Vertebral Fracture Identification & Management Pathways

Jill Griffin DCR (R)

Clinical Lead Quality Improvement Royal Osteoporosis Society
Vertebral fracture identification

Learning outcomes

• Understand the importance of vertebral fracture in onward outcomes for patients
• Understand challenges in identifying vertebral fracture in imaging
• Deciphering the radiology report
• Best practice for secondary fracture prevention

Email: Jill.Giffin@theros.org.uk
Summary

• The trouble with vertebral fractures:
• Associated with increased mortality, morbidity, and costs of healthcare and treatment
• Increase risk of subsequent fracture
• Identification is problematic and suboptimal-
• Opportunities missed
Why?

- **only 30% come to medical attention**
- Only a minority result from falls
- Often asymptomatic
- Symptoms often attributed to other causes by patients and healthcare professionals
- Routine imaging is discouraged for ‘back pain’
Vertebral fracture identification pathway

1. Patient presents with symptoms that suggest vertebral fracture
   - Clinically appropriate spine imaging obtained (radiograph, MRI or CT)

2. Patient has investigation for another indication
   - Lateral spine is evaluated routinely by reporting clinician in all imaging that includes the thoracic and/or lumbar spine

3. Patient attends for axial DXA
   - Where indicated, VFA is performed at time of DXA

Vertebral fracture identified
Gap analysis
**Challenge to Opportunity**

- Secondary fracture prevention works...
  - Fracture Liaison/ investigation, treatment and follow-up- prevents further fracture

Glasgow FLS 2000-2010

<table>
<thead>
<tr>
<th>Patients with fragility fracture assessed</th>
<th>50,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip fracture rates</td>
<td>-7.3%</td>
</tr>
<tr>
<td>England hip fracture rates</td>
<td>+ 17%</td>
</tr>
</tbody>
</table>

Secondary fracture prevention - functions of an FLS service

- Identify people with fragility fractures
- Investigate causes and risks (osteoporosis, fracture and falls)
- Intervene - treatment and management plan
- Follow up
Secondary fracture prevention functions of an FLS service

• Identify people with fragility fractures
• Investigate causes and risks (osteoporosis, fracture and falls)
• Intervene - treatment and management plan
• Follow up

QUALITY Integration & communication
Challenges and opportunities

• **Opportunities to find the 70%**
  • In diagnostic imaging
    • Clinical importance of VF poorly understood
    • Imaging for other indications not routinely scrutinised for incidental vertebral findings
    • Reporting terminology for VF ambiguous
    • Lack of pathways for further assessment
Clinical guidance for the effective identification of vertebral fractures
Every vertebral fracture accounts for **14 additional GP visits** in the year after fracture.16

Vertebral fractures are associated with an **8-fold increase** in age-adjusted mortality.17

The 5 IQ approach to quality in fracture prevention

1. Identify
2. Investigate
3. Inform
4. Intervene
5. Integrate
The Guidance

• Seek vertebral fractures apparent on any imaging that includes the thoracic and/or lumbar spine
• Report vertebral fractures clearly and unambiguously
• Alert the referring clinician to the need for further assessment of fracture risk, via FLS where available
Finding Vertebral fractures via imaging reports

1. Patient presents with symptoms that suggest vertebral fracture
2. Patient has investigation for another indication
3. Patient attends for axial DXA

Clinically appropriate spine imaging obtained (radiograph, MRI or CT)

Lateral spine is evaluated routinely by reporting clinician in all imaging that includes the thoracic and/or lumbar spine

Vertebral fracture identified

Where indicated, VFA is performed at time of DXA
When there are imaging findings that constitute a medical emergency or a significant unexpected finding, reporters should comply with local mechanisms to alert referrers.
The Guidance: Seek VFx

Q1. RCR Reporting standard 6: Are incidental vertebral fractures a significant unexpected finding?
The Guidance: Seek VFx

Are incidental vertebral fractures a significant unexpected finding?

- Yes
- No
Challenges and Opportunities

• Clinical importance poorly understood

‘We do not routinely report wedge fractures as incidental or alert findings because they won’t be treated’

‘Osteoporosis (and fracture) is a normal aging process’

‘I report on the primary question asked in the referral’
The Guidance: Report VFx

Report vertebral fractures clearly and unambiguously

• Comment on the spine

• Describe vertebral bodies as:
  • **Vertebral fracture**
  • Non fracture deformity
  • Normal
The Guidance: Alert

Alert the referring clinician the need for further assessment

• Use of failsafe alert system

• Agreed protocol and pathway
2. The wording of the report should be **unambiguous** and should take into account the professional background of the referrer. Further investigations or **specialist referral** should be **suggested within the report when they contribute to patient management**.

