“Clinical Relevance and Detection of Vertebral Fractures”
### Disclosures:
**Willem F. Lems**

<table>
<thead>
<tr>
<th>Speaking Fees/Advisory Boards</th>
<th>Amgen, Eli Lilly, Merck, UCB, Novartis, Curaphar, Servier, Will Pharma, Abbott, Pfizer, Roche.</th>
</tr>
</thead>
</table>
Learning Objectives

• To realise the clinical relevance of detecting vertebral fractures in your patients;
• To know how to diagnose vertebral fractures in your patients;

And:

• If you have access to Vertebral Fracture Assessment (VFA), to realise that in all patients in which a DXA is indicated, also a VFA is indicated.
CAPTURE THE FRACTURE®

• A global flagship programme by the International Osteoporosis Foundation (IOF)

• Launched in 2012

• **Mission**: facilitating the implementation of FLS to prevent secondary fractures
CTF STEERING COMMITTEE MEMBERS

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Prof. Willem Lems
VU University medical centre, The Netherlands

Dr. Donncha O’Gradaigh
Waterford Hospital, Ireland
Why Fracture Liaison Services?

High incidence fragility Fx

8.9 million fragility Fx/yr (1.6 million for hip)

2050: 6.3 million/yr hip Fx incidence alone

Care gap

80% Fx patients not screened & treated

Global health and economic burden

Direct cost >110Bn/yr by 2025 in the EU, US and China

FLS is a clinically and cost-effective model of care to prevent secondary fractures
### KEY AIMS

<table>
<thead>
<tr>
<th>Aim</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be the global voice</td>
<td></td>
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<tr>
<td>Drive national/international policy</td>
<td></td>
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<tr>
<td>Ensure quality</td>
<td></td>
</tr>
<tr>
<td>Provide support for FLS implementation, getting started &amp; improving</td>
<td></td>
</tr>
<tr>
<td>&amp; sustaining</td>
<td></td>
</tr>
</tbody>
</table>
Ensuring Quality

How do we evaluate the effectiveness of an FLS?
→ By creating standards
AIM:

1. Set the standard for FLS (13 criteria)

2. Guidance

3. Benchmarking and quality improvement

DOWNLOAD THE BPF

Download the Capture the Fracture Best Practice Framework in the following languages:

- Chinese (traditional)
- Chinese (simplified)
- English
- French
- German
- Italian
- Japanese
- Russian
- Slovak
- Spanish
- Polish
# 13 Criteria and Standards

| 1. Patient Identification |  
| 2. Patient Evaluation |  
| 3. Post Fracture Assessment Timing |  
| 4. Vertebral Fracture (VF) ID |  
| 5. Assessment Guidelines |  
| 6. Secondary Causes of OP |  
| 7. Falls Prevention Services |  
| 8. Multifaceted Assessment |  
| 9. Medication Initiation |  
| 10. Medication Review |  
| 11. Communication Strategy |  
| 12. Long-term Management |  
| 13. Database |  

**Standard 1 definition:**
Fracture patients are identified to enable delivery of secondary fracture prevention

<table>
<thead>
<tr>
<th>Standard</th>
<th>Bronze</th>
<th>Silver</th>
<th>Gold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Identification</td>
<td>Patients identified, not tracked</td>
<td>Patients identified, are tracked</td>
<td>Patients identified, tracked &amp; independently reviewed</td>
</tr>
</tbody>
</table>
SCORING: 5 domains
### Best Practice Framework Standards

#### 4. Vertebral Fracture Identification

Institution has a system whereby patients with previously unrecognized vertebral fractures are identified and undergo secondary fracture prevention evaluation.

