What tools can we use to monitor and improve bone and muscle strength in patients at high risk for fractures?

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Disclosures

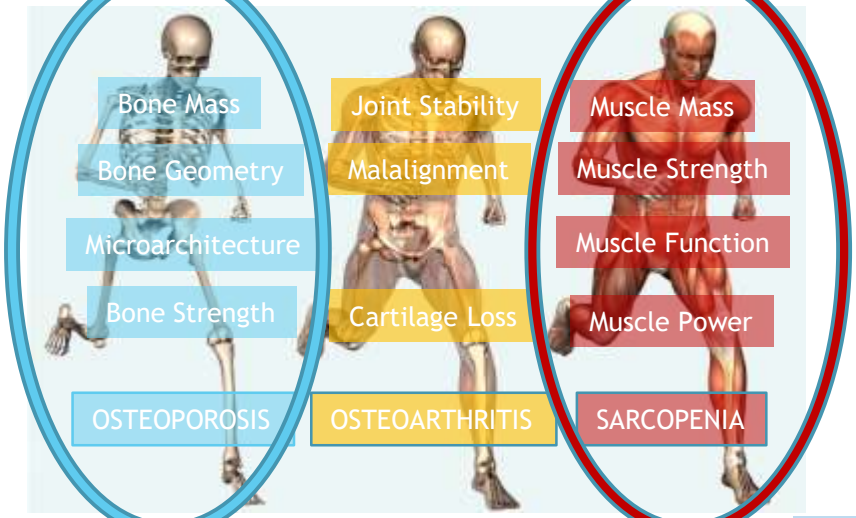
- Research Grants:
  - Industry partnership grant with CIHR, GreyBox and Amgen
    - HIP MOBILE study

Objectives

As a result of attending this session, participants will be able to:

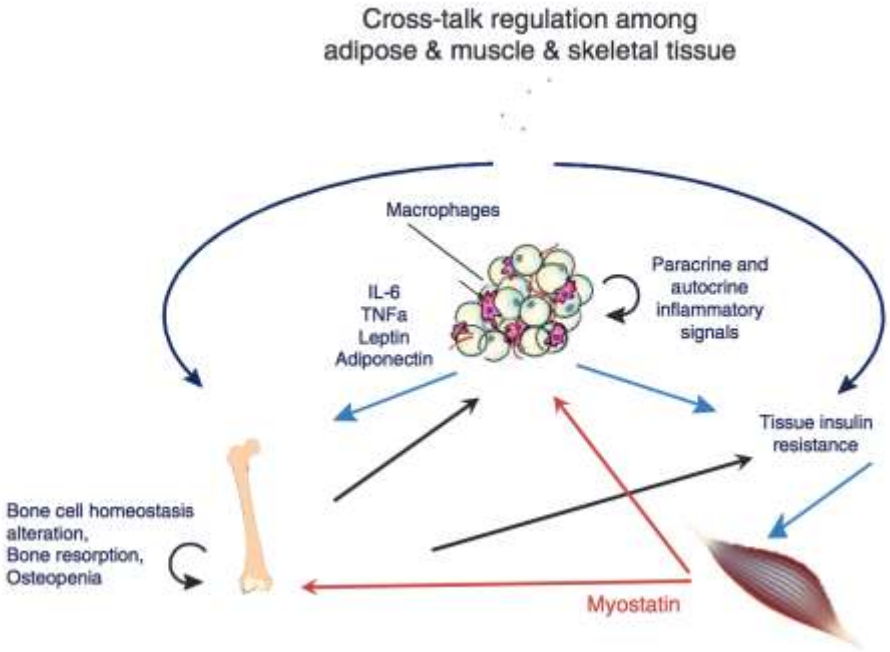
- 1. Use the most commonly available fracture risk assessment tools
- 2. Use the most commonly available muscle strength and function assessment tools
- 3. Devise strategies to improve and monitor bone and muscle strength in clinical practice