6. When there are imaging findings that constitute a medical emergency or an **unexpected finding**, reporters should comply with local mechanisms to **alert referrers**.
Opportunities - terminology

- Calling fractures ‘fractures’ 122 scan reports

<table>
<thead>
<tr>
<th>Terms used</th>
<th>n.</th>
<th>% using the ‘F’ word</th>
<th>% explicitly using the term ‘vertebral fracture’</th>
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</thead>
<tbody>
<tr>
<td>Vertebral collapse/osteoporotic collapse/collapse</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteoporotic wedge fracture/wedge fracture/anterior wedging</td>
<td>3</td>
<td>37.5%</td>
<td></td>
</tr>
<tr>
<td>End plate depression/end plate fracture/inferior end plate deformity</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteoporotic crush/crush</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression fracture</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of vertebral height</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fracture</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Audit: Alerting referrer to significant finding of vertebral fracture

<table>
<thead>
<tr>
<th></th>
<th>Identified at audit</th>
<th>Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with vertebral fracture</td>
<td>21% (n.17)</td>
<td>11.5% (n10)</td>
</tr>
<tr>
<td>Patients referred onwards</td>
<td>n/a</td>
<td>0</td>
</tr>
</tbody>
</table>
Finding Vertebral fractures via imaging reports

Terry 77 years:
Nov 2014- CT CAP
‘weight loss ? Upper abdominal mass
Finding Vertebral fractures via imaging reports

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‘The bones are generally osteopenic with vertebral collapse noted in the mid thoracic region, no evidence of bone destruction’
Opportunities- Impact case study

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**Nov 2014-** CT CAP ‘weight loss? 
Upper abdominal mass

‘The bones are generally osteopenic with vertebral collapse noted in the mid thoracic region, no evidence of bone destruction’

**June 2016-** ED 
admission fall at home 
comminuted 
intertrochanteric fracture
Opportunities - Impact case study

Nov 2014 - CT CAP ‘weight loss?
Upper abdominal mass

‘The bones are generally osteopenic with vertebral collapse noted in the mid thoracic region, no evidence of bone destruction’

June 2016 - ED admission fall at home: comminuted intertrochanteric fracture

August 2016 - DXA scan: osteoporosis
Opportunities - terminology

• Calling fractures 'fractures' 122 scan reports

Terms used n.

% using the 'F' word

Vertebral collapse/osteoporotic collapse/collapse 6

Osteoporotic wedge fracture/wedge fracture/anterior wedging 3

End plate depression/end plate fracture/end plate fracture/ inferior end plate deformity 4

% explicitly using the term 'vertebral fracture'

Osteoporotic crush/crush 2

Compression fracture 1

Loss of vertebral height 1

Fracture 2

Engagement with Radiology:

-ask questions ‘does end plate depression mean it could be an osteoporotic fracture?’

-suggest a short code to help identify VFx in imaging reports. ‘Could you end reports with VFx with ‘Fragility fracture needs investigating’ so we can know about these?’

-share evidence and give examples
Identify 

assessment 

Treatment plan 

follow-up

Reporting clinician records ‘vertebral fracture’ with appropriate signposting for further assessment

FLS case-finding or via referring clinician

Assessment to consider differential diagnosis, quantify fracture risk and investigate for underlying cause of osteoporosis

Implement management plan to control symptoms and reduce the risk of further fracture

Depending on local pathways, implementation within FLS or osteoporosis clinic

added to FLS Database
Vertebral fracture pathway design

Vertebral Fracture Identification:
Previously unreported vertebral fracture pathway in the absence of FLS

Patient has investigation for an indication outside of fragility fracture and osteoporosis

Lateral spine is evaluated routinely by reporting clinician in all imaging that includes the thoracic and/or lumbar spine

Vertebral fracture identified

Reporting clinician records ‘vertebral fracture’ with appropriate sign posting for further assessment

Report received by the referring clinician: action required

Imaging for an unrelated indication

Vertebral fracture identified

Assessment to consider differential diagnosis, quantify fracture risk and investigate underlying causes of osteoporosis. Implement management plans to control symptoms and reduce the risk of further fracture.

*Fragility fracture pathway for management for secondary fracture prevention

Reported as ‘vertebral fracture and alerted to the referrer

Referrer takes action
Vertebral fracture (newly diagnosed) management for secondary fracture prevention

Consider suitability for entry to fragility fracture pathway, e.g. AI, ADT & steroids, Exclude end-of-life and pathological fractures.

Is there a known malignancy?

- **YES**
  - Is this a fragility fracture? (low trauma)* or osteoporosis suspected?
    - **YES**
      - Appropriate Vertebral fracture symptom control
    - **NO**
      - Is there a Fracture Liaison Service (FLS)?
        - **YES**
          - Management by FLS
        - **NO**
          - Fragility Fracture pathway **

* A fracture sustained from a fall of standing height or less, or a force not normally expected to cause fracture.

