

Local Coverage Determination (LCD): Percutaneous Vertebral Augmentation (L34106)

Links in PDF documents are not guaranteed to work. To follow a web link, please use the MCD Website.

Contractor Information

Contractor Name	Contract Type	Contract Number	Jurisdiction	State(s)
Noridian Healthcare Solutions, LLC	A and B MAC	02101 - MAC A	J - F	Alaska
Noridian Healthcare Solutions, LLC	A and B MAC	02102 - MAC B	J - F	Alaska
Noridian Healthcare Solutions, LLC	A and B MAC	02201 - MAC A	J - F	Idaho
Noridian Healthcare Solutions, LLC	A and B MAC	02202 - MAC B	J - F	Idaho
Noridian Healthcare Solutions, LLC	A and B MAC	02301 - MAC A	J - F	Oregon
Noridian Healthcare Solutions, LLC	A and B MAC	02302 - MAC B	J - F	Oregon
Noridian Healthcare Solutions, LLC	A and B MAC	02401 - MAC A	J - F	Washington
Noridian Healthcare Solutions, LLC	A and B MAC	02402 - MAC B	J - F	Washington
Noridian Healthcare Solutions, LLC	A and B MAC	03101 - MAC A	J - F	Arizona
Noridian Healthcare Solutions, LLC	A and B MAC	03102 - MAC B	J - F	Arizona
Noridian Healthcare Solutions, LLC	A and B MAC	03201 - MAC A	J - F	Montana
Noridian Healthcare Solutions, LLC	A and B MAC	03202 - MAC B	J - F	Montana
Noridian Healthcare Solutions, LLC	A and B MAC	03301 - MAC A	J - F	North Dakota
Noridian Healthcare Solutions, LLC	A and B MAC	03302 - MAC B	J - F	North Dakota
Noridian Healthcare Solutions, LLC	A and B MAC	03401 - MAC A	J - F	South Dakota
Noridian Healthcare Solutions, LLC	A and B MAC	03402 - MAC B	J - F	South Dakota
Noridian Healthcare Solutions, LLC	A and B MAC	03501 - MAC A	J - F	Utah
Noridian Healthcare Solutions, LLC	A and B MAC	03502 - MAC B	J - F	Utah
Noridian Healthcare Solutions, LLC	A and B MAC	03601 - MAC A	J - F	Wyoming
Noridian Healthcare Solutions, LLC	A and B MAC	03602 - MAC B	J - F	Wyoming

[Back to Top](#)

LCD Information

Document Information

LCD ID L34106	Original Effective Date For services performed on or after 10/01/2015
Original ICD-9 LCD ID L24383	Revision Effective Date For services performed on or after 10/01/2015
LCD Title Percutaneous Vertebral Augmentation	Revision Ending Date N/A
Proposed LCD in Comment Period N/A	Retirement Date N/A
Source Proposed LCD N/A	Notice Period Start Date 07/15/2014
AMA CPT / ADA CDT / AHA NUBC Copyright Statement	Notice Period End Date 08/29/2014

CPT only copyright 2002-2018 American Medical Association. All Rights Reserved. CPT is a registered trademark of the American Medical Association. Applicable FARS/DFARS Apply to Government Use. Fee schedules, relative value units, conversion factors and/or related components are not assigned by the AMA, are not part of CPT, and the AMA is not recommending their use. The AMA does not directly or indirectly practice medicine or dispense medical services. The AMA assumes no liability for data contained or not contained herein.

The Code on Dental Procedures and Nomenclature (Code) is published in Current Dental Terminology (CDT). Copyright © American Dental Association. All rights reserved. CDT and CDT-2016 are trademarks of the American Dental Association.

UB-04 Manual. OFFICIAL UB-04 DATA SPECIFICATIONS MANUAL, 2014, is copyrighted by American Hospital Association ("AHA"), Chicago, Illinois. No portion of OFFICIAL UB-04 MANUAL may be reproduced, sorted in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior express, written consent of AHA." Health Forum reserves the right to change the copyright notice from time to time upon written notice to Company.

CMS National Coverage Policy

Title XVIII of the Social Security Act, Section 1862(a)(1)(A). This section allows coverage and payment for only those services that are considered to be reasonable and necessary.

Title XVIII of the Social Security Act, Section 1833(e). This section prohibits Medicare payment for any claim which lacks the necessary information to process the claim.

Coverage Guidance

Coverage Indications, Limitations, and/or Medical Necessity

This LCD applies to all types of and methods involving any procedure affecting vertebral augmentation, such as balloon reduction and augmentation, vertebroplasty.

In the US, more than one quarter of the population age 50 years or older experiences one vertebral fracture in the later years of life. Fractured vertebral bodies may produce intractable pain. Vertebral augmentation procedures are some of the invasive treatments that may be employed to address pain refractory to non-invasive therapeutic modalities. The percutaneous injection of medical cement or polymethylmethacrylate (PMM) or other material FDA-approved for this purpose into the vertebral body may reduce pain and improve function. One type of vertebral augmentation procedure, e .g. Kyphoplasty, also includes fracture reduction by expanding the intrabody space with a device such as a balloon. Following reduction, the bone cement is injected.

Indication

There is only one indication for these procedures: treatment of acute (< 4 months of symptoms) and painful compression fracture(s), regardless of etiology, in a patient without contraindication due to neurological deficits:

- The fracture may be demonstrated by plain film, CT or by MRI. The findings must correlate unequivocally with the site of the patient's pain as demonstrated by physical examination.
- Acuity may be established by history, MRI and/or nuclear medicine bone scan.
- Pain must be predominantly related to the demonstrated fracture(s), of moderate to severe intensity (e.g., pain level at least 6 on VAS 1-10), such that the patient cannot perform basic activities of daily living (ADLs), such as ambulation, sitting, bathing, transfers.

- Pain must be refractory to conservative measures employed for reasonable periods of time, such as medication management with appropriate titration.
 - Generally, procedures are not medically reasonable and necessary when performed immediately after the fracture occurs. Exceptions will not be allowed unless the medical record establishes a clear rationale for the exception. For example, "adequate pain control impairs basic ADLs" or "is associated with respiratory compromise.
- If pain may be due to one or more conditions, **prior** to any vertebral augmentation procedure, an appropriately comprehensive pain assessment and consequent pain management treatment plan must be instituted. Other probable causes of pain must be reasonably excluded. The treatment plan must begin with the least invasive approach that addresses identified pain generators; potentially, an implantable pump for analgesia or surgical stabilization in a patient with concurrent instability.
- An interval assessment by the proceduralist is an absolute requirement if the procedure is performed by any provider other than the diagnostician who performed the pain assessment and developed the plan of care. The proceduralist must document the rationale for proceeding with treatment in the medical record.
- The medical record must contain a detailed operative procedure narrative report. "Boilerplate" or other non-specific "canned" reports does not fulfill this requirement.
- While treatment of only one to two levels would be anticipated, treatment of no more than three (3) vertebral levels within the range of T1-L5 may be covered and reimbursed during the entire episode of pain caused by or related to an acute compression fracture(s), regardless of the number of fractures. Hence, if more than three acute fractures are present, alternative therapies must be employed. Treatment of three levels may be subject to pre- or post-pay review.
 - Exceptions: steroid-induced osteoporosis and multiple myeloma when conservative measures have been demonstrated to be inadequate in the specific patient and result in the inability to perform basic ADLs.
- Procedures must be performed with real-time CT or fluoroscopic imaging guidance, Images of final trocar placement and appearance of the vertebral body at the end of the procedure must be available on request.
- No percutaneous vertebral augmentation procedure, such as sacroplasty, is indicated for treatment of lesions of the sacrum or coccyx. The CPT Category III codes, 0200T and 0201T, are non-covered.