MUSCULOSKELETAL HEALTH



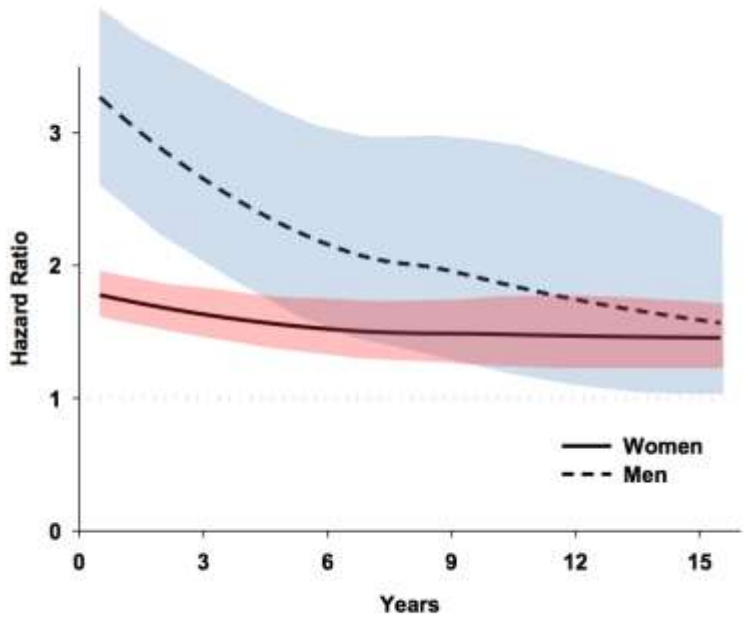
SN Morin 2018

Adipose, Bone, Muscle interaction



Migliaccio et al 2014 *Horm Mol Biol Clin Invest*

Subsequent Major Osteoporotic Fractures after Initial Fracture, in men and women



S Morin et al, 2018, *ASBMR*, Montreal

Fractures and Falls

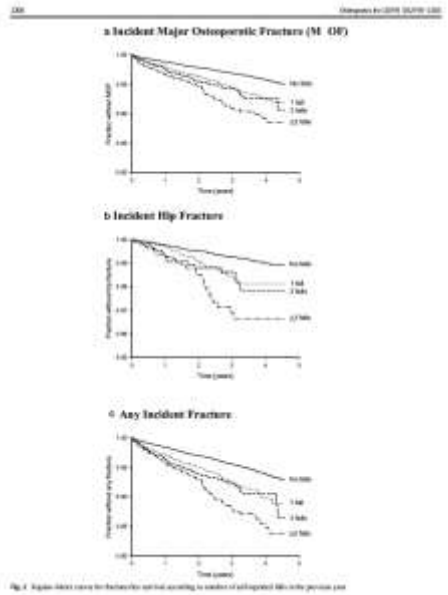


Table 2 Type of fall-related injuries among pre-frail and frail adults

	Pre-frail adults n (%)	Frail adults n (%)	p value	Adjusted p value[1]
Fallers	121 (60.5)	92 (53.2)	0.21	
Recurrent fallers	64 (52.9)	54 (58.7)	0.4	
Total falls	301	212		
Injurious falls				
Any injury	213 (70.8)	118 (55.6)	0.0004	0.005
None	88 (29.2)	94 (44.3)		
Type of injury[2]				
Minor	154 (72.3)	52 (44.1)	< 0.0001	< 0.0001
Moderate	39 (18.3)	34 (28.8)	0.01	0.01
Major	20 (9.4)	32 (27.1)	< 0.0001	0.005
Falls with fracture				
Fracture	15 (5.0)	22 (10.2)	0.02	0.04
No fracture	286 (95.0)	190 (89.8)		
Fracture location[3]				
Hip	1 (6.7)	8 (36.4)	0.04	0.01
Upper extremity	7 (46.7)	5 (22.7)	0.13	0.12
Vertebral	1 (6.7)	2 (9.1)	0.79	0.42
Other	6 (40.0)	7 (31.8)	0.61	0.78

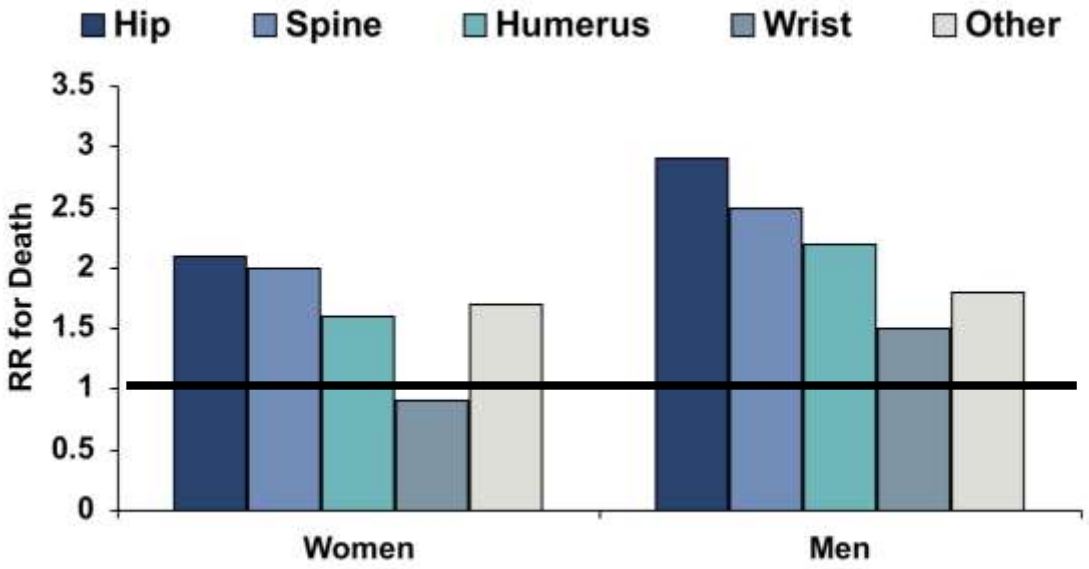
[1] Results from generalized linear models adjusting for age, gender, and days of follow-up