**
## ROS Incidental VFx -> FLS demand model

### Vertebral fracture demand modelling: Audit criteria

A retrospective audit evaluating the proportion of incidentally found vertebral fractures in CT chest abdomen and pelvis studies to include referral source. Supporting demand modelling through vertebral fracture management decision tree.

1. Up to 200 consecutively acquired CT CAP in people aged 50 and over, 150-200 data entries are recommended.
2. Sagittal views of the spine (MPR) are assessed, by a clinician with experience of interpreting spine images, for the presence of moderate and severe vertebral fractures.
3. Vertebral fractures are defined using either semi-quantitative morphometry (Genant et al) or the algorithm-based quantitative (ABQ) (Jiang et al) method (sheet 4).
4. Referral source/type is recorded (oncology staging/trauma).
5. Vertebral fracture type is recorded (metastatic/pathological/traumatic).
6. History of FLS/secondary fracture prevention/osteoporosis referral is recorded.
7. Demand model indicates the expected number of new FLS assessments per n. CT scan input.

This audit could be applied to all imaging.
**Demand modelling**

Vertebral fracture FLS demand model

This demand model uses data from the audit reporting template to estimate the caseload for further investigation. Amend the number of CT CAP scans in the orange box to project demand per week/month/annually based on number of scans performed.

<table>
<thead>
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<th>%</th>
<th>Total number of Vfx identified</th>
<th>36</th>
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<tbody>
<tr>
<td>18</td>
<td>% subtracted with metastatic/pathological Vfx</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>% subtracted with traumatic vfx</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>% subtracted with vfx and known to FLS or osteoporosis service</td>
<td>2</td>
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Total vfx excluded from FLS referral: 6

Projected referrals to FLS: 30

Of these 2 may need assessment by oncology outside of FLS

Demand excluding oncology assessment requirement: 28
### Demand modelling

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**Projected referrals to FLS:** 30  
Of these 2 may need assessment by oncology outside of FLS.

**Demand excluding oncology assessment requirement:** 28
Secondary fracture prevention

Assessments
- Fracture risk (FRAX Qfracture)
- Falls

DXA
- Where appropriate
- If note done in 24 months previous

FRAX + BMD
- FRAX/NOGG guidance

Other tests
- Bloods/ biochemistry

Management
- NICE 1st or 2nd line TREATMENT
- Follow-up 4 months & 12 months (+ 3 year Zoledronic Acid & 5 Year alendronate)
Supporting services

FLS Implementation Toolkit  www.nos.org.uk/toolkit

1. Call to Action
   Service Improvement Guide

2. Improvement Project Plan

3. FLS Benefits Calculator

4. Service Specification

5. Getting to Yes

6. Outcome & Performance Indicators

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Audit criteria
A retrospective audit evaluating reporting practice of incidentally found vertebral fractures in CT CAP studies.

1. 150–200 consecutive cases
2. Sagittal views of the spine for interpreting spine imaging
3. Vertebral fracture (minimal or no abnormality) or the algorithm
4. Findings are consistent

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Support

Royal Osteoporosis Society Guidance:

FLS Implementation Toolkit

A collection of tools and resources developed in conjunction with partners in the NHS to aid the commissioning of fracture liaison services

Clinical Standards for FLS

Setting out standards for care that professionals and patients expect
**Education**

**Fracture Prevention Practitioner Training**
Online course - Deliver excellent healthcare to people with or at risk of osteoporosis and fragility fractures.

**Bone Densitometry Foundation course**
Online course - Gain a foundation in osteoporosis and dual energy x-ray absorptiometry (DXA).

**Osteoporosis Resources for Primary Care**
Online resources - To support you in the identification, assessment and management of osteoporosis in primary care.

**RCGP Osteoporosis e-Learning Module**
Online course - For GPs to develop their knowledge around the diagnosis and management of patients with osteoporosis.
Engagement with Radiology:

- **DO NOT** point fingers
- **DO:**
  - Ask questions - clinical and process
  - Share data - audit evidence
  - Share your ‘problem’
  - Give examples - case studies
  - Make suggestions - that will help your service - it might help theirs
  - **Build relationships**
“It’s a sad thing, but I really do believe that if the fracture I suffered in my spine had been spotted earlier than it was, I would have been spared a great deal of pain and suffering.

Believe me when I say, living with these fractures is a nightmare that never goes away.”

Christine Sharp
Summary

• **Seek**- vertebral fractures

• **Decipher Radiology Reports**- ‘is this a vertebral fracture’

• **Implement secondary fracture prevention**

• **Support and collaborate**
Supporting You

Jill Griffin DCR (R )
Clinical Lead- Quality Improvement

jill.griffin@theros.org.uk
07912 295670