Contraindications

- Absence of a confirmed fracture or fracture more than 4 months unless there is evidence of edema on MRI. Symptoms that cannot be directly related to a specific acute fracture(s).
- Prophylactic treatment for osteoporosis of the spine or for chronic back pain unrelated to compression fractures. All prophylactic procedures will be denied.
- Symptomatic foraminal stenosis, other spinal degenerative disease, facet arthropathy, or other significant coexistent spinal or bony pain generators that account for the predominant portion of the patient's pain. These conditions require treatment before reimbursement for vertebral augmentation procedures may be considered. Following adequate address of other pain generators accounting for most of the patient's pain, residual disabling pain localized to the compression fracture may allow payment for vertebroplasty or vertebral augmentation procedures.
- Investigational procedures such as performance of a vertebral augmentation procedure concurrent with an open spinal surgical procedure.
- Unstable fracture or requirement for stabilization procedure in same or adjacent spinal region.
- Presence of painful metastases to areas other than the spine unless radiotherapy and other conservative measures have failed to relieve the pain due to the compression fracture.
- Presence of any other condition described as a contraindication in the FDA labeling.

Special Considerations

- Bone biopsy done at the same level as Vertebral Augmentation is part of the primary procedure and is not be separately payable consistent with CPT Manual instructions.
- In and of themselves, vertebral augmentation procedures do not require inpatient admission and the procedures do not appear on the Inpatient Only list.

Provider Qualifications

Patient safety and quality of care mandate that healthcare professionals who perform Facet Joint Injections, Medial Branch Blocks, and Facet Joint Radiofrequency Neurotomy percutaneous vertebral augmentation procedures are appropriately experienced and/or trained to provide and manage the services. The CMS Manual System, Pub. 100-8, [Program Integrity Manual, Chapter 13, Section 5.1](#) underscores this point and states that

"reasonable and necessary" services must be "ordered and/or furnished by qualified personnel." Services will be considered medically reasonable and necessary only if performed by appropriately experienced and/or formally trained providers.

The following training requirement applies only to those providers who have **not** provided these specific interventional pain management services on a regular basis (at least one time per month) during the ten years prior to the effective date of this LCD as may be established by claims billings.

A basic requirement of payment is training and/or credentialing by a formal residency/fellowship program and/or other training program that is accredited by a nationally-recognized body and whose core curriculum includes the performance and management of the procedures addressed in this policy. (Recognized accrediting bodies include only those whose program accreditation gains the trainee eligibility to sit for a healthcare-related licensing exam or licensing itself, which in turn allows the licensee to perform these procedures. At a minimum, training must cover and develop an understanding of anatomy and drug pharmacodynamics and kinetics, the technical performance of the procedure(s) and utilization of the required associated imaging modalities, and the diagnosis and management of potential complications from the intervention.

The following *credentialing* requirement applies to all providers of the services addressed in this policy. If the practitioner works in a hospital facility at any time and/or is credentialed by a hospital for any procedure, the practitioner must be credentialed to perform the same procedure in the outpatient setting.

Summary of Evidence

Due to changes in the processes for claims review and company limitations by Noridian, the Contractor can no longer require enrollment and monitoring of such enrollment in a registry as indicated by this policy. Data collection for this procedure is still very important for outcomes research in general, but the policy requirement for enrollment in a registry is removed.

Analysis of Evidence (Rationale for Determination)

N/A

[Back to Top](#)

Coding Information

Bill Type Codes:

Contractors may specify Bill Types to help providers identify those Bill Types typically used to report this service. Absence of a Bill Type does not guarantee that the policy does not apply to that Bill Type. Complete absence of all Bill Types indicates that coverage is not influenced by Bill Type and the policy should be assumed to apply equally to all claims.

011x Hospital Inpatient (Including Medicare Part A)
012x Hospital Inpatient (Medicare Part B only)
013x Hospital Outpatient
022x Skilled Nursing - Inpatient (Medicare Part B only)
023x Skilled Nursing - Outpatient
071x Clinic - Rural Health
072x Clinic - Hospital Based or Independent Renal Dialysis Center
085x Critical Access Hospital

999x Not Applicable

Revenue Codes:

Contractors may specify Revenue Codes to help providers identify those Revenue Codes typically used to report this service. In most instances Revenue Codes are purely advisory. Unless specified in the policy, services reported under other Revenue Codes are equally subject to this coverage determination. Complete absence of all Revenue Codes indicates that coverage is not influenced by Revenue Code and the policy should be assumed to apply equally to all Revenue Codes.

- 032X Radiology - Diagnostic - General Classification
- 033X Radiology - Therapeutic and/or Chemotherapy Administration - General Classification
- 036X Operating Room Services - General Classification
- 040X Other Imaging Services - General Classification
- 045X Emergency Room - General Classification
- 049X Ambulatory Surgical Care - General Classification
- 050X Outpatient Services - General Classification
- 051X Clinic - General Classification
- 076X Specialty Services - General Classification
- 096X Professional Fees - General Classification

CPT/HCPCS Codes

Group 1 Paragraph: N/A

Group 1 Codes:

- 22510 PERCUTANEOUS VERTEBROPLASTY (BONE BIOPSY INCLUDED WHEN PERFORMED), 1 VERTEBRAL BODY, UNILATERAL OR BILATERAL INJECTION, INCLUSIVE OF ALL IMAGING GUIDANCE; CERVICOTHORACIC
- 22511 PERCUTANEOUS VERTEBROPLASTY (BONE BIOPSY INCLUDED WHEN PERFORMED), 1 VERTEBRAL BODY, UNILATERAL OR BILATERAL INJECTION, INCLUSIVE OF ALL IMAGING GUIDANCE; LUMBOSACRAL
- 22512 PERCUTANEOUS VERTEBROPLASTY (BONE BIOPSY INCLUDED WHEN PERFORMED), 1 VERTEBRAL BODY, UNILATERAL OR BILATERAL INJECTION, INCLUSIVE OF ALL IMAGING GUIDANCE; EACH ADDITIONAL CERVICOTHORACIC OR LUMBOSACRAL VERTEBRAL BODY (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROCEDURE)
- 22513 PERCUTANEOUS VERTEBRAL AUGMENTATION, INCLUDING CAVITY CREATION (FRACTURE REDUCTION AND BONE BIOPSY INCLUDED WHEN PERFORMED) USING MECHANICAL DEVICE (EG, KYPHOPLASTY), 1 VERTEBRAL BODY, UNILATERAL OR BILATERAL CANNULATION, INCLUSIVE OF ALL IMAGING GUIDANCE; THORACIC
- 22514 PERCUTANEOUS VERTEBRAL AUGMENTATION, INCLUDING CAVITY CREATION (FRACTURE REDUCTION AND BONE BIOPSY INCLUDED WHEN PERFORMED) USING MECHANICAL DEVICE (EG, KYPHOPLASTY), 1 VERTEBRAL BODY, UNILATERAL OR BILATERAL CANNULATION, INCLUSIVE OF ALL IMAGING GUIDANCE; LUMBAR
- 22515 PERCUTANEOUS VERTEBRAL AUGMENTATION, INCLUDING CAVITY CREATION (FRACTURE REDUCTION AND BONE BIOPSY INCLUDED WHEN PERFORMED) USING MECHANICAL DEVICE (EG, KYPHOPLASTY), 1 VERTEBRAL BODY, UNILATERAL OR BILATERAL CANNULATION, INCLUSIVE OF ALL IMAGING GUIDANCE; EACH ADDITIONAL THORACIC OR LUMBAR VERTEBRAL BODY (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROCEDURE)

Group 2 Paragraph:

The following procedure codes are non-covered, regardless of diagnosis.

Group 2 Codes:

- 0200T PERCUTANEOUS SACRAL AUGMENTATION (SACROPLASTY), UNILATERAL INJECTION(S), INCLUDING THE USE OF A BALLOON OR MECHANICAL DEVICE, WHEN USED, 1 OR MORE NEEDLES, INCLUDES IMAGING GUIDANCE AND BONE BIOPSY, WHEN PERFORMED
- 0201T PERCUTANEOUS SACRAL AUGMENTATION (SACROPLASTY), BILATERAL INJECTIONS, INCLUDING THE USE OF A BALLOON OR MECHANICAL DEVICE, WHEN USED, 2 OR MORE NEEDLES, INCLUDES IMAGING GUIDANCE AND BONE BIOPSY, WHEN PERFORMED

ICD-10 Codes that Support Medical Necessity

Group 1 Paragraph:

Note: Diagnosis codes are based on the current ICD-10-CM codes that are effective at the time of LCD publication. Any updates to ICD-10-CM codes will be reviewed by Noridian, and coverage should not be presumed until the results of such review have been published/posted.