[2] Among those with injury only

[3] Among those with fractures only

Death 1st Year Post Fracture

adjusted for age, comorbidity, home care/LTC status



N=49,197
Incident fractures

N=21,067
Incident fractures

Morin S. et al *Osteoporos Int*. 2010

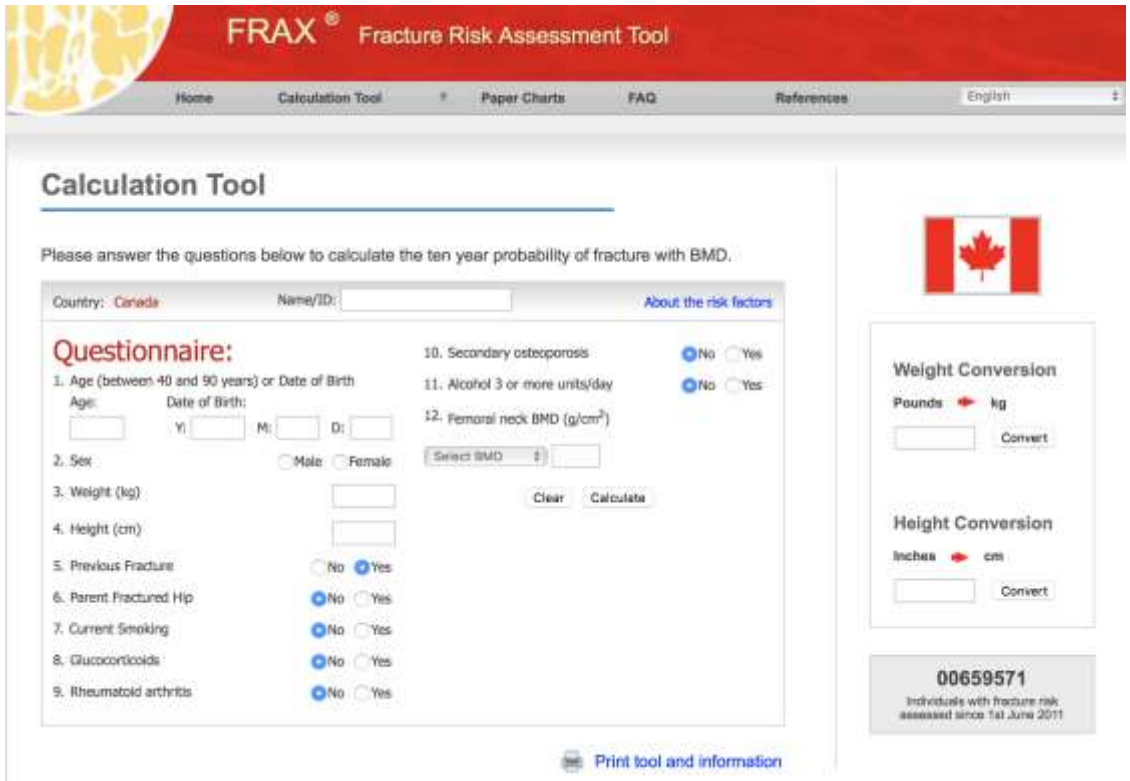
Fracture risk assessment tools

Table 1 Most studied fracture risk assessment tools

Name, URL	Risk factors included in the tool	Tool output	Unique features
FRAX (Fracture Risk Assessment Tool) (25), www.shef.ac.uk/FRAX	• Age, sex, body mass index, prior fragility fracture, glucocorticoid use ≥3 months, secondary osteoporosis, rheumatoid arthritis, parental hip fracture, current cigarette smoking, alcohol intake of ≥3 units/day • Femoral neck BMD or T-score (optional)	• 10-year major osteoporotic fracture (clinical vertebral, hip, forearm, proximal humerus) • 10-year hip fracture	• Meta-analyses for selection of clinical risk factors selection and consideration of interaction between risk factors • Considers competing mortality risk • Population-specific calibration
QFracture-2016 (26, 27), www.qfracture.org	• Age, sex, ethnic groups (9), height, weight, smoking (5 categories), alcohol intake (6 categories) diabetes (type 1 or 2), previous fracture, parental osteoporosis/hip fracture, living in a nursing or care home, history of falls, dementia, cancer, asthma/COPD, cardiovascular disease, chronic liver disease, advanced chronic kidney disease, Parkinson's disease, rheumatoid arthritis/SLE, malabsorption, endocrine problems, epilepsy or anticonvulsant use, antidepressant use, steroid use, HRT use	• 1- to 10-year osteoporotic fracture (clinical spine, hip, distal forearm; humerus fracture) • 1 to 10 year hip fracture	• Includes dose–response for smoking (4 levels), alcohol intake (5 levels), type of diabetes • BMD is not an input variable • Does not consider competing mortality risk • Calibrated for the UK population
Garvan Fracture Risk Calculator (28, 29), www.garvan.org.au/bone-fracture-risk	• Age, sex, fractures after age 50 (none, 0, 1, 2, ≥3), history of falls in the previous 12 months (none, 0, 1, 2, ≥3) • Femoral neck BMD (or T-score) or weight if BMD unavailable	• 5- or 10-year any osteoporotic fracture (hip, clinical vertebrae, wrist, metacarpal, humerus, scapula, clavicle, distal femur, proximal tibia, patella, pelvis, and sternum) • 5- or 10-year hip fracture	• Includes dose–response for number of prior fractures and falls • Does not consider competing mortality risk • Calibrated for the Australian population

Leslie WD, Morin SN , Abrahamsen B, *Osteoporosis*, 5th Edition, in Press, 2019

Fractures Risk Assessment: FRAX



Muscle Function Assessment

Muscle Strength:

- Grip Strength

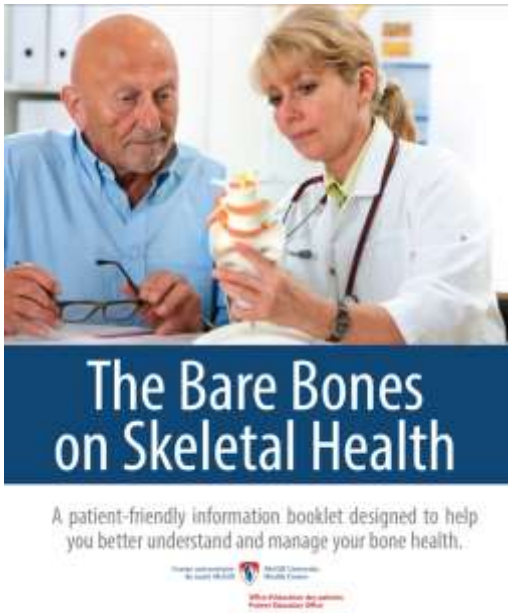
Muscle Power:

- Leg Press,
- Knee extension

Physical Performance:

- Gait Speed
- Chair Stand Test
- Timed Up and Go

SHARED DECISION MAKING



Patient Engagement in Clinical Guidelines Development: Input from 1108 patients

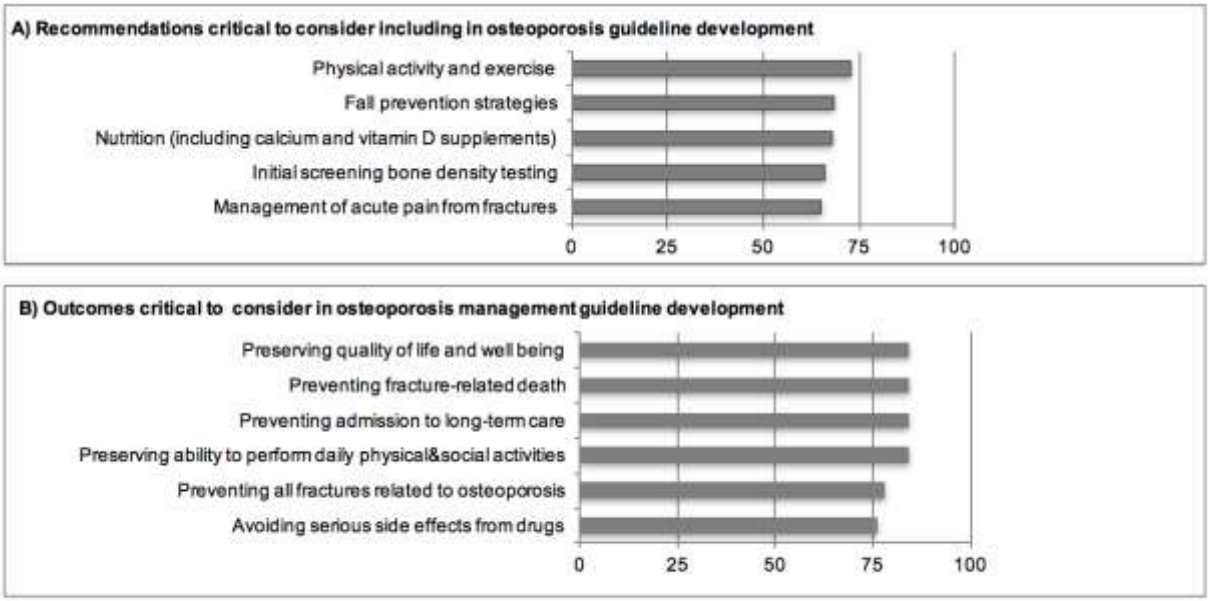


Figure 1 Percentage of respondents who indicated that specific recommendations and outcomes were critical to consider in the updated osteoporosis clinical guideline development.

A Survey of Patients on Essential Features of a Mobile Application (App) for the Management of Acute Pain Post-Fracture

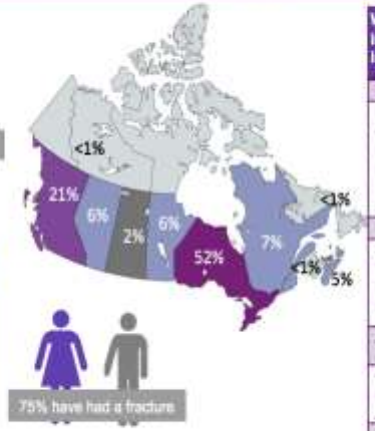
Who answered the survey?

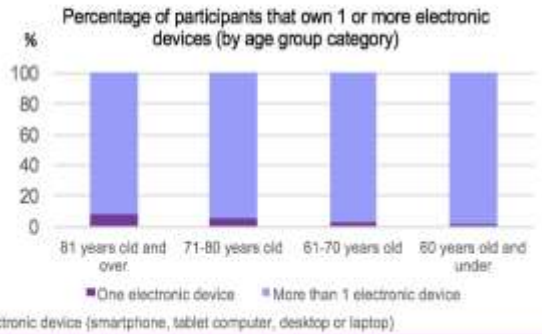
305 members

Online survey went out in March and April 2019

Participant characteristics

Age category (years)	Number of participants
> 81 years	26
71-80	107
61-70	116
< 60 years	56





*Electronic device (smartphone, tablet computer, desktop or laptop)

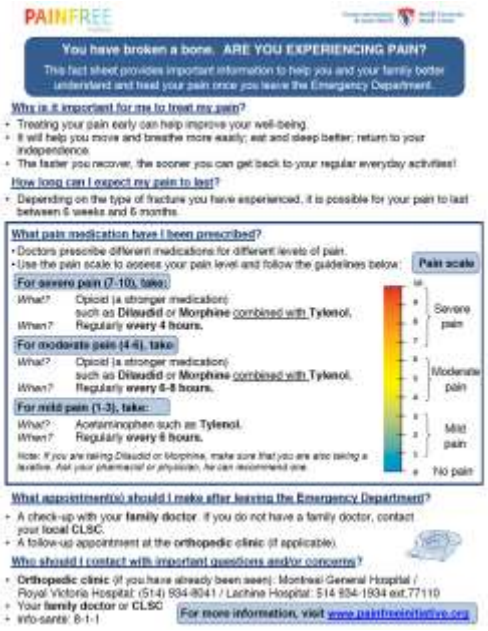
What do you feel would be the most important subject matter (topics) to include in such a mobile health app?	Answers N=1108
Mobility	**427**
Exercises Cast care Physiotherapy & Occupational therapy Managing Activities of Daily Living & Instrumental Activities of Daily Living Fall prevention	
Pharmacologic management	**238**
Side effects & Drug interactions Timing and frequency Non-opioid pain medications Pain medication Do's & Don'ts	
Addressing general issues on pain management	**191**