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with <strong>clinical vertebral fractures</strong> undergo assessment and/or receive treatment for prevention of secondary fractures.</td>
<td>Patients with <strong>non-vertebral fractures</strong> routinely undergo assessment with lateral vertebral morphometry by DXA (or possibly by plain spine radiology) to assess for vertebral fractures.</td>
<td>Patients <strong>reported by the Institution’s Radiologists</strong> to have vertebral fractures on plain X-rays, CT &amp; MRI scans (whether these are serendipitous or not) are identified by the FLS in order that they undergo assessment for treatment for prevention of secondary fractures.</td>
</tr>
</tbody>
</table>

Source: Akeson K, et al Osteo Int 2013

[www.capturethefracture.org](http://www.capturethefracture.org)

[International Osteoporosis Foundation](http://www.iof.net)
308 FLS, 39 countries, 6 continents

FLS in S. America = 36
FLS in N. America = 37
FLS in Europe = 173
FLS in MENA region = 7
FLS in APAC region = 55
The Process

Step 1
FLS submits online application

Step 2
FLS marked in green on the map while being reviewed

Step 3
BPF achievement level assigned

Step 4
FLS is scored and recognized on the map

https://youtu.be/gpAAvvukjQw
Step 2: FLS marked in green on the map while being reviewed
Running an FLS?

Join the Capture the Fracture® Programme

Why join?

• Showcase your achievements
• Learn from the BPF to improve your service
• Get international recognition with a Gold, Silver, or Bronze star
• Be part of a global initiative to prevent secondary fractures

Who can participate?

• Coordinator-based models of care
• All type of facilities
• At any stage in development
• Any size worldwide
Steps 3+4: FLS is scored and recognized on the map.
Learning Objectives

• To realise the clinical relevance of detecting vertebral fractures in your patients;
• To know how to diagnose vertebral fractures in your patients;
• And:
• If you have access to Vertebral Fracture Assessment (VFA), to realise that in all patients in which a DXA is indicated, also a VFA is indicated.
• 3 Clinical Cases;
• Epidemiology of Vertebral Fractures, why are vertebral fractures so often missed?
• Clinical Relevance of Detecting Vertebral Fractures.
• How to detect Vertebral Fractures easily and reliably in patients at high risk for subsequent fractures? Pitfalls in detecting Vertebral Fractures, Strength/weakness of VFA.
• Discussion on the statement that “in each patient in which a DXA is indicated, also a VFA is indicated”
• Questions.
Key Question: how to prevent secondary fractures in patients 50 years and over with a recent fracture?
Perspective | Free Access

Making the first fracture the last fracture: ASBMR task force report on secondary fracture prevention

John A Elsman, Earl R Bogoch, Rick Dell, J Timothy Harrington, Ross E McKinney Jr., Alastair McEllan, Paul J Mitchell, Stuart Silverman, Rick Singleton, Ethel Siris. ... See all authors

First published: 26 July 2012 | https://doi.org/10.1002/jbmr.1698 | Cited by: 144

Capture the Fracture: A Best Practice Framework and global campaign to break the fragility fracture cycle


Author information | Article notes | Copyright and License information | Disclaimer

Recommendation

EULAR/EFORT recommendations for management of patients older than 50 years with a fragility fracture and prevention of subsequent fractures


Case 1: how to prevent secondary fractures in patients 50 years and over with a recent fracture?

A DXA is indicated, but also a VFA??
(Vertebral Fracture Assessment)
Case 2: 65-year old lady, with a upper arm fracture (1).

- Traffic accident, BMI 24, no other diseases/drugs

- T score lumbar spine -1.7 and total hip -1.9.

- It is reasonable to conclude osteopenia, and to suggest a healthy life-style (adequate calcium, vitamin D, exercise), but no start of anti-osteoporotic drug treatment (usually bisphosphonates);
Case 2: 65-year old lady, with a upper arm fracture (2).

- Traffic accident, BMI 24, no other diseases/drugs
- T score lumbar spine -1.7 and total hip -1.9.