Two codes are required to describe the medical necessity of the procedure: one for the compression fracture and one to indicate pain. These are the **only** covered ICD-10-CM codes that support medical necessity:

Group 1: Compression fracture**Group 1 Codes:**

ICD-10 Codes	Description
M48.53XA	Collapsed vertebra, not elsewhere classified, cervicothoracic region, initial encounter for fracture
M48.53XD	Collapsed vertebra, not elsewhere classified, cervicothoracic region, subsequent encounter for fracture with routine healing
M48.53XG	Collapsed vertebra, not elsewhere classified, cervicothoracic region, subsequent encounter for fracture with delayed healing
M48.53XS	Collapsed vertebra, not elsewhere classified, cervicothoracic region, sequela of fracture
M48.54XA	Collapsed vertebra, not elsewhere classified, thoracic region, initial encounter for fracture
M48.54XD	Collapsed vertebra, not elsewhere classified, thoracic region, subsequent encounter for fracture with routine healing
M48.54XG	Collapsed vertebra, not elsewhere classified, thoracic region, subsequent encounter for fracture with delayed healing
M48.54XS	Collapsed vertebra, not elsewhere classified, thoracic region, sequela of fracture
M48.55XA	Collapsed vertebra, not elsewhere classified, thoracolumbar region, initial encounter for fracture
M48.55XD	Collapsed vertebra, not elsewhere classified, thoracolumbar region, subsequent encounter for fracture with routine healing
M48.55XG	Collapsed vertebra, not elsewhere classified, thoracolumbar region, subsequent encounter for fracture with delayed healing
M48.55XS	Collapsed vertebra, not elsewhere classified, thoracolumbar region, sequela of fracture
M48.56XA	Collapsed vertebra, not elsewhere classified, lumbar region, initial encounter for fracture
M48.56XD	Collapsed vertebra, not elsewhere classified, lumbar region, subsequent encounter for fracture with routine healing
M48.56XG	Collapsed vertebra, not elsewhere classified, lumbar region, subsequent encounter for fracture with delayed healing
M48.56XS	Collapsed vertebra, not elsewhere classified, lumbar region, sequela of fracture
M48.57XA	Collapsed vertebra, not elsewhere classified, lumbosacral region, initial encounter for fracture
M48.57XD	Collapsed vertebra, not elsewhere classified, lumbosacral region, subsequent encounter for fracture with routine healing
M48.57XG	Collapsed vertebra, not elsewhere classified, lumbosacral region, subsequent encounter for fracture with delayed healing
M48.57XS	Collapsed vertebra, not elsewhere classified, lumbosacral region, sequela of fracture
M80.08XA	Age-related osteoporosis with current pathological fracture, vertebra(e), initial encounter for fracture
M80.08XD	Age-related osteoporosis with current pathological fracture, vertebra(e), subsequent encounter for fracture with routine healing
M80.08XG	Age-related osteoporosis with current pathological fracture, vertebra(e), subsequent encounter for fracture with delayed healing
M80.08XK	Age-related osteoporosis with current pathological fracture, vertebra(e), subsequent encounter for fracture with nonunion
M80.08XP	Age-related osteoporosis with current pathological fracture, vertebra(e), subsequent encounter for fracture with malunion
M80.08XS	Age-related osteoporosis with current pathological fracture, vertebra(e), sequela
M80.88XA	Other osteoporosis with current pathological fracture, vertebra(e), initial encounter for fracture
M80.88XD	Other osteoporosis with current pathological fracture, vertebra(e), subsequent encounter for fracture with routine healing
M80.88XG	Other osteoporosis with current pathological fracture, vertebra(e), subsequent encounter for fracture with delayed healing
M80.88XK	Other osteoporosis with current pathological fracture, vertebra(e), subsequent encounter for fracture with nonunion

ICD-10 Codes	Description
M80.88XP	Other osteoporosis with current pathological fracture, vertebra(e), subsequent encounter for fracture with malunion
M80.88XS	Other osteoporosis with current pathological fracture, vertebra(e), sequela
M84.58XA	Pathological fracture in neoplastic disease, other specified site, initial encounter for fracture
M84.58XD	Pathological fracture in neoplastic disease, other specified site, subsequent encounter for fracture with routine healing
M84.58XG	Pathological fracture in neoplastic disease, other specified site, subsequent encounter for fracture with delayed healing
M84.58XK	Pathological fracture in neoplastic disease, other specified site, subsequent encounter for fracture with nonunion
M84.58XP	Pathological fracture in neoplastic disease, other specified site, subsequent encounter for fracture with malunion
M84.58XS	Pathological fracture in neoplastic disease, other specified site, sequela
M84.68XA	Pathological fracture in other disease, other site, initial encounter for fracture
M84.68XD	Pathological fracture in other disease, other site, subsequent encounter for fracture with routine healing
M84.68XG	Pathological fracture in other disease, other site, subsequent encounter for fracture with delayed healing
M84.68XK	Pathological fracture in other disease, other site, subsequent encounter for fracture with nonunion
M84.68XP	Pathological fracture in other disease, other site, subsequent encounter for fracture with malunion
M84.68XS	Pathological fracture in other disease, other site, sequela
S22.010A	Wedge compression fracture of first thoracic vertebra, initial encounter for closed fracture
S22.010B	Wedge compression fracture of first thoracic vertebra, initial encounter for open fracture
S22.010D	Wedge compression fracture of first thoracic vertebra, subsequent encounter for fracture with routine healing
S22.010G	Wedge compression fracture of first thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.010K	Wedge compression fracture of first thoracic vertebra, subsequent encounter for fracture with nonunion
S22.010S	Wedge compression fracture of first thoracic vertebra, sequela
S22.011A	Stable burst fracture of first thoracic vertebra, initial encounter for closed fracture
S22.011B	Stable burst fracture of first thoracic vertebra, initial encounter for open fracture
S22.011D	Stable burst fracture of first thoracic vertebra, subsequent encounter for fracture with routine healing
S22.011G	Stable burst fracture of first thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.011K	Stable burst fracture of first thoracic vertebra, subsequent encounter for fracture with nonunion
S22.011S	Stable burst fracture of first thoracic vertebra, sequela
S22.018A	Other fracture of first thoracic vertebra, initial encounter for closed fracture
S22.018B	Other fracture of first thoracic vertebra, initial encounter for open fracture
S22.018D	Other fracture of first thoracic vertebra, subsequent encounter for fracture with routine healing
S22.018G	Other fracture of first thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.018K	Other fracture of first thoracic vertebra, subsequent encounter for fracture with nonunion
S22.018S	Other fracture of first thoracic vertebra, sequela
S22.020A	Wedge compression fracture of second thoracic vertebra, initial encounter for closed fracture
S22.020B	Wedge compression fracture of second thoracic vertebra, initial encounter for open fracture
S22.020D	Wedge compression fracture of second thoracic vertebra, subsequent encounter for fracture with routine healing
S22.020G	Wedge compression fracture of second thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.020K	Wedge compression fracture of second thoracic vertebra, subsequent encounter for fracture with nonunion
S22.020S	Wedge compression fracture of second thoracic vertebra, sequela
S22.021A	Stable burst fracture of second thoracic vertebra, initial encounter for closed fracture
S22.021B	Stable burst fracture of second thoracic vertebra, initial encounter for open fracture
S22.021D	Stable burst fracture of second thoracic vertebra, subsequent encounter for fracture with routine healing
S22.021G	Stable burst fracture of second thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.021K	Stable burst fracture of second thoracic vertebra, subsequent encounter for fracture with nonunion

