fracture**. A fracture detected as a radiographic observation alone … counts as a previous fracture.**"
- From the 2023 CPG: **"Previous fracture of the vertebra (clinical or documented on imaging) …indicates high risk for future fractures."**
- Presence of a VF might suggest longer duration of therapy
- Need more history to see if perhaps a recent event, puts risk at an even higher level. Recent and severe might prompt discussion of anabolic therapy
- Smoking cessation for overall health benefit!

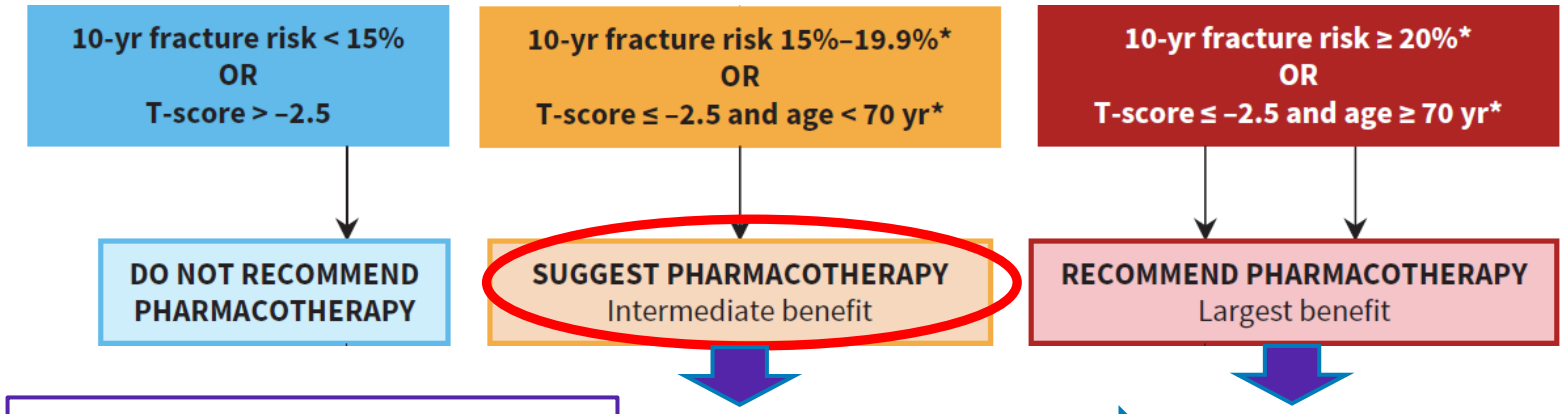
Case 2: Pharmacotherapy

63-year-old female

- **MOF = 17%**
- **T-score ≤ -2.5 and age <70yo**

"SUGGEST"
Pharmacotherapy

Conditional Recommendation
Benefits ***probably*** outweighs harms in most settings.
Patients: most would want suggested action, but many would not
Clinicians: should recognize that different choices will be appropriate for each person.



If chose bisphosphonates suggested duration:

3 yrs → **6 yrs**

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COPN

For patients.

By patients.

CANADIAN OSTEOPOROSIS PATIENT NETWORK (COPN)

is a national network of people living with or affected by osteoporosis. COPN supports members by:

- Connecting through newsletters and resources made *by patients, for patients*
- Sharing evidence-based information about this disease, its challenges, and living well with osteoporosis

OSTEOPOROSIS

For more information and to join COPN, visit:
osteoporosis.ca/copn-patient-network/

Case 2: Nutrition

Her 63-year-old sister

- **She is lactose intolerant and cannot afford lactose-free dairy, does not like plant-based food**
  - In small amounts: yogurts and hard cheese
  - Lactase enzyme supplements to help tolerate lactose (less expensive than lactose-free dairy)
  - Food sources of higher amounts of calcium: tinned salmon with crushed bones, calcium-fortified orange juice; almonds
  - Check calcium intake with calcium calculator to determine a level of calcium supplementation needed in addition to food sources
  - Vitamin D: 400 IU vitamin D as per Health Canada recommendation and may need additional supplementation if not consuming vitamin D rich foods such as fluid milk or fortified plant beverage
  - Refer to dietitian