General approach Unexpected symptoms Alternative strategies	
Non-pharmacologic pain management	**85**
Nutrition, Vitamins & supplements Relaxation & Meditation	
Healing & recovery	**82**
Healing timeline & Preventative strategies Sleep aids Wound care	
Information	**43**
Nearby services Online education resources Osteoporosis FAQs	
Psychological wellbeing	**42**
Mood management Support groups Motivation & reinforcement	

What would be the most important features, or characteristics, to include in such a mobile health app?	Answers N=736
Audiovisual	**335**
Easy navigation Images & videos Easy layout Option to have content spoken	
Ways to convey the information	**136**
Concrete examples regarding medications Alternative therapies examples (exercises, breathing, relaxation etc.) Providing reliable sources of additional information Concrete examples (what to expect)	
Support	**95**
Online or telephone advisors for medical or technical support FAQs Patient support groups	
Feedback	**70**
General incorporation of feedback Ability to give feedback Ability to receive feedback	
Understandability of information	**42**
Easy to understand Concise & Readability	
Ability to personalize mobile app	**19**
Tracking pain & progress Tracking medication dosing and timing Reminders	
Accessibility	**10**
Ability for use on various devices Obtaining app at no charge Options for different languages	
Other	**29**
Miscellaneous opinions	

Thank you COPN!