Suppose that 2 vertebral fractures were found: that increases her subsequent fracture risk;
It reasonable to start with anti-osteoporotic drugs, usually a bisphosphonate (in addition to a more healthy life style)
Case 3: A 72-year old lady has severe backpain, after lifting a heavy bag

• She has been treated with alendronate for 4 years, her initial DXA showed a hip T-score of -3.1;
• Now a vertebral fracture was diagnosed with 30% height loss;

• Is it a new vertebral (incident) fracture during therapy (failure of therapy?), or is it an old (prevalent) fracture (no failure of therapy)

• For these cases, it is very helpful when an initial DXA was accompanied by an initial VFA.
Definition of osteoporosis

A disease characterized by low bone mass and micro-architectural deterioration of bone tissue leading to reduced bone strength and a consequent increase in fracture risk.

• 3 Clinical cases;
• Epidemiology of Vertebral Fractures, why are vertebral fractures so often missed?
• Clinical Relevance of Detecting Vertebral Fractures.
• How to detect Vertebral Fractures easily and reliably in patients at high risk for subsequent fractures? Pitfalls in detecting Vertebral Fractures, Strength/weakness of VFA.
• Discussion on the statement that “in each patient in which a DXA is indicated, also a VFA is indicated”
• Questions.
Vertebral Fractures are by far the most common fractures!
<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoporotic fracture</td>
<td>46-53%</td>
<td>21-22%</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>15-23%</td>
<td>5-11%</td>
</tr>
<tr>
<td>Radiographic vertebral fracture</td>
<td>27%</td>
<td>11%</td>
</tr>
<tr>
<td>Clinical vertebral fracture</td>
<td>15%</td>
<td>8%</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>10-13%</td>
<td></td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>9-11%</td>
<td></td>
</tr>
</tbody>
</table>

NB: variable between countries

Annual incidence in the United States - both sexes all ages

Comparison of osteoporotic fractures with other common diseases

- Osteoporotic Fractures:
  - Hip: 300,000
  - Forearm: 400,000
  - Other sites: 800,000
  - Vertebral fractures (by X-ray): 550,000

- Heart Attack: 1,255,000
- Stroke: 795,000
- Breast Cancer: 186,500

References:
- Burge R et al. (2007) JBMR 22(3): 465

International Osteoporosis Foundation
www.iofbonehealth.org
Vertebral shapes and grading

Shape
- N (Normal)
- EP (Endplate)
- W (Wedge)
- C (Crush)

These changes in shape are often combined.

% change in shape
- Grade 1: ~20-25%
- Grade 2: ~26-40%
- Grade 3: ~40% +

The higher the grade of fracture the higher the risk of future fracture.
Semi-quantitative visual grading of vertebral fractures

Grade 0: normal, non-fractured vertebra

Grade 1: mild fracture with approximately 20-25% reduction in anterior, middle and posterior relative to the same or adjacent vertebrae.

Grade 2: moderate fracture with approximately 25-40% reduction in anterior, middle and posterior relative to the same or adjacent vertebrae.

Grade 3: severe fracture with approximately >40% reduction in anterior, middle and posterior relative to the same or adjacent vertebrae.
Why are vertebral fractures so often missed?

- Diagnosing vertebral fractures is more difficult than nonvertebral fractures, because they are often NOT related to trauma;
- Vertebral fractures are often overlooked at radiographs;
- The diagnosis vertebral fracture can be overruled by another diagnosis;
- Missing the clinical relevance of diagnosing vertebral fractures;

Why are vertebral fractures so often missed?

- Diagnosing vertebral fractures is more difficult than nonvertebral fractures, because they are often NOT related to trauma;
- Vertebral fractures are often overlooked at radiographs;
- The diagnosis vertebral fracture can be overruled by another diagnosis;
- Missing the clinical relevance of diagnosing vertebral fractures;
- Only 1/3 are symptomatic (= patients are searching for pain relief by their physician), 2 out of 3 vertebral fractures are regarded as “asymptomatic”

Vertebral fractures are often not recognized!