ICD-10 Codes	Description
S22.021S	Stable burst fracture of second thoracic vertebra, sequela
S22.028A	Other fracture of second thoracic vertebra, initial encounter for closed fracture
S22.028B	Other fracture of second thoracic vertebra, initial encounter for open fracture
S22.028D	Other fracture of second thoracic vertebra, subsequent encounter for fracture with routine healing
S22.028G	Other fracture of second thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.028K	Other fracture of second thoracic vertebra, subsequent encounter for fracture with nonunion
S22.028S	Other fracture of second thoracic vertebra, sequela
S22.030A	Wedge compression fracture of third thoracic vertebra, initial encounter for closed fracture
S22.030B	Wedge compression fracture of third thoracic vertebra, initial encounter for open fracture
S22.030D	Wedge compression fracture of third thoracic vertebra, subsequent encounter for fracture with routine healing
S22.030G	Wedge compression fracture of third thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.030K	Wedge compression fracture of third thoracic vertebra, subsequent encounter for fracture with nonunion
S22.030S	Wedge compression fracture of third thoracic vertebra, sequela
S22.031A	Stable burst fracture of third thoracic vertebra, initial encounter for closed fracture
S22.031B	Stable burst fracture of third thoracic vertebra, initial encounter for open fracture
S22.031D	Stable burst fracture of third thoracic vertebra, subsequent encounter for fracture with routine healing
S22.031G	Stable burst fracture of third thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.031K	Stable burst fracture of third thoracic vertebra, subsequent encounter for fracture with nonunion
S22.031S	Stable burst fracture of third thoracic vertebra, sequela
S22.038A	Other fracture of third thoracic vertebra, initial encounter for closed fracture
S22.038B	Other fracture of third thoracic vertebra, initial encounter for open fracture
S22.038D	Other fracture of third thoracic vertebra, subsequent encounter for fracture with routine healing
S22.038G	Other fracture of third thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.038K	Other fracture of third thoracic vertebra, subsequent encounter for fracture with nonunion
S22.038S	Other fracture of third thoracic vertebra, sequela
S22.040A	Wedge compression fracture of fourth thoracic vertebra, initial encounter for closed fracture
S22.040B	Wedge compression fracture of fourth thoracic vertebra, initial encounter for open fracture
S22.040D	Wedge compression fracture of fourth thoracic vertebra, subsequent encounter for fracture with routine healing
S22.040G	Wedge compression fracture of fourth thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.040K	Wedge compression fracture of fourth thoracic vertebra, subsequent encounter for fracture with nonunion
S22.040S	Wedge compression fracture of fourth thoracic vertebra, sequela
S22.041A	Stable burst fracture of fourth thoracic vertebra, initial encounter for closed fracture
S22.041B	Stable burst fracture of fourth thoracic vertebra, initial encounter for open fracture
S22.041D	Stable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with routine healing
S22.041G	Stable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.041K	Stable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with nonunion
S22.041S	Stable burst fracture of fourth thoracic vertebra, sequela
S22.048A	Other fracture of fourth thoracic vertebra, initial encounter for closed fracture
S22.048B	Other fracture of fourth thoracic vertebra, initial encounter for open fracture
S22.048D	Other fracture of fourth thoracic vertebra, subsequent encounter for fracture with routine healing
S22.048G	Other fracture of fourth thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.048K	Other fracture of fourth thoracic vertebra, subsequent encounter for fracture with nonunion
S22.048S	Other fracture of fourth thoracic vertebra, sequela
S22.050A	Wedge compression fracture of T5-T6 vertebra, initial encounter for closed fracture
S22.050B	Wedge compression fracture of T5-T6 vertebra, initial encounter for open fracture
S22.050D	Wedge compression fracture of T5-T6 vertebra, subsequent encounter for fracture with routine healing
S22.050G	Wedge compression fracture of T5-T6 vertebra, subsequent encounter for fracture with delayed healing

ICD-10 Codes	Description
S22.050K	Wedge compression fracture of T5-T6 vertebra, subsequent encounter for fracture with nonunion
S22.050S	Wedge compression fracture of T5-T6 vertebra, sequela
S22.051A	Stable burst fracture of T5-T6 vertebra, initial encounter for closed fracture
S22.051B	Stable burst fracture of T5-T6 vertebra, initial encounter for open fracture
S22.051D	Stable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with routine healing
S22.051G	Stable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with delayed healing
S22.051K	Stable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with nonunion
S22.051S	Stable burst fracture of T5-T6 vertebra, sequela
S22.058A	Other fracture of T5-T6 vertebra, initial encounter for closed fracture
S22.058B	Other fracture of T5-T6 vertebra, initial encounter for open fracture
S22.058D	Other fracture of T5-T6 vertebra, subsequent encounter for fracture with routine healing
S22.058G	Other fracture of T5-T6 vertebra, subsequent encounter for fracture with delayed healing
S22.058K	Other fracture of T5-T6 vertebra, subsequent encounter for fracture with nonunion
S22.058S	Other fracture of T5-T6 vertebra, sequela
S22.060A	Wedge compression fracture of T7-T8 vertebra, initial encounter for closed fracture
S22.060B	Wedge compression fracture of T7-T8 vertebra, initial encounter for open fracture
S22.060D	Wedge compression fracture of T7-T8 vertebra, subsequent encounter for fracture with routine healing
S22.060G	Wedge compression fracture of T7-T8 vertebra, subsequent encounter for fracture with delayed healing
S22.060K	Wedge compression fracture of T7-T8 vertebra, subsequent encounter for fracture with nonunion
S22.060S	Wedge compression fracture of T7-T8 vertebra, sequela
S22.061A	Stable burst fracture of T7-T8 vertebra, initial encounter for closed fracture
S22.061B	Stable burst fracture of T7-T8 vertebra, initial encounter for open fracture
S22.061D	Stable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with routine healing
S22.061G	Stable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with delayed healing
S22.061K	Stable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with nonunion
S22.061S	Stable burst fracture of T7-T8 vertebra, sequela
S22.068A	Other fracture of T7-T8 thoracic vertebra, initial encounter for closed fracture
S22.068B	Other fracture of T7-T8 thoracic vertebra, initial encounter for open fracture
S22.068D	Other fracture of T7-T8 thoracic vertebra, subsequent encounter for fracture with routine healing
S22.068G	Other fracture of T7-T8 thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.068K	Other fracture of T7-T8 thoracic vertebra, subsequent encounter for fracture with nonunion
S22.068S	Other fracture of T7-T8 thoracic vertebra, sequela
S22.070A	Wedge compression fracture of T9-T10 vertebra, initial encounter for closed fracture
S22.070B	Wedge compression fracture of T9-T10 vertebra, initial encounter for open fracture
S22.070D	Wedge compression fracture of T9-T10 vertebra, subsequent encounter for fracture with routine healing
S22.070G	Wedge compression fracture of T9-T10 vertebra, subsequent encounter for fracture with delayed healing
S22.070K	Wedge compression fracture of T9-T10 vertebra, subsequent encounter for fracture with nonunion
S22.070S	Wedge compression fracture of T9-T10 vertebra, sequela
S22.071A	Stable burst fracture of T9-T10 vertebra, initial encounter for closed fracture
S22.071B	Stable burst fracture of T9-T10 vertebra, initial encounter for open fracture
S22.071D	Stable burst fracture of T9-T10 vertebra, subsequent encounter for fracture with routine healing
S22.071G	Stable burst fracture of T9-T10 vertebra, subsequent encounter for fracture with delayed healing
S22.071K	Stable burst fracture of T9-T10 vertebra, subsequent encounter for fracture with nonunion
S22.071S	Stable burst fracture of T9-T10 vertebra, sequela
S22.078A	Other fracture of T9-T10 vertebra, initial encounter for closed fracture
S22.078B	Other fracture of T9-T10 vertebra, initial encounter for open fracture
S22.078D	Other fracture of T9-T10 vertebra, subsequent encounter for fracture with routine healing
S22.078G	Other fracture of T9-T10 vertebra, subsequent encounter for fracture with delayed healing
S22.078K	Other fracture of T9-T10 vertebra, subsequent encounter for fracture with nonunion
S22.078S	Other fracture of T9-T10 vertebra, sequela
S22.080A	Wedge compression fracture of T11-T12 vertebra, initial encounter for closed fracture
S22.080B	Wedge compression fracture of T11-T12 vertebra, initial encounter for open fracture
S22.080D	Wedge compression fracture of T11-T12 vertebra, subsequent encounter for fracture with routine healing

