FRAX: Clinical uses, adjustments and developments

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Disclosures

• Consultant/Advisor/Speaker for:
  o Amgen, AstraZeneca, Consilient Healthcare, Fresenius Kabi, GSK, Hologic, Internis, Lilly, ObsEva, Pfizer, UCB

• Research support:
  o Including above plus Versus Arthritis, I3 Innovus, MRC, IOF, Unilever

• Financial holdings:
  o None
What is the intended use of FRAX®?

- Osteoporosis is a common disease
  - It should largely be managed in primary care.
- Experts in osteoporosis are used to integrating information derived from multiple risk factors, but
  - Most primary care physicians in many countries have little expert knowledge.
  - It is this constituency for which FRAX® is primarily designed
- To increase awareness and knowledge of osteoporosis and to initiate appropriate treatment in patients at highest risk of fracture.
Osteoporotic fracture and BMD

Siris. Surgeon General’s Workshop on Osteoporosis and Bone Health, December 2002
Femoral neck BMD and hip fracture prediction

RR/SD

Men and women

Age (years)
Risk factors for hip fracture in men and women
Welcome to FRAX®

The FRAX® tool has been developed to evaluate fracture risk of patients. It is based on individual patient models that integrate the risks associated with clinical risk factors as well as bone mineral density (BMD) at the femoral neck.

The FRAX® models have been developed from studying population-based cohorts from Europe, North America, Asia and Australia. In their most sophisticated form, the FRAX® tool is computer-driven and is available on this site. Several simplified paper versions, based on the number of risk factors are also available, and can be downloaded for office use.

The FRAX® algorithms give the 10-year probability of fracture. The output is a 10-year probability of hip fracture and the 10-year probability of a major osteoporotic fracture (clinical spine, forearm, hip or shoulder fracture).

Dr. John A Kanis
Professor Emeritus, University of Sheffield

Clarification

The University of Sheffield launched the FRAX tool in 2008. At that time the University hosted the The World Health Organisation (WHO) Collaborating Centre for Metabolic Bone Diseases (1991-2010), and the FRAX tool is based on data generated from that centre. However, FRAX

FRAX Desktop Application

Click here to view the applications available

Web Version 4.3

View Release Notes
UDI: (01)05065010474000(8012).4.3

Links

www.iobonehealth.org

www.nof.org

www.jpof.or.jp

www.esceo.org

41759760

Individuals with fracture risk assessed since 1st June 2011
Strengths and limitations of FRAX

UK NOGG Assessment and intervention thresholds
Limitations of FRAX

No dose response
- Glucocorticoids
- Smoking
- Prior fracture

Some variables not considered
- Diabetes
- Falls
- Lumbar spine BMD
- Trabecular bone score

Time dependency
- Recency of fracture
Limitations of BMD

• Does not accommodate all known risk factors
  o Age, fractures, falls, glucocorticoids, RA, biochemical markers, QUS etc.
• Lacks detail?
  o Interpretation of DXA, image quality, confounders etc.
• Depends on adequacy of epidemiological information
• Model relevant only for untreated patients?
• Does not replace clinical judgment
FRAXplus® - Beta version

Please select one of the available adjustment algorithms:

- Adjust probability according to recent fractures
- Adjust probability according to the dose of oral glucocorticoids
- Adjust probability according to TBS value
- Adjust probability according to duration of diabetes
- Adjust probability according to recent falls
- Adjust major osteoporotic fracture probability according to differences between femoral neck and lumbar spine BMD T-scores
- Adjusting FRAX hip fracture probabilities according to the hip axis length (HAL)
FRAXplus® - Beta version

In addition to FRAX score adjustments, FRAXplus® offers many helpful features accessible via 'My FRAX':

1/ User Account
   Enter and manage your personal data in order to save time when connecting in the future.

2/ Results are saved
   Your results, scores and risk variables will be saved in your personal user account for future reference and use.

3/ History / Log
   Keep track of your past tests to easily access a history of your activities and results.

4/ PDF export
   Easily export your results in a pdf file to avoid transcription errors and any loss of data.

5/ Send by email feature
   An intuitive way to share your results by email.

6/ Synchronisation between devices
   Benefit from an automatic synchronisation of your results between several devices (phone, tablet, computer, etc.)
Recency of fracture
Recurrent fractures following individual sentinel fractures

Course of recurrent fractures in men and women

Hazard ratio (compared with whole population [N=18,872])

Probability ratios for recency vary by sentinel fracture site

FRAX multiplier for MOF probability

FRAX® and FRAXplus®

Questionnaire

1. Age (between 40 and 90 years) or Date of Birth
   - 65

2. Sex
   - Female

3. Weight
   - kg 74

4. Height
   - cm 157

5. Previous Fracture
   - YES

6. Parent Fractured Hip
   - NO

7. Current Smoking
   - YES

8. Glucocorticoids
   - NO

9. Rheumatoid arthritis
   - NO

10. Secondary osteoporosis
    - NO

11. Alcohol 3 or more units/day
    - NO

12. Femoral neck BMD
   - T-score -2.1

THE TEN-YEAR PROBABILITY OF FRACTURE

- Major osteoporotic: 17%
- Hip: 5%

Adjust your results, try FRAX plus®

What does FRAX plus® do? Click here

BMD, bone mineral density; BMI, body mass index; FRAX, Fracture Risk Assessment Tool.
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Where next for FRAX?

<table>
<thead>
<tr>
<th></th>
<th>FRAX&lt;sup&gt;1&lt;/sup&gt;</th>
<th>FRAX&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
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<tbody>
<tr>
<td>Cohorts</td>
<td>9</td>
<td>64</td>
</tr>
<tr>
<td>Total</td>
<td>46,340</td>
<td>2,138,428</td>
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<tr>
<td>Person-years</td>
<td>189,852</td>
<td>≈ 20,000,000</td>
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<tr>
<td>% female</td>
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<td>69</td>
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<tr>
<td>% Europe</td>
<td>56</td>
<td>69</td>
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<tr>
<td>Hip fractures</td>
<td>850</td>
<td>42,468</td>
</tr>
<tr>
<td>Osteoporotic fractures</td>
<td>4,168</td>
<td>194,369</td>
</tr>
</tbody>
</table>

FRAX, Fracture Risk Assessment Tool.

<sup>1</sup>Kanis et al The use of clinical risk factors enhances the performance of BMD in the prediction of hip and osteoporotic fractures in men and women. (2007) Osteoporos Int 18:1033-1046

<sup>2</sup>Vandenput et al. Update of the fracture risk prediction tool FRAX: A systematic review of potential cohorts and analysis plan. (2022) Osteoporos Int (under review)
Summary

• FRAX has become an established clinical tool, widely used in the assessment of fracture risk and treatment decisions

• Similar to all such clinical tools, FRAX has limitations that are well recognised

• Modification of existing risk factors is possible, though the level of evidence is lower (currently) than for FRAX itself

• The next generation of FRAX, including novel and updated existing risk factors, is being developed