Only 1 out of 5 vertebral fractures are adequately diagnosed and treated!

n=934 women >60 years old

Gehlbach et al, Osteoporos Int 2000; 11: 577-582
Under-diagnosed vertebral fractures

934 hospitalised women with a lateral chest X-ray

- Fracture identified by study radiologists: 132
- Fracture noted in radiology report: 65
- Fracture noted in medical record: 23
- Received osteoporosis treatment: 25

459 elderly patients

- Fracture identified by study radiologists: 72
- Fracture noted in radiology report: 43
- Received osteoporosis treatment: 18

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1 Gehlbach SH et al. (2000) Osteoporos Int 11: 577
2 Majumdar SR et al. (2005) Arch Intern Med 165: 905
Why are vertebral fractures so often missed?

- Mrs L., 77 years old
- Presented with left lower lobe pneumonia
  - Height loss of 4cm
  - Maternal hip fracture
  - Regular use of psychotropic drugs
    - Chest x-ray reveals vertebral Fractures T6-8
      - BMD T score –2.8 SD at hip.
Is Physical Examination Useful in diagnosing Vertebral Fractures?

- Comparing actual height with height at peak bone age might be very informative!

- 3-5 cm height loss or more might be highly suggestive for vertebral

- (NB Height loss in osteoporotic patients can be up to 10-15 cm!)
Vertebral versus nonvertebral fractures, clinical characteristics

- **Vertebral Fracture:**
  - May occur without trauma; during daily activities;
  - Painful in 1 out of 3, majority “asymptomatic”;
  - Gradual;
  - May worsen at same location;
  - Height loss.

- **Peripheral Fracture:**
  - Nearly always direct after trauma;
  - Severe pain;
  - All or none;
  - Usually not at same location;
  - No deformity.
Vertebral versus nonvertebral fractures, clinical characteristics

- **Vertebral Fracture:**
  - May occur without trauma; during daily activities;
  - Painful in 1 out of 3, majority “asymptomatic”;
  - Gradual;
  - May worsen at same location;
  - Height loss.

- **Peripheral Fracture:**
  - Nearly always direct after trauma;
  - Severe pain;
  - All or none;
  - No deformity.

*Diagnosing a vertebral fracture is more difficult than diagnosing a peripheral fracture!*
Treatment for Symptomatic Osteoporotic Vertebral Fractures (1)

• Acute Phase:
   Bed rest in patients with severe pain
   Analgesics such as paracetamol, avoid NSAIDs, morphines.
   Eventually low dose paracetamol and low dose tramadol.
   Start physical therapy as early as possible
• Non-pharmacological prevention of future fractures: adequate supply of calcium and vitamin D. Exercises, and stop smoking/limit alcohol intake

• Start with anti-osteoporotic drugs, usually an oral bisphosphonate (alendronate, risedronate) or zoledronic acid (iv)/denosumab sc. Usually drug-treatment for 5 years (or more)
Suppose, your (elderly) patient has back pain and a vertebral deformity. Can you list 4 categories of differential diagnosis and some clues or characteristics of the other 4 listed in the differential diagnosis?

❖ Osteoporotic Fracture
❖ .............................................
❖ .............................................
❖ .............................................
❖ .............................................
Suppose, your (elderly) patient has back pain and a vertebral deformity. Can you list 4 categories of differential diagnosis and some clues or characteristics of the other 4 listed in the differential diagnosis?

❖ Osteoporotic Fracture
❖ Non-specific musculoskeletal back pain
❖ Cancer: Multiple myeloma or Metastasis
❖ Infection: Osteomyelitis
❖ Inflammatory Back Pain (Spondyloarthritis)
• 3 Clinical Cases;
• Epidemiology of Vertebral Fractures, why are vertebral fractures so often missed?
• **Clinical Relevance of Detecting Vertebral Fractures.**
• How to detect Vertebral Fractures easily and reliably in patients at high risk for subsequent fractures? Pitfalls in detecting Vertebral Fractures, Strength/weakness of VFA.
• Discussion on the statement that “in each patient in which a DXA is indicated, also a VFA is indicated”
• Questions.
Similar mortality in patients with vertebral fractures and in those with hip fractures

Adapted from Bliuc D et al. (2009) JAMA 301(5): 513
Relative risk of death following clinical osteoporotic fractures