ICD-10 Codes	Description
S22.080G	Wedge compression fracture of T11-T12 vertebra, subsequent encounter for fracture with delayed healing
S22.080K	Wedge compression fracture of T11-T12 vertebra, subsequent encounter for fracture with nonunion
S22.080S	Wedge compression fracture of T11-T12 vertebra, sequela
S22.081A	Stable burst fracture of T11-T12 vertebra, initial encounter for closed fracture
S22.081B	Stable burst fracture of T11-T12 vertebra, initial encounter for open fracture
S22.081D	Stable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with routine healing
S22.081G	Stable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with delayed healing
S22.081K	Stable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with nonunion
S22.081S	Stable burst fracture of T11-T12 vertebra, sequela
S22.088A	Other fracture of T11-T12 vertebra, initial encounter for closed fracture
S22.088B	Other fracture of T11-T12 vertebra, initial encounter for open fracture
S22.088D	Other fracture of T11-T12 vertebra, subsequent encounter for fracture with routine healing
S22.088G	Other fracture of T11-T12 vertebra, subsequent encounter for fracture with delayed healing
S22.088K	Other fracture of T11-T12 vertebra, subsequent encounter for fracture with nonunion
S22.088S	Other fracture of T11-T12 vertebra, sequela
S32.010A	Wedge compression fracture of first lumbar vertebra, initial encounter for closed fracture
S32.010B	Wedge compression fracture of first lumbar vertebra, initial encounter for open fracture
S32.010D	Wedge compression fracture of first lumbar vertebra, subsequent encounter for fracture with routine healing
S32.010G	Wedge compression fracture of first lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.010K	Wedge compression fracture of first lumbar vertebra, subsequent encounter for fracture with nonunion
S32.010S	Wedge compression fracture of first lumbar vertebra, sequela
S32.011A	Stable burst fracture of first lumbar vertebra, initial encounter for closed fracture
S32.011B	Stable burst fracture of first lumbar vertebra, initial encounter for open fracture
S32.011D	Stable burst fracture of first lumbar vertebra, subsequent encounter for fracture with routine healing
S32.011G	Stable burst fracture of first lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.011K	Stable burst fracture of first lumbar vertebra, subsequent encounter for fracture with nonunion
S32.011S	Stable burst fracture of first lumbar vertebra, sequela
S32.018A	Other fracture of first lumbar vertebra, initial encounter for closed fracture
S32.018B	Other fracture of first lumbar vertebra, initial encounter for open fracture
S32.018D	Other fracture of first lumbar vertebra, subsequent encounter for fracture with routine healing
S32.018G	Other fracture of first lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.018K	Other fracture of first lumbar vertebra, subsequent encounter for fracture with nonunion
S32.018S	Other fracture of first lumbar vertebra, sequela
S32.020A	Wedge compression fracture of second lumbar vertebra, initial encounter for closed fracture
S32.020B	Wedge compression fracture of second lumbar vertebra, initial encounter for open fracture
S32.020D	Wedge compression fracture of second lumbar vertebra, subsequent encounter for fracture with routine healing
S32.020G	Wedge compression fracture of second lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.020K	Wedge compression fracture of second lumbar vertebra, subsequent encounter for fracture with nonunion
S32.020S	Wedge compression fracture of second lumbar vertebra, sequela
S32.021A	Stable burst fracture of second lumbar vertebra, initial encounter for closed fracture
S32.021B	Stable burst fracture of second lumbar vertebra, initial encounter for open fracture
S32.021D	Stable burst fracture of second lumbar vertebra, subsequent encounter for fracture with routine healing
S32.021G	Stable burst fracture of second lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.021K	Stable burst fracture of second lumbar vertebra, subsequent encounter for fracture with nonunion
S32.021S	Stable burst fracture of second lumbar vertebra, sequela
S32.028A	Other fracture of second lumbar vertebra, initial encounter for closed fracture
S32.028B	Other fracture of second lumbar vertebra, initial encounter for open fracture

ICD-10 Codes	Description
S32.028D	Other fracture of second lumbar vertebra, subsequent encounter for fracture with routine healing
S32.028G	Other fracture of second lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.028K	Other fracture of second lumbar vertebra, subsequent encounter for fracture with nonunion
S32.028S	Other fracture of second lumbar vertebra, sequela
S32.030A	Wedge compression fracture of third lumbar vertebra, initial encounter for closed fracture
S32.030B	Wedge compression fracture of third lumbar vertebra, initial encounter for open fracture
S32.030D	Wedge compression fracture of third lumbar vertebra, subsequent encounter for fracture with routine healing
S32.030G	Wedge compression fracture of third lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.030K	Wedge compression fracture of third lumbar vertebra, subsequent encounter for fracture with nonunion
S32.030S	Wedge compression fracture of third lumbar vertebra, sequela
S32.031A	Stable burst fracture of third lumbar vertebra, initial encounter for closed fracture
S32.031B	Stable burst fracture of third lumbar vertebra, initial encounter for open fracture
S32.031D	Stable burst fracture of third lumbar vertebra, subsequent encounter for fracture with routine healing
S32.031G	Stable burst fracture of third lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.031K	Stable burst fracture of third lumbar vertebra, subsequent encounter for fracture with nonunion
S32.031S	Stable burst fracture of third lumbar vertebra, sequela
S32.038A	Other fracture of third lumbar vertebra, initial encounter for closed fracture
S32.038B	Other fracture of third lumbar vertebra, initial encounter for open fracture
S32.038D	Other fracture of third lumbar vertebra, subsequent encounter for fracture with routine healing
S32.038G	Other fracture of third lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.038K	Other fracture of third lumbar vertebra, subsequent encounter for fracture with nonunion
S32.038S	Other fracture of third lumbar vertebra, sequela
S32.040A	Wedge compression fracture of fourth lumbar vertebra, initial encounter for closed fracture
S32.040B	Wedge compression fracture of fourth lumbar vertebra, initial encounter for open fracture
S32.040D	Wedge compression fracture of fourth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.040G	Wedge compression fracture of fourth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.040K	Wedge compression fracture of fourth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.040S	Wedge compression fracture of fourth lumbar vertebra, sequela
S32.041A	Stable burst fracture of fourth lumbar vertebra, initial encounter for closed fracture
S32.041B	Stable burst fracture of fourth lumbar vertebra, initial encounter for open fracture
S32.041D	Stable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.041G	Stable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.041K	Stable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.041S	Stable burst fracture of fourth lumbar vertebra, sequela
S32.048A	Other fracture of fourth lumbar vertebra, initial encounter for closed fracture
S32.048B	Other fracture of fourth lumbar vertebra, initial encounter for open fracture
S32.048D	Other fracture of fourth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.048G	Other fracture of fourth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.048K	Other fracture of fourth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.048S	Other fracture of fourth lumbar vertebra, sequela
S32.050A	Wedge compression fracture of fifth lumbar vertebra, initial encounter for closed fracture
S32.050B	Wedge compression fracture of fifth lumbar vertebra, initial encounter for open fracture
S32.050D	Wedge compression fracture of fifth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.050G	Wedge compression fracture of fifth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.050K	Wedge compression fracture of fifth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.050S	Wedge compression fracture of fifth lumbar vertebra, sequela

ICD-10 Codes	Description
S32.051A	Stable burst fracture of fifth lumbar vertebra, initial encounter for closed fracture
S32.051B	Stable burst fracture of fifth lumbar vertebra, initial encounter for open fracture
S32.051D	Stable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.051G	Stable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.051K	Stable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.051S	Stable burst fracture of fifth lumbar vertebra, sequela
S32.058A	Other fracture of fifth lumbar vertebra, initial encounter for closed fracture
S32.058B	Other fracture of fifth lumbar vertebra, initial encounter for open fracture
S32.058D	Other fracture of fifth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.058G	Other fracture of fifth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.058K	Other fracture of fifth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.058S	Other fracture of fifth lumbar vertebra, sequela

Group 2 Paragraph:

Group 2: Pain, thoracic or lumbar spine:

Group 2 Codes:

ICD-10 Codes	Description
M54.5	Low back pain
M54.6	Pain in thoracic spine
M54.89	Other dorsalgia
M54.9	Dorsalgia, unspecified

ICD-10 Codes that DO NOT Support Medical Necessity

Group 1 Paragraph:

All diagnoses **not** listed in this policy under ICD-10-CM Codes that Support Medical Necessity above.