Case 2 – part 2: 2 years later

65 year old female

- Declined pharmacotherapy 2 years ago
- Recent radius fracture – slipped on wet sidewalk
- Family history of osteoporosis – mother fractured her hip 4 years ago
- She is still smoking
- She introduced calcium-rich food in her diet and started resistance training twice weekly

Medications:

- Amlodipine 10 mg
- Rosuvastatin 10 mg
- Calcium 500 mg daily and vitamin D 400 IU daily

DXA (2 years ago):

- L1-L4: T=-2.6
- FN: T=-2.2
- Total Hip: T=-2.1

Case 2 – part 2: Updated FRAX

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: Canada Name/ID: About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: 65 Date of Birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg) — 61
4. Height (cm) — 167
5. Previous Fracture — No / Yes
6. Parent Fractured Hip — No / Yes
7. Current Smoking — No / Yes
8. Glucocorticoids — No / Yes
9. Rheumatoid arthritis — No / Yes
10. Secondary osteoporosis — No / Yes
11. Alcohol 3 or more units/day — No / Yes
12. Femoral neck BMD (g/cm^2) — Select BMD: -2.2

Clear Calculate

BMI: 21.9

The ten year probability of fracture (%)

without BMD

Major osteoporotic	31
Hip Fracture	7.4

Case 2 – part 2 : Poll question

1. Would recommend pharmacotherapy?
   a) Yes
   b) No

2. What pharmacotherapy would you consider?
   a) Bisphosphonate
   b) Denosumab
   c) Anabolic therapy

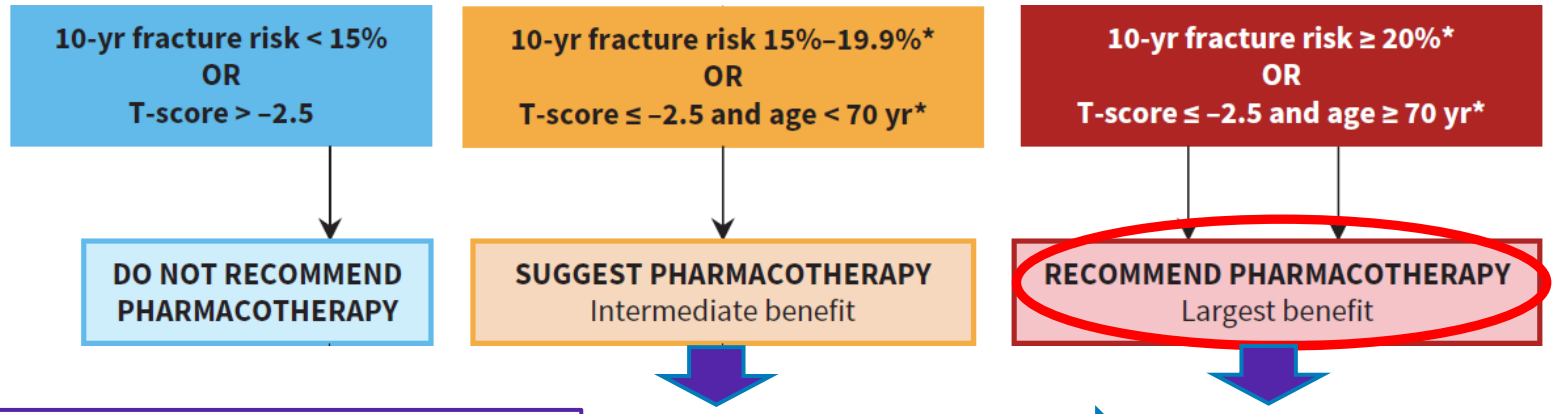
Case 2 (2 years later): Pharmacotherapy

65-year-old female

- **Recent radius fracture**
- **MOF = 31%**

"RECOMMEND"
Pharmacotherapy

Strong Recommendation
Benefits ***clearly*** outweighs harms in most settings.
Patients: most would want recommended action, but only small number would not
Clinicians: should provide recommendation to almost all patients