Fracture Intervention Trial (FIT)*

*6459 postmenopausal women ages 55-81 years followed for an average of 3.8 years

Adapted from Cauley JA et al. (2000) Osteoporos Int 11: 556
Mortality rate increases with the number of prevalent vertebral fractures

![Bar graph showing mortality rate per 1000 person-years by number of prevalent vertebral fractures.](image)

- P for trend < 0.001

Adapted from Kado DM et al. (1999) Arch Intern Med 159: 1215
Quality of life decreases with age and with number of vertebral fractures

Mean QUALEFFO total score

Age >71
Age 65–71
Age <65

No fracture  1 fracture  2 fractures  ≥3 fractures

*Age p = 0.020
*Fracture p < 0.001

Oleksik, Lips et al,
Prevalent Vertebral Fractures reduce “Health-Related Quality Of Life” (HRQOL)

![Graph showing mean OPAQ scores for physical function, emotional status, complaints, and total HRQOL across different numbers of vertebral fractures.]

Days with Back Pain, SOF-study. N=9700, 4 years observation

Days with Limited Activity, SOF-study, n=9700, 4 years observation

Consequences of vertebral fractures

- Kyphosis
- Loss of height
- Bulging abdomen
- Acute and chronic back pain
- Breathing difficulties
- Depression
- Reflux and other GI symptoms
- Difficulty with activity of daily living (bending, rising, dressing, climbing stairs)
- Need to use a walking aid

Reduced independence and quality of life
Prior vertebral fracture increases the risk of subsequent vertebral fracture

Adapted from Lindsay R et al. (2001) JAMA 285(3): 320
Deterioration of bone strength

1 in 5 postmenopausal women who have an incident vertebral fracture, fracture again within a year

Lindsay et al.  JAMA 285: 320-23 (2001)
Prior fracture increases the risk for future vertebral fracture, independent of BMD

Risk of vertebral fractures (% per year)

Fracture

- Low: 5.8
- Middle: 3.4
- High: 2.3

No Fracture

- Low: 1.7
- Middle: 1.0
- High: 0.2

BMD Tertiles

- Low
- Middle
- High

Adapted from Ross et al. (1991) Ann Int Med 114(11): 919
Relative Risk for Future Fractures in patients with a prevalent vertebral deformity (corrected for age and BMD)

Study of Osteoporotic Fractures, Black et al, J Bone Min Res 1999: 821-828
Relative Risk for Subsequent Fractures, related to Number of Prevalent Vertebral fractures

SOF, Black et al, J Bone Min Res 1999: 821-828
Relative Risk for subsequent Vertebral fractures, related to Severity of Prevalent Vertebral Fractures

SOF, Black et al, J Bone Min Res 1999: 821-828
Vertebral fractures increase the risk for hip fractures over 3-4 years

<table>
<thead>
<tr>
<th></th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melton '99</td>
<td>2</td>
</tr>
<tr>
<td>Gunnes '98</td>
<td>2.5</td>
</tr>
<tr>
<td>Black '99</td>
<td>3</td>
</tr>
<tr>
<td>Ismail '01</td>
<td>4</td>
</tr>
</tbody>
</table>


- **Clinically diagnosed vertebral fracture**
- **Radiologically diagnosed vertebral fracture**
• 3 Clinical Cases
• Epidemiology of Vertebral Fractures, why are vertebral fractures so often missed?
• Clinical Relevance of Detecting Vertebral Fractures.
• How to detect Vertebral Fractures easily and reliably in patients at high risk for subsequent fractures? Pitfalls in detecting Vertebral Fractures, Strength/weakness of VFA.
• Discussion on the statement that “in each patient in which a DXA is indicated, also a VFA is indicated”
• Questions.
Dual-energy X-ray Absorptiometry (DXA)

T-score
• >-1: normal
• -1,-2.5: osteopenia
• <-2.5: osteoporosis
Examples of SQ vertebral fractures