This survey highlights issues important to people living with osteoporosis when considering acute pain management following a fracture. This will inform the development of a mobile app to support the self management of acute pain.

Acute Pain Management Post Fracture-Tools



PAINFREE

You have broken a bone. ARE YOU EXPERIENCING PAIN?

This fact sheet provides important information to help you and your family better understand and treat your pain once you leave the Emergency Department.

Why is it important for me to treat my pain?

- Treating your pain early can help improve your well-being.
- It will help you move and breathe more easily; eat and sleep better; return to your independence.
- The faster you recover, the sooner you can get back to your regular everyday activities!

How long can I expect my pain to last?

- Depending on the type of fracture you have experienced, it is possible for your pain to last between 6 weeks and 6 months.

What pain medication have I been prescribed?

- Doctors prescribe different medications for different levels of pain.
- Use the pain scale to assess your pain level and follow the guidelines below:

Pain scale

For severe pain (7-10), take:

What? Opioid (a stronger medication) such as **Dilaudid** or **Morphine** combined with **Tylenol**.
When? Regularly **every 4 hours.**

For moderate pain (4-6), take:

What? Opioid (a stronger medication) such as **Dilaudid** or **Morphine** combined with **Tylenol**.
When? Regularly **every 6-8 hours.**

For mild pain (1-3), take:

What? Acetaminophen such as **Tylenol**.
When? Regularly **every 6 hours.**

Note: If you are taking Dilaudid or Morphine, make sure that you are also taking a laxative. Ask your pharmacist or physician, he can recommend one.

Severe pain
Moderate pain
Mild pain
No pain

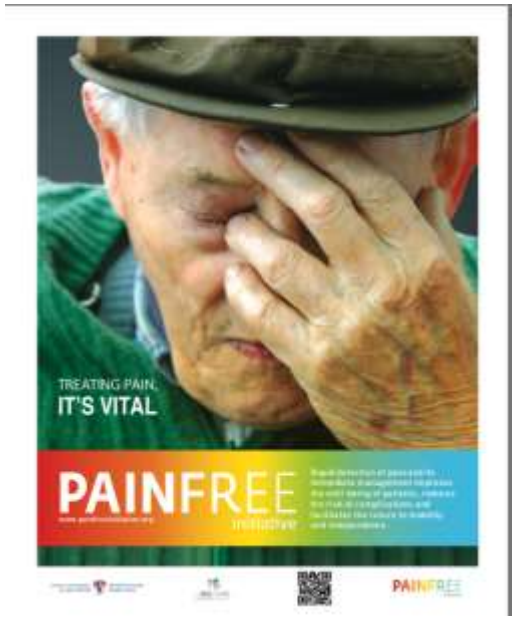
What appointment(s) should I make after leaving the Emergency Department?

- A check-up with your **family doctor**. If you do not have a family doctor, contact your **local CLSC**.
- A follow-up appointment at the **orthopedic clinic** (if applicable).

Who should I contact with important questions and/or concerns?

- **Orthopedic clinic** (if you have already been seen): Montreal General Hospital / Royal Victoria Hospital: (514) 934-8041 / Lachine Hospital: 514 634-1934 ext.77110
- Your **family doctor** or **CLSC**
- Info-santé: 8-1-1