If chose bisphosphonates suggested duration:

3 yrs → **6 yrs**

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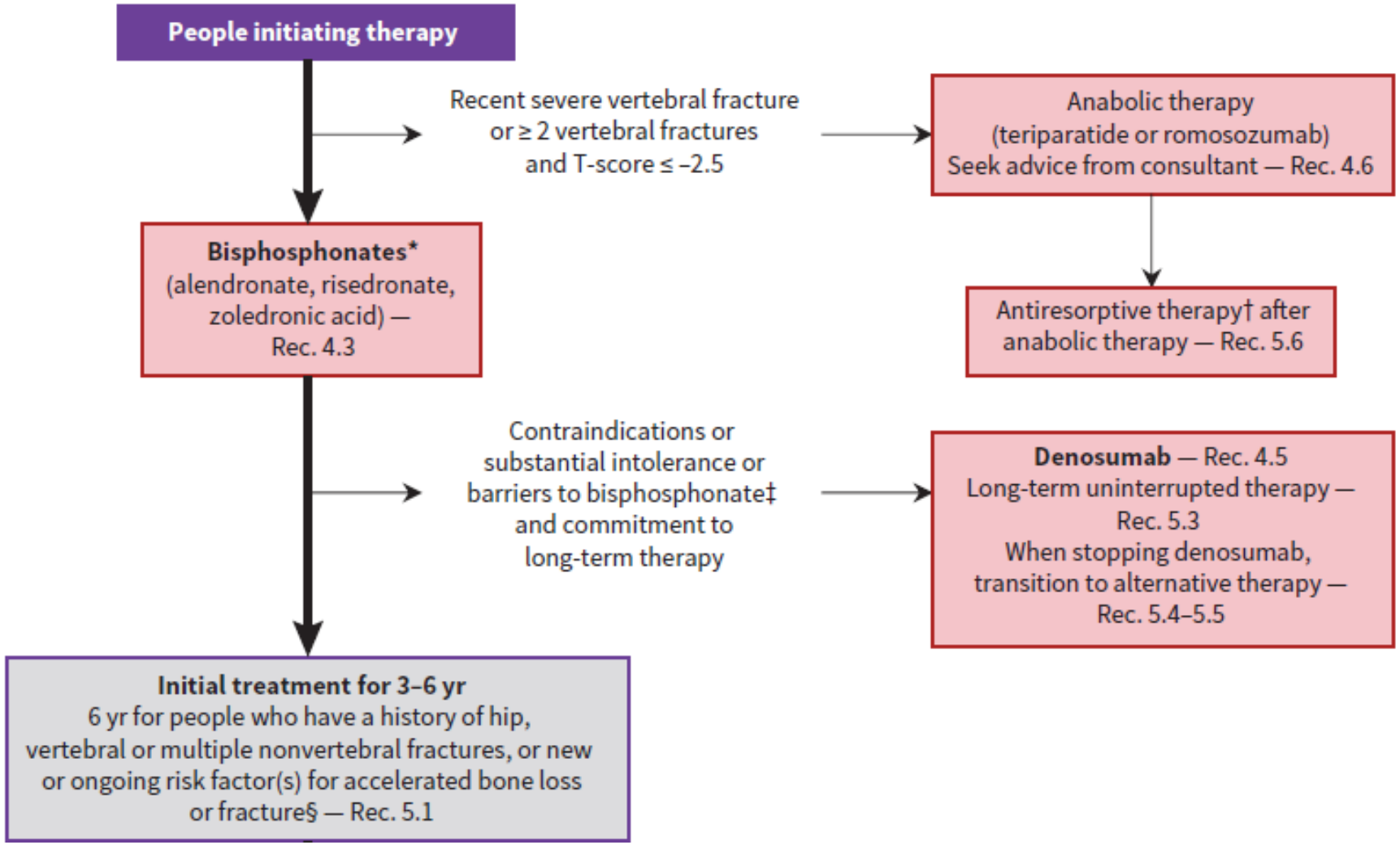
Case 2 (2 years later): Pharmacotherapy