Grade 0
Normal

Grade 1
Mild

Grade 2
Moderate

Grade 3
Severe
SQ mild fractures
Loss of contiguity and parallelism of adjacent endplates
SQ incident moderate fracture
SQ incident
severe & moderate fractures
Modern DXA-machines are capable to detect Vertebral Fractures (Vertebral Fracture Assessment)
Vertebral Fracture Assessment (VFA)

Definition

- Use of fan beam densitometry to image the lateral and AP thoraco-lumbar spine for prevalent and incident vertebral fractures
New Technique: Vertebral Fracture Assessment (VFA) with a DXA machine

<table>
<thead>
<tr>
<th>Label</th>
<th>Height (mm)</th>
<th>Percent Deformation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Post</td>
<td>Mid</td>
</tr>
<tr>
<td>T6</td>
<td>19.5</td>
<td>19.0</td>
</tr>
<tr>
<td>T7</td>
<td>22.6</td>
<td>18.7</td>
</tr>
<tr>
<td>T8</td>
<td>23.1</td>
<td>20.7</td>
</tr>
<tr>
<td>T9</td>
<td>22.4</td>
<td>20.9</td>
</tr>
<tr>
<td>T10</td>
<td>24.3</td>
<td>22.7</td>
</tr>
<tr>
<td>T11</td>
<td>25.7</td>
<td>23.9</td>
</tr>
<tr>
<td>T12</td>
<td>25.0</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td>L1</td>
<td>30.6</td>
</tr>
<tr>
<td></td>
<td>L2</td>
<td>32.8</td>
</tr>
<tr>
<td></td>
<td>L3</td>
<td>31.6</td>
</tr>
<tr>
<td></td>
<td>L4</td>
<td>26.6</td>
</tr>
</tbody>
</table>
How does VFA compare to standard lateral spine radiography?
Comparison of X-ray and VFA

<table>
<thead>
<tr>
<th></th>
<th>X-ray</th>
<th>VFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiation dose</td>
<td>600 μSv</td>
<td>3 - 40 μSv</td>
</tr>
<tr>
<td>Access</td>
<td>Separate visit</td>
<td>Point of service</td>
</tr>
<tr>
<td>Cost</td>
<td>Higher ($92*)</td>
<td>Lower ($45*)</td>
</tr>
<tr>
<td>Obliquity</td>
<td>Common in LS</td>
<td>Less parallax effect</td>
</tr>
<tr>
<td>Resolution</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Visualization</td>
<td>Superior above T7</td>
<td>May be superior in LS</td>
</tr>
</tbody>
</table>

* Medicare reimbursement; Sv = Sievert, LS = Lumbar Spine

Adapted from the ISCD VFA Course 2009
Limitations of VFA

• Lower resolution than X-ray
  – Can be more difficult to differentiate etiologies for vertebral deformities other than fracture

• Poor visualization above T7
  – T7 and below - 97% visualized\(^1\)
  – T6 - 70%\(^2\)
  – T5 - 60%\(^2\)
  – T4 - 43%\(^2\)

\(^1\)Rea JA et al. (1998) Osteoporos Int 8(2):177
Prevalence of vertebral fractures on VFA and spine radiographs

Adapted from Hospers IC et al. (2009) Radiology 251(3): 822-828
Incident T4 to T6 fractures are not common

Incident fractures:
6.3 years,
Rotterdam study
240 new fractures
in 176 of 3469 persons

Adapted from van der Klift M et al. (2002) J Bone Miner Res 6: 1051
Grade 1 fractures: more difficult to identify

Of 22 grade 1 compression fractures present in evaluable vertebral bodies, 11 (50%) were detected by LVA (VFA)

Adapted from Binkley N et al. (2005) Osteoporos Int 16:1513
Accuracy of VFA vs. standard radiography (per vertebra analyses)

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture Grades 1-3</td>
<td>53% - 70%</td>
<td>94% - 99%</td>
</tr>
<tr>
<td>Fracture Grades 2-3</td>
<td>57% - 95%</td>
<td>96% - 99%</td>
</tr>
</tbody>
</table>