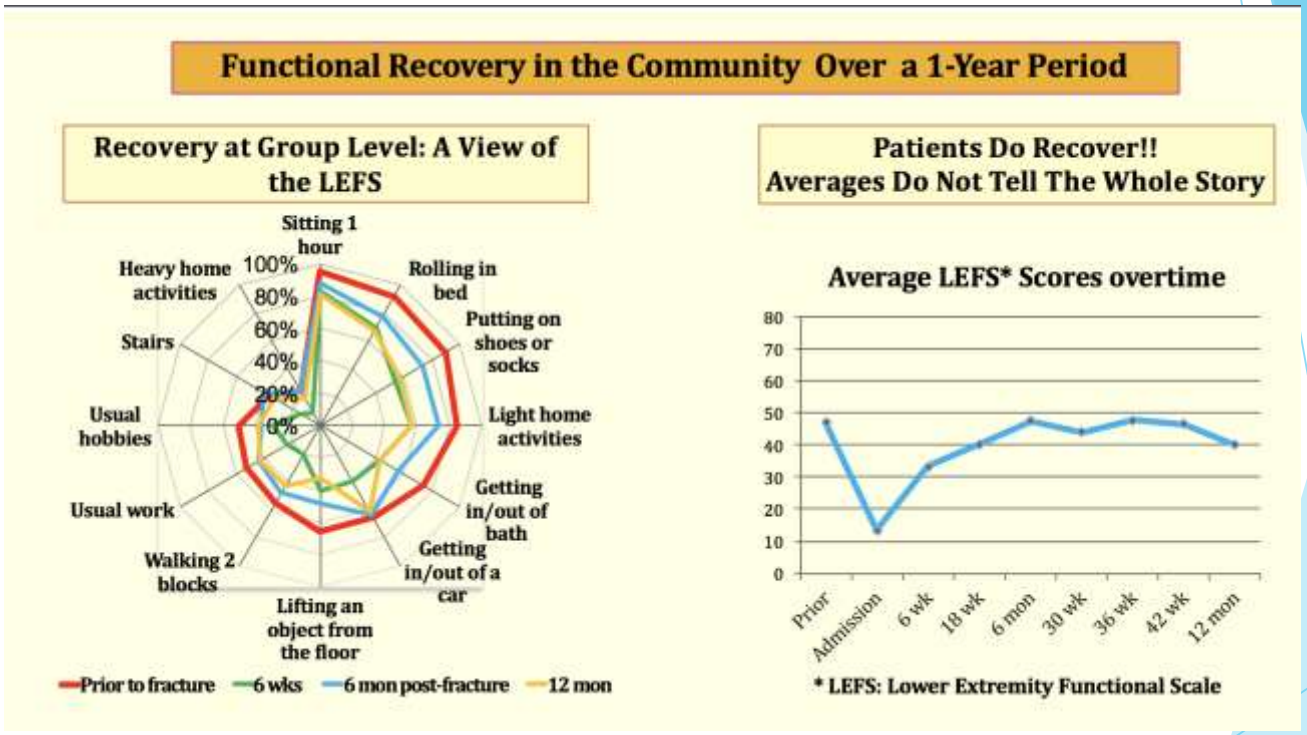
For more information, visit www.painfreeinitiative.org



What questions do you have about the safety or effectiveness of exercise or safe performance of physical activities of leisure or daily living

	Reference* N=586
How can I exercise safely?	222
Safety of specific/preferred exercises (yoga etc.)	69
What exercises to avoid	56
What exercises/classes/movements are safe to do	53
Concerns about adverse effects (including pain)	31
If I have a vertebral fracture	14
How can I exercise effectively?	145
Best/most effective exercises for my condition	88
Right frequency/duration/intensity of exercise/ strength training	57
How can I access safe and effective exercises?	116
Trained professionals	48
Make adapted exercises available online/on video/ at home	35
Community /support groups/ age specific classes	33
What are the benefits of exercise on:	72
Bone Mineral Density	23
Fracture risk	23
Balance and strength	15
Pain and quality of life improvement	11
Other	31

Functional Recovery Post Hip Fracture



Auais M et al *Arch Phys Med Rehabil.* 2018

Too Fit to Fall or Fracture

Too Fit to Fall or Fracture

Strength Training At least 2 days/week

- Exercises for legs, arms, chest, shoulders, back
- Use body weight against gravity, bands, or weights*
- 8 - 12 repetitions per exercise

Try these to get started:
- ☐ Classes at YMCA/community centre
- ☐ Consult a physical therapist/kinesiologist
- ☐ Contact Osteoporosis Canada

Squat | Wall Push Up | Seated Row

Balance Exercises Every day

- Tai Chi, dancing, walking on your toes or heels
- Have a sturdy chair, counter, or wall nearby, and try (from easier to harder): shift weight from heels to toes while standing; stand heel to toe; stand on one foot; walk on a pretend line

Stand on one foot | Heel to toe stance

Posture Awareness Every day

- Gently tuck your chin in and draw your chest up slightly
- Imagine your collarbones are wings - spread your wings slightly without pulling your shoulders back

Do | Don't

Aerobic Physical Activity At least 150 mins/week

- Bouts of 10 mins or more, moderate to vigorous intensity*
- You should feel like your heart is beating faster and you are breathing harder
- You might be able to talk while doing it, but not sing

Examples:
- ☐ Brisk walking
- ☐ Dancing
- ☐ Jogging
- ☐ Aerobics class

*If you have a spine fracture, consult a physical therapist/kinesiologist before using weights, and choose moderate, not vigorous aerobic physical activity.