Group 1 Codes: N/A

ICD-10 Additional Information [Back to Top](#)

General Information

Associated Information

All the documentation requirements described in the Indications section of this LCD must be met. The most important clinical information – information that must be unequivocally documented in the medical record – is that one or more but less than four **acute and painful vertebral compression** fractures is/are present and that the patient’s pain is predominantly, if not solely, related to the demonstrated fracture(s).

This final LCD, effective 10/01/2015, combines JFA L34168 into the JFB LCD so that both JFA and JFB contract numbers will have the same final MCD LCD number.

Sources of Information

N/A
Bibliography

1. AAOS. The treatment of symptomatic osteoporotic spinal compression fractures: guideline and evidence report Sept. 24, 2010.
<http://www.aaos.org/Research/guidelines/SCFguideline.pdf>
2. Alvarez, L., Alcaraz, M., Pérez-Higueras, A., Granizo, J.J., de Miguel, I., Rossi, R.E., Quiñones, D. (2006). Percutaneous vertebroplasty: functional improvement in patients with osteoporotic compression fractures. *Spine*, 1;31(10),1113-1118.
3. Amar AP, Larsen DW, Esnaashari N, Albuquerque FC, Lavine SD, Teitelbaum GP. Percutaneous transpedicular polymethylmethacrylate vertebroplasty for the treatment of spinal compression fractures. *Neurosurgery* 2001; 49:1105-14; discussion 14-5.
4. An KC, Kang S, Choi JS, Seo JH. The clinical and radiological availability of percutaneous balloon kyphoplasty as a treatment for osteoporotic burst fractures. *Asian Spine J* 2008; 2:9-14.
5. Anselmetti GC, Manca A, Ortega C, Grignani G, Debernardi F, Regge D. Treatment of extraspinal painful bone metastases with percutaneous cementoplasty: a prospective study of 50 patients. *Cardiovasc Intervent Radiol* 2008;31:1165-73.
6. Atkins D, Best D, Briss PA, et al. Grading quality of evidence and strength of recommendations. *BMJ* 2004; 328:1490.
7. Avram Allan Edidin, PhD; Kevin L. Ong, PhD; Edmund Lau, MS; Steven M. Kurtz, PhD Mortality Risk for Operated and Non-Operated Vertebral Fracture Patients in the Medicare Population. *JBMR(J Bone Miner Res.* 2011 Feb 9. Doi: 10.1002/jbmr.353).
8. Babayev M, Lachmann E, Nagler W. The controversy surrounding sacral insufficiencyfractures: to ambulate or not to ambulate? *Am J Phys Med Rehabil* 2000;79:404-9.
9. Bae, H., Shen, M., Maurer, P., Peppelman, W., Beutler, W., Linovitz, R., Westerlund, E., Peppers, T., Lieberman, I., Kim, C., Girardi, F. (2010). Clinical experience using Cortoss for treating vertebral compression fractures with vertebroplasty and kyphoplasty: twenty four-month follow-up. *Spine*, 35(20), E1030-E1036. doi: 10.1097/BRS.0b013e3181dcda75.
10. Baerlocher MO, Munk PL, Liu DM, et al. Clinical utility of vertebroplasty: need for better evidence.*Radiology* 2010;255:669-74.
11. Baron JA, Weiderpass E. An introduction to epidemiological research with medical databases. *Ann Epidemiol* 2000;10:200-4.
12. Basile A, Tsetis D, Cavalli M, et al. Sacroplasty for Local or Massive Localization of Multiple Myeloma. *Cardiovasc Intervent Radiol* 2009.
13. Bayley E, Srinivas S, Boszczyk BM. Clinical outcomes of sacroplasty in sacral insufficiency fractures: a review of the literature. *Eur Spine J* 2009;18:1266-71.
14. Belinson S. Percutaneous Vertebroplasty or Kyphoplasty for Vertebral Fractures Caused by Osteoporosis: *Kaiser Foundation Health Plan and Southern California Permanente Group; 2010 April, 2010.*
15. Berenson, J., Pflugmacher, R., Jarzem, P., Zonder, J., Schechtman, K., Tillman, J.B., Bastian, L., Ashraf, T., Vrionis, F., Cancer Patient Fracture Evaluation (CAFE) Investigators. (2011). Balloon kyphoplasty versus non-surgical fracture management for treatment of painful vertebral body compression fractures in patients with cancer: a multicentre, randomised controlled trial. *Lancet Oncol.* 12(3), 225-235. doi: 10.1016/S1470-2045(11)70008-0. *Epub* 2011 Feb 16.
16. Berenson JR, Pflugmacher R, Jarzem P, Zonder JA, Tillman JB, Ashraf T, et al. Final results of the first randomized trial comparing balloon kyphoplasty (BKP) to non-surgical management among cancer patients with vertebral compression fractures: marked improvement in back function, quality of life and pain in the BKP arm. *Blood* 2009; 114:2873.
17. Binaghi S, Guntern D, Schnyder P, Theumann N. A new, easy, fast, and safe method for CT-guided sacroplasty. *Eur Radiol* 2006;16:2875-8.
18. Black DM, Arden NK, Palermo L, Pearson J, Cummings SR. Prevalent vertebral deformities predict hip fractures and new vertebral deformities but not wrist fractures. Study of Osteoporotic Fractures Research Group. *J Bone Miner Res* 1999; 14:821-8.
19. Bohner M, Gasser B, Baroud G, Heini P. Theoretical and experimental model to describe the injection of a polymethylmethacrylate cement into a porous structure. *Biomaterials* 2003;24:2721-30.
20. Bono CM, Heggeness M, Mick C, Resnick D, Watters IWC. North American Spine Society. Newly released vertebroplasty randomized controlled trials: a tale of two trials. *Spine J. Mar;10(3):* 238-40.
21. Boonen, S., Van Meirhaeghe, J., Bastian, L., Cummings, S.R., Ransam, J., Tillman, J.B., Eastell, R., Talmadge, K., Wardlaw, D. (2011). Balloon kyphoplasty for the treatment of acute vertebral compression fractures: 2-year results from a randomized trial. *J Bone Miner Res*, 26(7), 1627-1637. doi: 10.1002/jbmr.364.
22. Bouza C, Lopez-Cuadrado T, Cediél P, Saz-Parkinson Z, Amate JM. Balloon kyphoplasty in malignant spinal fractures: a systematic review and meta-analysis. *BMC Palliat Care* 2009; 8:12.
23. Bouza C, Lopez T, Magro A, Navalpotro L, Amate JM. Efficacy and safety of balloon kyphoplasty in the treatment of vertebral compression fractures: a systematic review. *Eur Spine J* 2006;15:1050-67.
24. Brook AL, Mirsky DM, Bello JA. Computerized tomography guided sacroplasty: a practical treatment for sacral insufficiency fracture: case report. *Spine (Phila Pa 1976)* 2005;30:E450-4.