- Those patients with unevaluable vertebrae on VFA or moderate to severe scoliosis excluded

Improved VFA technology

All but one of the studies comparing VFA and standard radiography used older technology

Hospers, IC et al. (2009) Radiology 251(3): 822-828

- Agreement between VFA vs Genant SQ radiography (grades 1-3): kappa = 0.83
- Agreement between VFA vs qualitative radiography (grades 1-3): kappa = 0.82
Changes in VFA technology: newer (A) vs. older (B)
Vertebral deformities that are not osteoporotic fractures

- Normal anatomic variants
- Congenital anomaly
- Degenerative disease – disc space narrowing
- Infection – TB, osteomyelitis
- Paget’s disease
- Scheuermann’s disease (+/- Schmorl’s Nodes)
- Malignancy
- Short vertebral height without any endplate depression or cortical break?
Degenerative remodeling and hypertrophy causing elongation and wedging of vertebra – mimics fracture
Non-fracture abnormality

Schmorl’s nodes
Here associated with vertebral fractures

Schmorl’s nodes are herniations of the intervertebral disc through the vertebral end-plate
“in every patient that is visiting an FLS in which a DXA is made, also a VFA should be done”, how to interprete the VFA? (1)

“Since the specificity of VFA is very high, a completely normal VFA more or less rules out a vertebral fracture”. 
“in every patient that is visiting an FLS in which a DXA is made, also a VFA should be done”, how to interpret the VFA? (2)

- In Clinical Trials, a height loss of 20% is regarded as a vertebral fracture;

- In Clinical Practice: because of the low sensitivity, the threshold for starting anti-osteoporotic treatment based on VFA is higher, e.g. one severe deformity (>40% height loss), or 2 or more moderate deformities (25-40% height loss);

- When there is doubt about the presence or absence of a vertebral fracture in a patient in which that influences starting with anti-osteoporotic treatment or not, conventional X-rays of the spine should be performed.
• 3 Clinical Cases
• Epidemiology of Vertebral Fractures, why are vertebral fractures so often missed?
• Clinical Relevance of Detecting Vertebral Fractures.
• How to detect Vertebral Fractures easily and reliably in patients at high risk for subsequent fractures? Pitfalls in detecting Vertebral Fractures, Strength/weakness of VFA.
• Discussion on the statement that “in each patient in which a DXA is indicated, also a VFA is indicated”
• Questions.
Effect of implementation of guidelines on assessment and diagnosis of vertebral fractures in patients older than 50 years with a recent non-vertebral fracture

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Figure 4 Percentage of patients with ≥1 newly diagnosed vertebral fracture according to baseline fracture (only patients after implementation of VFA)

<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>% of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td>18.2%</td>
</tr>
<tr>
<td>Major</td>
<td>21.5%</td>
</tr>
<tr>
<td>Minor</td>
<td>12.2%</td>
</tr>
</tbody>
</table>
Figure 2 Percentage of patients with ≥1 newly diagnosed vertebral fracture (≥ grade 2) according to BMD

- Normal BMD: 12.1%
- Osteopenia: 13.6%
- Osteoporosis: 17.7%
Figure 3 Clinical implication in patients with osteopenia

In 13.2% of patients with osteopenia indication for therapy in the Netherlands
Worldwide, a substantial percentage of vertebral fractures are not diagnosed by radiologists or clinicians\(^1\)

It is likely that this contributes to unnecessary pain and suffering and to the under treatment of osteoporosis

Identification of patients with a vertebral fracture is important because the presence of prevalent fracture greatly increases the risk of future fracture

Recent widespread approval of effective treatments for patients with osteoporotic vertebral fractures

\(^1\) Delmas PD et al. (2005) JBM R 20: 557-563
“In each patient in which a DXA is indicated, also a VFA is indicated”

• Diagnosing one or more vertebral fractures in a patient with osteopenia increases the subsequent fracture risk, and that may be crucial for starting anti-osteoporotic treatment or not;

• Having a baseline VFA, offers the opportunity to discriminate between incident fractures and prevalent fractures. This is clinically relevant, since incident fractures might indicate treatment failure, while prevalent fractures do not.
Learning Points Vertebral Fractures

- Recognize the signs and symptoms of an vertebral fracture;
- Be aware of the high prevalence of vertebral fractures and its risk factors;
- Diagnose a vertebral fracture efficiently;
- Know about symptomatic treatment options in the acute phase;
- Realise that prevention of subsequent fractures is crucial.