Questions? Want a free physical activity booklet? Contact Osteoporosis Canada: English 1 800 463 6842 / French 1 800 977 1778 or www.osteoporosis.ca
Locate a Bone Fit™ trained instructor: English 1 800 463 6842 / French 1 800 477 1779 or www.bonefit.ca

Ontario | GERAS

Strength Training (more examples) At least 2 days/week

Other exercises include:
- Upright row
- Step up

Upright Row | Step Up

What are spine sparing strategies?

Spine sparing strategies help "spare" the spine from injury. Injuries to the spine can occur when we bend forward or twist the spine quickly or repeatedly, or if we lift something heavy, bend far forward (e.g., tying shoes) or twist the torso all the way to the side. Bending or twisting while holding a weighted object (e.g., groceries, grandchild) is also risky.
http://www.osteoporosis.ca/osteoporosis-and-you/too-fit-to-fracture/

Spine sparing strategies:
- Bend with your hips and knees, not your spine
- Turn your whole body rather than twisting your spine

Using a stool to tie shoes | Do | Don't | Step-to-turn

Goals and next steps:

The information contained in this guide is not intended to replace health professional advice. Consult your healthcare provider or a physical therapist about what exercises are right for you.

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New tricks

Confidence using current technology
Survey of 2,027 Canadians

80%
of those aged 50-64 feel confident using current technology

74%
of those aged 65+ feel confident using current technology

AGE WELL 2019, **Attitudes of Canadians 65+ and 50-64 Towards Technology, Aging and**

Benefits of technological advancements

Over 8 in 10 Canadians aged 65+

believe technological advancements can help them stay

- **SAFE**
- **INDEPENDENT**
- **IN THEIR HOMES LONGER**
- **CONNECTED TO OTHERS**

AGE WELL 2019, **Attitudes of Canadians 65+ and 50-64 Towards Technology, Aging and**

Uses of technology in health and wellness

- **7 in 10 Canadians over 50** would use the following technology for health and wellness:

- Devices that **alert for falls**
- Devices that keep them **mentally active at home**
- Devices that help them **recover at home**
- Devices that help **connect with a doctor/health care provider**
- Devices that allow them to **stay independent at home**

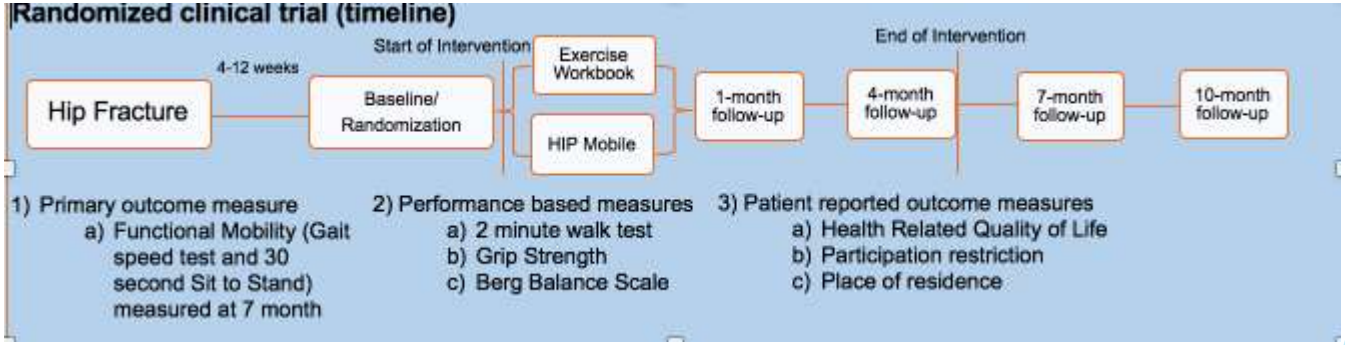
AGE WELL 2019, **Attitudes of Canadians 65+ and 50-64 Towards Technology, Aging and**

Patients with recent Fracture 3 Orthopedic Clinics (Montreal) Survey

- In a recent survey of 401 adults, ≥50 years we have documented
- 81% owned electronic mobile devices (tablet, smartphone)
- among those who had recently accessed the internet, 70% had a level of e-Health literary (eHealth literacy scale [eHEALS] with a score ≥26 indicating high eHealth literacy) sufficiently high for effective use of mobile apps

Cherid C et al submitted OI 2019

HIP Mobile



Ahmed Abou-Sharkh, 2018

Case Discussions

Key messages

- **Objectives 1 and 2**
  - Use a fracture risk assessment tool to determine fracture risk
  - Use a Muscle Function or Physical Performance Assessment test to determine fall risk
- **Objective 3**
  - Develop a management plan that includes exercise, nutrition and pharmacotherapy as required
  - Harness the environment and community resources
  - Imaginative use of technologies to monitor, guide and empower individuals to optimize MSK health