25. Buchbinder, R., Osborne, R.H., Ebeling, P.R., Wark, J.D., Mitchell, P., Wriedt, C., Graves, S., Staples, M.P., Murphy, B. (2009). A randomized trial of vertebroplasty for painful osteoporotic vertebral fractures. *N Engl J Med*, 6;361(6), 557-568. doi: 10.1056/NEJMoa0900429.
26. Butler CL, Given CA, 2nd, Michel SJ, Tibbs PA. Percutaneous sacroplasty for the treatment of sacral insufficiency fractures. *AJR Am J Roentgenol* 2005;184:1956-9.
27. Cahill KS, Chi JH, Day A, Claus EB. Prevalence, complications, and hospital charges associated with use of bone-morphogenetic proteins in spinal fusion procedures. *JAMA* 2009;302:58-66.
28. California Technology Assessment Forum (CTAF). Vertebroplasty as a Treatment for Osteoporotic Compression Fractures. *In*; 2010:1-16.
29. Cauley JA, Thompson DE, Ensrud KC, Scott JC, Black D. Risk of mortality following clinical fractures. *Osteoporos Int* 2000; 11:556-61.
30. Chapman JR, Hanson BP, Dettori JR, Norvell DC. Spine outcomes measures and instruments. Dübendorf, Switzerland: *AOSpine International*; 2007.
31. Cochrane Database of Systematic Reviews: Plain Language Summaries [Internet] - John Wiley & Sons, Ltd Version: April 30, 2015 *PMHID*: PMH0073518 [pubmedhealth](#)
32. Connell FA, Diehr P, Hart LG. The use of large data bases in health care studies. *Annu Rev Public Health* 1987;8:51-74.
33. Cooper C, Atkinson EJ, O'Fallon WM, Melton LJ, 3rd. Incidence of clinically diagnosed vertebral fractures: a population-based study in Rochester, Minnesota, 1985-1989. *J Bone Miner Res* 1992; 7:221-7.
34. Costa L, Badia X, Chow E, Lipton A, Wardley A. Impact of skeletal complications on patients' quality of life, mobility, and functional independence. *Support Care Cancer* 2008;16:879-89.
35. Convertino VA, Bloomfield SA, Greenleaf JE. An overview of the issues: physiological effects of bed rest and restricted physical activity. *Med Sci Sports Exerc* 1997;29:187-90.
36. Cortet B, Cotton A, Boutry N, et al. Percutaneous Vertebroplasty in the Treatment of Osteoporotic Vertebral Compression Fractures: An Open Prospective Study. *J Rheumatol*. 1999 Oct; 26(1): 2222-8.
37. De Negri, P., Tirri T, Paternoster, G., Modano, P. (2007). Treatment of painful osteoporotic or traumatic vertebral compression fractures by percutaneous vertebral augmentation procedures: a nonrandomized comparison between vertebroplasty and kyphoplasty. *Clin J Pain*, 23(5), 425-430.
38. Dehdashti AR, Martin JB, Jean B, Rufenacht DA. PMMA cementoplasty in symptomatic metastatic lesions of the S1 vertebral body. *Cardiovasc Intervent Radiol* 2000;23:235-7.
39. Diamond, T.H., Bryant, C., Browne, L., Clark, W.A. (2006). Clinical outcomes after acute osteoporotic vertebral fractures: a 2-year non-randomised trial comparing percutaneous vertebroplasty with conservative therapy. *Med J Aust*, 6; 184(3),113-7.
40. Dong, R., Chen, L., Gu, Y., Han, G., Yang, H., Tang, T., Xiaoqing, C. Improvement in respiratory function after vertebroplasty and kyphoplasty. (2009). *Int Orthop*, 33(6) ,1689-1694. doi: 10.1007/s00264-008-0680-2. *Epub* 2008 Nov 7.
41. Dworkin RH, Turk DC, Wyrwich KW, et al. Interpreting the clinical importance of treatment outcomes in chronic pain clinical trials: IMMPACT recommendations. *J Pain* 2008; 9:105-21.
42. Eck JC, Nachtigall D, Humphreys SC, Hodges SD. Comparison of vertebroplasty and balloon kyphoplasty for treatment of vertebral compression fractures *J Vasc Interv Radiol* 2010
43. Ehteshami Rad A, Gray LA, Kallmes DF. Incident Vertebral Fractures in Patients not Undergoing Vertebroplasty. *J Vasc Interv Radiol* 2010.
44. EPOS group. Incidence of vertebral fracture in Europe: results from the European Prospective Osteoporosis Study (EPOS). *J Bone Miner Res* 2002;17:716-24.
45. Ettinger B, Black DM, Nevitt MC, et al. Contribution of vertebral deformities to chronic back pain and disability. The Study of Osteoporotic Fractures Research Group. *J Bone Miner Res* 1992;7:449-56.
46. Flood AB. Peaks and pits of using large data bases to measure quality of care. *Int J Technol Assess Health Care* 1990; 6:253-62.
47. Fournay DR, Schomer DF, Nader R, et al. Percutaneous vertebroplasty and kyphoplasty for painful vertebral body fractures in cancer patients. *J Neurosurg* 2003;98:21-30.
48. Fournay DR. Vertebroplasty versus kyphoplasty in the cancer setting: rethinking the relative indications. *Support Cancer Ther* 2005 Oct 1;3(1):26-7.
49. Frankel BM, Monroe T, Wang C. Percutaneous vertebral augmentation: an elevation in adjacent-level fracture risk in kyphoplasty as compared with vertebroplasty. *Spine J* 2007; 7:575-82.
50. Freitag M, Gottschalk A, Schuster M, Wenk W, Wiesner L, Standl TG. Pulmonary embolism caused by polymethylmethacrylate during percutaneous vertebroplasty in orthopaedic surgery. *Acta Anaesthesiol Scand* 2006;50:248-51.
51. Frey ME, Depalma MJ, Cifu DX, Bhagia SM, Carne W, Daitch JS. Percutaneous sacroplasty for osteoporotic sacral insufficiency fractures: a prospective, multicenter, observational pilot study. *Spine J* 2008;8:367-73.
52. Fribourg D, Tang C, Sra P, Delamarter R, Bae H. Incidence of subsequent vertebral fracture after kyphoplasty. *Spine (Phila Pa 1976)* 2004;29:2270-6; discussion 7.
53. Galibert P, Deramond H, Rosat P, Le Gars D. [Preliminary note on the treatment of vertebral angioma by percutaneous acrylic vertebroplasty]. *Neurochirurgie* 1987;33:166-8.

54. Garant M. Sacroplasty: a new treatment for sacral insufficiency fracture. *J Vasc Interv Radiol* 2002;13:1265-7.
55. Garfin SR, Yuan HA, Reiley MA. New technologies in spine: kyphoplasty and vertebroplasty for the treatment of painful osteoporotic compression fractures. *Spine (Phila Pa 1976)* 2001;26:1511-5.
56. Georgy BA. Interventional techniques in managing persistent pain after vertebral augmentation procedures: a retrospective evaluation. *Pain Physician* 2007;10:673-6.
57. Gold Deborah J, PhD, Silverman Stuart L, MD, FACP, FACR, "The Downward Spiral of Vertebral Osteoporosis: Consequences" Monograph, Remedica Communications, Inc., June 2003, Sponsored by Cedars-Sinai Medical Center, Los Angeles, CA. Grados F, Depriester C, Cayrolle G, et al. Long-term observations of vertebral osteoporotic fractures treated by percutaneous Vertebroplasty. *Rheumatology* 2000; Dec;39(12):1410-14.
58. Grados F, Depriester C, Cayrolle G, et al. Long-term observations of vertebral osteoporotic fractures treated by percutaneous Vertebroplasty. *Rheumatology* 2000; Dec;39(12):1410-14.
59. Grafe, I.A., Da Fonseca, K., Hillmeier, J., Meeder, P.J., Libicher, M., Nöldge, G., Bardenheuer, H., Pyerin, W., Basler, L., Weiss, C., Taylor, R.S., Nawroth, P., Kasperk, C. (2005). Reduction of pain and fracture incidence after kyphoplasty: 1-year outcomes of a prospective controlled trial of patients with primary osteoporosis. *Osteoporos Int*, 16(12), 2005-2012. Epub 2005 Aug 3.
60. Gray DT, Hollingworth W, Onwudiwe N, Jarvik JG. Costs and state-specific rates of thoracic and lumbar vertebroplasty, 2001-2005. *Spine (Phila Pa 1976)* 2008;33:1905-12.
61. Grohs, J.G., Matzner, M., Trieb, K., Krepler, P. (2005). Minimal invasive stabilization of osteoporotic vertebral fractures: a prospective nonrandomized comparison of vertebroplasty and balloon kyphoplasty. *J Spinal Disord Tech*, 18(3), 238-242. Grotle M, Brox JI, Vollestad NK. Concurrent comparison of responsiveness in pain and functional status measurements used for patients with low back pain. *Spine (Phila Pa 1976)* 2004;29:E492-501.
62. Grotle M, Brox JI, Vollestad NK. Concurrent comparison of responsiveness in pain and functional status measurements used for patients with low back pain. *Spine (Phila Pa 1976)* 2004;29:E492-50
63. Hardouin P, Fayada P, Leclot H, et al. Kyphoplasty. *Joint Bone Spine* 2002 May; 69(3):256-61.
64. Hardouin P, Grados F, Cotton A, et al. Should percutaneous Vertebroplasty be used to treat osteoporotic fractures? An update. *Joint Bone Spine* 2001 May; 68(3):216.21.
65. Hawthorne G, Osborne R. Population norms and meaningful differences for the Assessment of Quality of Life (AQoL) measure. *Aust N Z J Public Health* 2005;29:136-42.
66. Hiwatashi A, Westesson PL, Yoshiura T, et al. Kyphoplasty and vertebroplasty produce the same degree of height restoration. *AJNR Am J Neuroradiol* 2009; 30:669-73. WA HTA: Vertebroplasty, Kyphoplasty and Sacroplasty Final Report (11-4-2010) Page 124 of 126 *WA Health Technology Assessment – HTA*
67. Hrobjartsson A, Gotzsche PC. Is the placebo powerless? An analysis of clinical trials comparing placebo with no treatment. *N Engl J Med* 2001;344:1594-602.
68. Hrobjartsson A, Gotzsche PC. Is the placebo powerless? Update of a systematic review with 52 new randomized trials comparing placebo with no treatment. *J Intern Med* 2004;256:91-100.
69. Institute for Clinical Systems Improvement (ICSI). Assessment and Management of Chronic Pain. In. Bloomington, MN: *National Guideline Clearinghouse (NGC)*; 2008:84.
70. Interventional Procedures Programme. Interventional Procedure Guidance (IPG) for Vertebroplasty and Balloon Kyphoplasty. In: *National Institute for Health and Clinical Excellence*; 2007.
71. James Berenson, MD, Robert Pflugmacher, MD, Peter Jarzem, MD, Jeffrey Zonder, MD, Kenneth Schechtman, PhD, John B Tillman, PhD, Prof Leonard Bastian, MD, Talat Ashraf, MD, Prof Frank Vrionis, MD, for the Cancer Patient Fracture Evaluation (CAFÉ) Investigators. Balloon kyphoplasty versus non-surgical fracture management for treatment of painful vertebral body compression fractures in patients with cancer: a multicentre, randomized controlled trial. *The Lancet Oncology*, Volume 12, Issue 3, Pages 225-235, March 2011. Doi:10.1016/S1470-2045(11)70008-0.
72. Jang JS, Lee SH, Jung SK. Pulmonary embolism of polymethylmethacrylate after percutaneous vertebroplasty: a report of three cases. *Spine (Phila Pa 1976)* 2002;27:E416-8.
73. Jarvik JG, Deyo RA. Cementing the evidence: time for a randomized trial of vertebroplasty. *AJNR Am J Neuroradiol* 2000;21:1373-4.
74. Jensen ME, Evans AJ, Mathis JM, Kallmes DF, Cloft HJ, Dion JE. Percutaneous polymethylmethacrylate vertebroplasty in the treatment of osteoporotic vertebral body compression fractures: technical aspects. *AJNR Am J Neuroradiol* 1997;18:1897-904.
75. Johnell O, Kanis JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. *Osteoporos Int* 2006;17:1726-33.
76. Jones JO, Bruel BM, Vattam SR, Management of painful vertebral hemangiomas with kyphoplasty; a report of two cases and a literative review. *Pain Physician*. 2009 July-Aug;12(4): E297-303.
77. Kado DM, Browner WS, Palermo L, Nevitt MC, Genant HK, Cummings SR. Vertebral fractures and mortality in older women: a prospective study. Study of Osteoporotic Fractures Research Group. *Arch Intern Med* 1999;159:1215-20.