- Assess for secondary causes and potential limitations when considering pharmacotherapy
- Bisphosphonates first choice
- Duration likely for 6 yrs
- Denosumab if contraindications or substantial intolerance or barriers to bisphosphonates

Case 2 (2 years later): Pharmacotherapy Monitoring

Rec 6.5 Assess adherence and tolerance, for new fractures and risk factors
Rec 6.6 Counsel on and monitor for AFF and ONJ

Reassess BMD and fracture risk

If initiated pharmacotherapy:§

- Reassess in 3 yr

If not a candidate for or chose not to take pharmacotherapy:§

- If 10-yr fracture risk < 10% , reassess in 5–10 yr
- If 10-yr fracture risk 10%–15%, reassess in 5 yr
- If 10-yr fracture risk ≥ 15%, reassess in 3 yr

***Remark**: BMD in may be repeated at shorter interval if secondary causes, new fracture or new clinical risk factors associated with rapid bone loss*

Case 3:

The two sisters were at a family function and noticed that their 88-year-old father looked significantly shorter and hunched and encouraged him to speak with his family physician

- He looks kyphotic
- He has not experienced any new or severe back pain
- He has had several falls over the past year
- On physical exam he has lost 5 cm, unstable gait, sarcopenic
- You order a BMD test and spine X-ray:
  - T-score -2.5 lumbar spine, -2.8 FN and -2.7 TH
  - Vertebral osteoporotic fractures T8-T9
- Normal labs

Case 3: FRAX calculation

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: Canada Name/ID: About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: 88 Date of Birth: Y: M: D:
2. Sex: Male / Female
3. Weight (kg): 80
4. Height (cm): 178
5. Previous Fracture: No / Yes
6. Parent Fractured Hip: No / Yes
7. Current Smoking: No / Yes
8. Glucocorticoids: No / Yes
9. Rheumatoid arthritis: No / Yes
10. Secondary osteoporosis: No / Yes
11. Alcohol 3 or more units/day: No / Yes
12. Femoral neck BMD (g/cm^2)
    T-Score -2.8

Clear Calculate

BMI: 24.7
The ten year probability of fracture (%)
with BMD

Major osteoporotic	17
Hip Fracture	7.1

If you have a TBS value, click here: Adjust with TBS

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Case 3: Poll questions

1. In this scenario, would you recommend resistance training?
   a) Yes
   b) No

2. What would you prescribe?
   a) Bisphosphonate
   b) Denosumab
   c) Anabolic therapy

Exercise for individuals at high risk of fracture

- ✓ Recommend balance and strength training at least twice weekly for all people at risk of fracture, *even individuals with a history of spine fracture*
- ✓ Include exercises for shoulder stabilizers and back extensor muscles
  - ✓ Refer to local exercise physiologists, fall prevention exercise classes, Osteoporosis Canada resources
- ✓ Encourage activities they wish to do, if they can be done safely
- ✓ Refer to OT/PT/resources for fall risk assessment/prevention, safe movement

Ponzano et al, 2023

What's in your toolbox?

Identify a variety resources in your community that you can refer people to.