- Vertebral fracture with VFA can be diagnosed in patients in which a DXA is indicated and performed.
Thank you
THANK YOU

AMGEN

Inspired by patients.
Driven by science.
On behalf of IOF and CTF SteerCo, we thank you for your participation in this webinar.

If you have any additional questions or comments please email mfujita@iofbonehealth.org.
“In patients visiting an FLS, not only a DXA is indicated, but also a VFA (vertebral fracture assessment)”. 

You can ask your questions Now!, or later at wf.lems@vumc.nl 

Thank you for your attention!
Q & A
Q1: Is there an standardized way to report VFA findings that you could recommend to us?

• Good question. Unfortunately, radiologists often report either “some height loss”, or only “height loss”. I strongly advocate that radiologists also quantify and report the amount of height loss: Th8 has a height loss of 22% and TH10 of 41%, that really helps clinicians. In this example, the fracture of Th8 is mild according to Genant, but the fracture of Th10 is severe, and can be an indication for treatment (in a patient with BMD in osteopenic range)
Q2: in your opinion: What are the issues behind DXA+VFA reimbursement?

- That differs from country to country. Although I am not an expert in costs, costs are certainly an issue. In US there is the so-called crisis in osteoporosis: underdiagnosis and undertreatment. The reimbursement for DXA is going down to only around 35 dollar; I can understand that also performing VFA and reporting VFA for 35 dollar can be limited. This is one of the reasons for crisis in osteoporosis in US.

- In many other countries, among them the Netherlands, the reimbursement is above 100 Euro, it is more easy to perform both a DXA and VFA. Additionally, performing a VFA is also incorporated in our Dutch recommendations: only performing a DXA is suboptimal diagnostics.
Q3: The more VFA we perform, the higher number of osteopenic patients with vertebral fractures: How do you consider the best way to spread the need (among physicians) of performing more VFA tests in Osteopenic & Osteoporotic patients?

- **Key question.** My answer is very clear: in all individuals in which there is an indication for a DXA, because of an earlier fracture, or in patients with risk factors, or in prednisone users, always do a VFA in addition to DXA.
Q4: How does an FLS improve diagnosis, management and treatment of VF patients?

- Excellent question. I suppose that in all your patients with a recent fracture at FLS, a DXA is performed. My statement that you should also perform a VFA in these patients. If not available, you should buy not a new machine, but only some additional software, which is not very costly. The two most important advantages are that:
  - you can diagnosis vertebral fractures in patients with osteopenia (which differs from no indication for treatment because of osteopenia to start anti-osteoporotic treatment because of vertebral fractures). In my lecture, I showed in Maastricht that occurs in 13.2% of their FLS patients
  - you can later in the course of the disease differentiate between a new incident (treatment failure?) and an already existing prevalent fracture (=no treatment failure), when you find a vertebral fracture, because you have a baseline value.
Q5:) If you do not have access to DXA due to resource limitation, nor VFA. What do you recommend? CT and MRI?

- A good question, in fact two questions.
- One answer is conventional radiographs. Conventional radiographs are gold standard for detecting vertebral fractures, and thus even better than VFA. However, they are limited by the higher costs and the radioactivity. In patients in which you know their length at peak bone loss, you can measure their actual length: if it is 3-5 cm or more it is highly likely that the patient has vertebral fractures. CT and MRI are very expensive, we only use that when there is doubt whether it is an osteoporotic fracture or another disease eg a malignancy.
- If you do not have access to DXA, you have clinical risk factors like age and BMI, and the best you can do in that situation is a FRAX score without BMD.