- Osteoporosis Canada Too Fit To Fracture handouts and videos: https://osteoporosis.ca/exercise-recommendations/
- BoneFit™: https://bonefit.ca/bonefit-map-locator/
- Find a CSEP Certified Exercise Physiologist (CEP): https://csep.ca/membership-overview/directory/
- GLA:D™ Canada for arthritis: https://gladcanada.ca/how-to-participate-in-glad-canada/
- Otago Exercise Program for fall prevention (people at risk of falls): https://www.physio-pedia.com/Otago_Exercise_Programme
- Falls prevention exercise programs in community
- Tai Chi for fall prevention

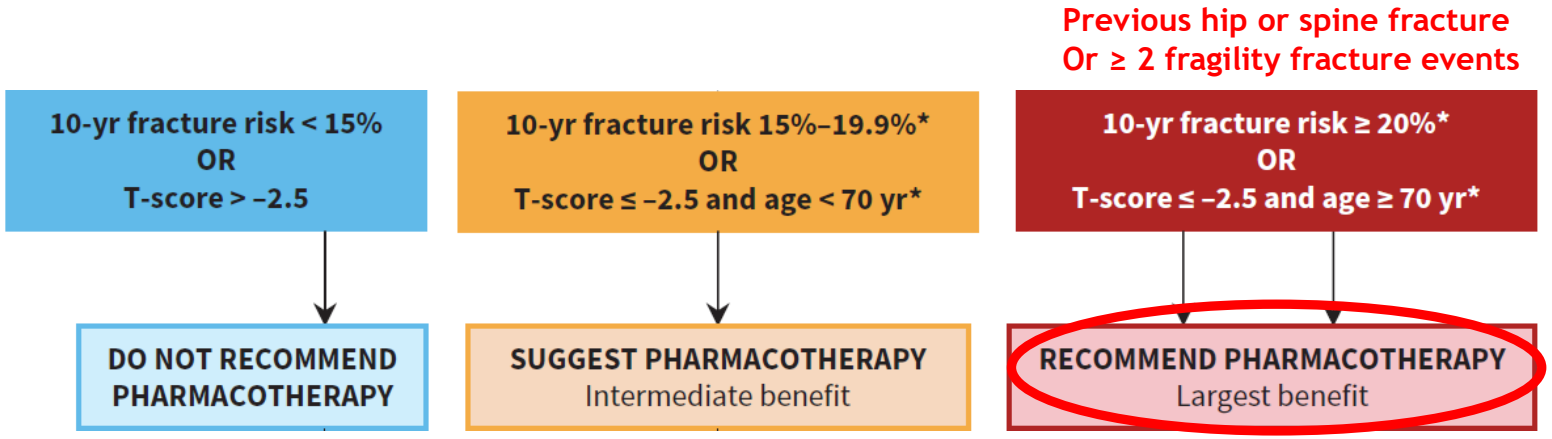
Case 3: Pharmacotherapy

88-year-old male

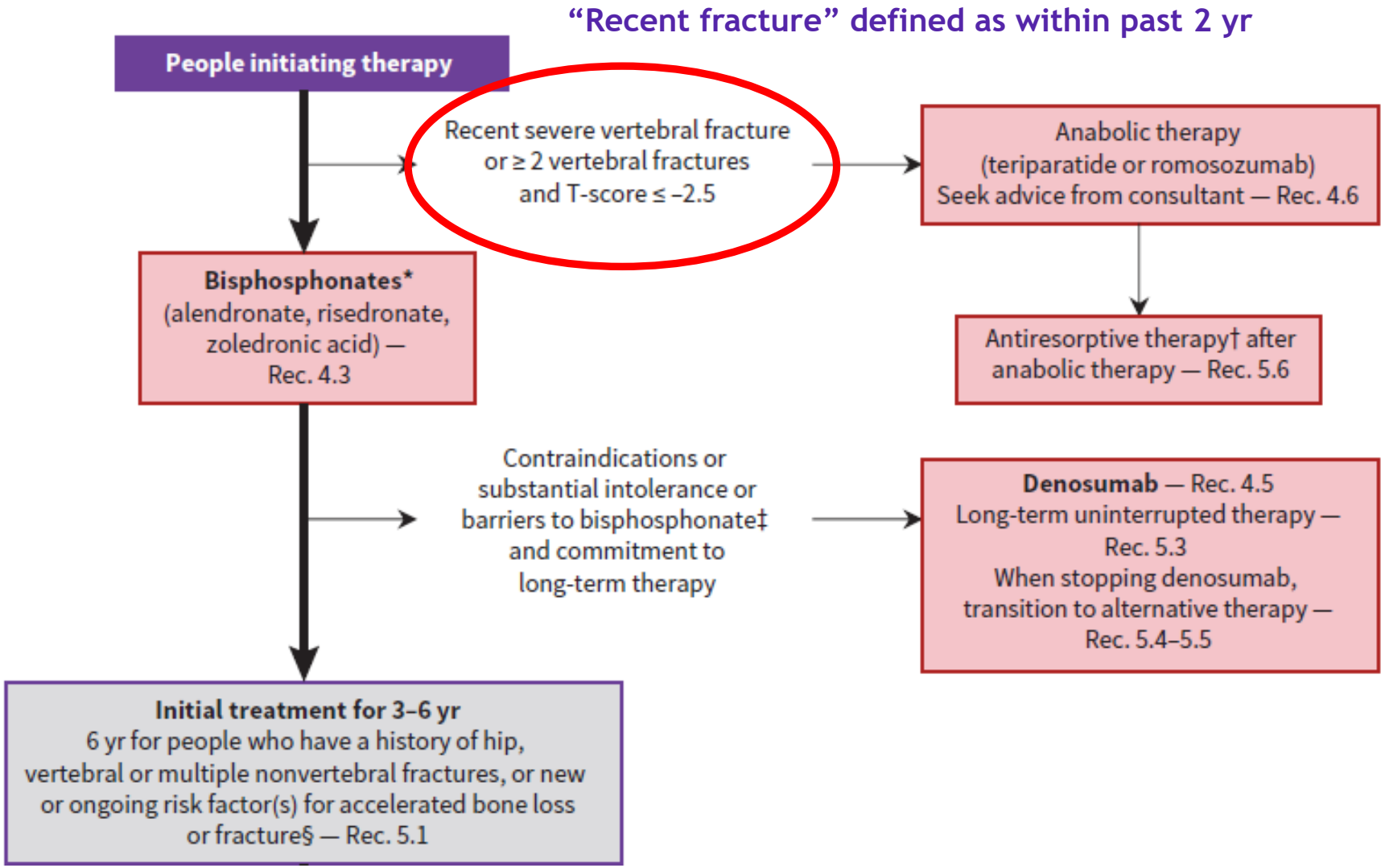
- **MOF = 17%**
- **T-score ≤-2.5 and age ≥ 70 yo**
- **Radiologic T8-T9 fractures**

"RECOMMEND"
Pharmacotherapy

Strong Recommendation
Benefits ***clearly*** outweighs harms in most settings.
Patients: most would want recommended action, but only small number would not
Clinicians: should provide recommendation to almost all patients



Case 3: Pharmacotherapy



- Assess for secondary causes and potential limitations when considering pharmacotherapy
- Considerations for upfront anabolic therapy
- Otherwise, bisphosphonates first choice
- Denosumab if contraindications or substantial intolerance or barriers to bisphosphonates

Case 3: Considerations for Anabolic Therapy

- Teriparatide: PM females (anti-fracture), males (to increase bone mass, no fracture data), GIOP
- Romosozumab: only approved for postmenopausal females
- Rapid ↑ BMD and rapid ↓ fracture risk compared to bisphosphonates
  - Teriparatide (VERO trial: teriparatide vs risedronate)
  - Romosozumab (ARCH trial: romosozumab vs alendronate)
- Barriers: high cost and feasibility

Anabolic Therapy (Teriparatide or Romosozumab)
Seek advice from consultant
- *Rec 4.6*

<u>Remark:</u> The choice of anabolic therapy may depend on affordability and feasibility of injection schedule.

Kendler, Lancet 2018; Saag NEJM 2017

Case 4:

The 87-year-old mother

- Had a hip fracture at age 81
- Has been on Risedronate DR since she had the hip fracture 6 years ago
- Stable height, no new medical concern

Osteoporosis Therapy:

- Risedronate DR
- Calcium 500 mg daily
- Vitamin D 2000 IU daily (25OHD was 100 nmol/L when she started risedronate, on supplementation)
- Current BMD (compared to the one 3 years ago)
  - L1-L4: T=-2.1 (increased by 4%)
  - FN: T=-2.9
  - Total Hip: T=-2.7 (stable)

Case 4: Poll questions

1. What would you recommend for her Vitamin D supplementation?
   a) Continue 2000 IU
   b) Reduce to 1000 IU
   c) Reduce to 800 IU
   d) Reduce to 400 IU

2. She has been on bisphosphonates for 6 years. Would you:
   a) Stop risedronate for a drug holiday
   b) Continue risedronate
   c) Switch to denosumab
   d) Switch to anabolic therapy

Case 4: Nutrition

The 87-year-old mother

Osteoporosis Therapy:

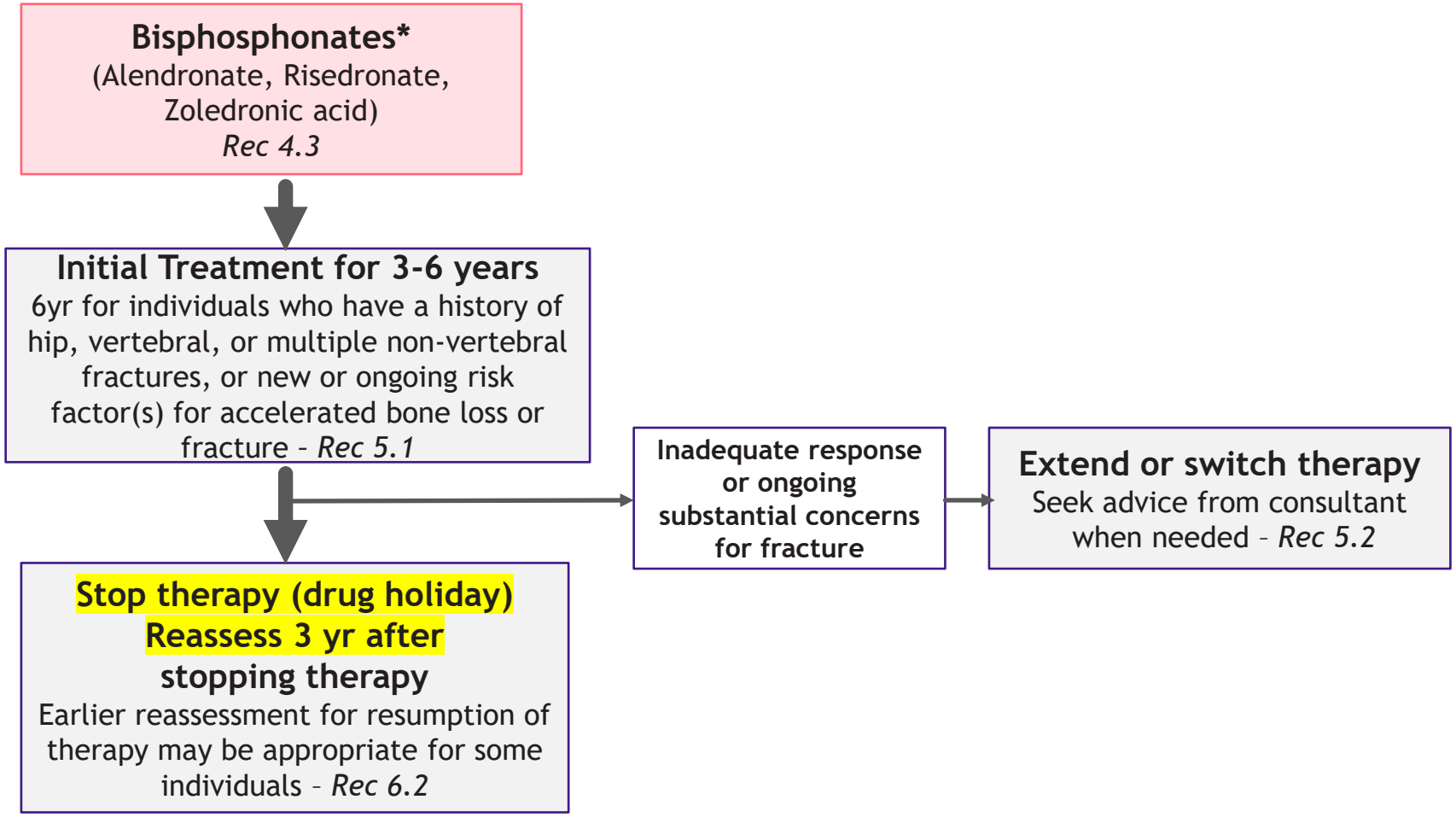
- Risedronate DR
- Calcium 500 mg daily
- Vitamin D 2000 IU daily

- Good practice statement: Although most participants in pharmacotherapy trials received a minimum of 400 IU vitamin D/day and up to 1000 mg calcium/day, food sources or supplementation should be individualized according to risk factors for insufficiency.
- Assess dietary calcium intake using calcium calculator
- Recommend protein food at every meal
- Consult nutrition resources on OC website

Case 4: Pharmacotherapy

87-year-old female

- **Hip fracture 6-7 yrs ago**
- **Risedronate DR x 6 yrs now**
- **No new fractures or falls**
- **No new risk factors**
- **Stable bone density**



- Other potential factors:
  - Reported adherence
  - Zol> Aln > Ris
  - Asian female
  - Dental health
  - Falls risk

***Remark**: Earlier reassessment in those with higher risk of fracture (e.g. previous hip fracture, high FRAX score), secondary causes, new fracture or new clinical risk factors associated with rapid bone loss.*

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Exercise for people at risk of fracture

What's in your toolbox?

Identify a variety resources in your community that you can refer people to.

Address ROM, hyperkyphosis, pain, movement education, exercise after spine fracture

Other interventions based on impairments

Encourage physical activities for fun or fitness if they can be done safely, modified

Prioritize balance, functional & strength training 2x/week for all

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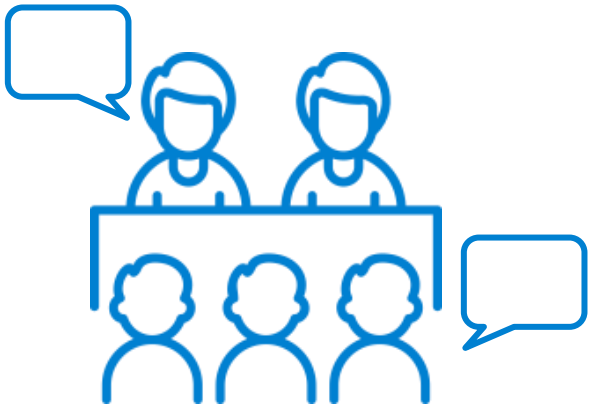
4th Canadian Musculoskeletal Conference

A PROFESSIONAL EDUCATIONAL SYMPOSIUM FOCUSED ON TREATMENT, MANAGEMENT & PREVENTION

Introducing Osteoporosis Canada's 2023 Clinical Practice Guideline (CPG)



Ask the Expert Panel

Moderator:

Heather McDonald-Blumer, MD, FRCPC

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