78. Kallmes, D.F., Comstock, B.A., Heagerty, P.J., Turner, J.A., Wilson, D.J., Diamond, T.H., Edwards, R., Gray, L.A., Stout, L., Owen, S., Hollingworth, W., Ghdoke, B., Annesley-Williams, D.J., Ralston, S.H., Jarvik, J.G. (2009). A randomized trial of vertebroplasty for osteoporotic spinal fractures. *New England Journal of Medicine*, 361(6), 569-579. doi: 10.1056/NEJMoa0900563.
79. Kallmes DF, Comstock BA, Gray LA, et al. Baseline pain and disability in the Investigational Vertebroplasty Efficacy and Safety Trial. *AJNR Am J Neuroradiol* 2009;30:1203-5.
80. Kamel EM, Binaghi S, Guntern D, Mouhsine E, Schnyder P, Theumann N. Outcome of long-axis percutaneous sacroplasty for the treatment of sacral insufficiency fractures. *Eur Radiol* 2009 Dec; 19(12):3002-7.
81. Kang SE, Lee JW, Kim JH, Park KW, Yeom JS, Kang HS. Percutaneous sacroplasty with the use of C-arm flat-panel detector CT: technical feasibility and clinical outcome. *Skeletal Radiol* 2010. WA HTA: Vertebroplasty, Kyphoplasty and Sacroplasty Final Report (11-4-2010) Page 125 of 126 *WA Health Technology Assessment – HTA*
82. Kasperk, C., Grafe, I.A., Schmitt, S., Nöldge, G., Weiss, C., Da Fonseca, K., Hillmeier, J., Libicher, M., Sommer, U., Rudofsky, G., Meeder, P.J., Nawroth, P. (2010). Three-year outcomes after kyphoplasty in patients with osteoporosis with painful vertebral fractures. *J Vasc Interv Radiol*. 21(5),701-9. doi: 10.1016/j.jvir.2010.01.003. Epub 2010 Mar 20.
83. Kim AK, Jensen ME, Dion JE, Schweickert PA, Kaufmann TJ, Kallmes DF. Unilateral transpedicular percutaneous vertebroplasty: initial experience. *Radiology* 2002;222:737-41.
84. Klazen CA, Venmans A, de Vries J, et al. Percutaneous Vertebroplasty Is Not a Risk Factor for New Osteoporotic Compression Fractures: Results from *VERTOS II*. *AJNR Am J Neuroradiol*.
85. Klazen, C.A., Lohle, P.N., de Vries, J., Jansen, F.H., Tielbeek, A.V., Blonk, M.C., Venmans, A., van Rooij, W.J., Schoemaker, M.C., Juttman, J.R., Lo, T.H., Verhaar, H.J., van der Graaf, Y., van Everdingen, K.J., Muller, A.F., Elgersma, O.E., Halkema, D.R., Fransen, H., Janssens, X., Buskens, E., Mali, W.P. (2010). Vertebroplasty versus conservative treatment in acute osteoporotic vertebral compression fractures (Vertos II): an open-label randomised trial. *Lancet*, 376(9746), 1085-1092. doi: 10.1016/S0140-6736(10)60954-3. Epub 2010 Aug 9.
86. Klotzbuecher CM, Ross PD, Landsman PB, Abbott TA, 3rd, Berger M. Patients with prior fractures have an increased risk of future fractures: a summary of the literature and statistical synthesis. *J Bone Miner Res* 2000; 15:721-39.
87. Korovessis, P., Vardakastanis, K., Repantis, T., Vitsas, V. (2013). Balloon kyphoplasty versus KIVA vertebral augmentation comparison of 2 techniques for osteoporotic vertebral body fractures: a prospective randomized study. *Spine*, 38(4), 292-299. doi: 10.1097/BRS.0b013e31826b3aef.
88. Köse KC, Cebesoy O, Akan B, Altinel L, Dincer D, Yazar T. Functional results of vertebral augmentation techniques in pathological vertebral fractures of myelomatous patients. *J Natl Med Assoc* 2006;98:1654-8.
89. Krueger A, Bliemel C, Zettl R, Ruchholtz S. Management of pulmonary cement embolism after percutaneous vertebroplasty and kyphoplasty: a systematic review of the literature. *Eur Spine J* 2009;18:1257-65.
90. Kumar, K., Nguyen, R., Bishop, S. (2010). A comparative analysis of the results of vertebroplasty and kyphoplasty in osteoporotic vertebral compression fractures. *Neurosurgery*. 67(3 Suppl Operative),ons 171-188; discussion ons188. doi: 10.1227/01.NEU.0000380936.00143.11.
91. Langdon J, Way A, Heaton S, Bernard J, Molloy S. Vertebral compression fractures—new clinical signs to aid diagnosis. *Ann R Coll Surg Engl* 2010 Mar;92(2):163-6.
92. Lange LL, Jacox A. Using large data bases in nursing and health policy research. *J Prof Nurs* 1993; 9:204.
93. Laredo JD, Hamze B. Complications of percutaneous vertebroplasty and their prevention. *Skeletal Radiol* 2004;33:493-505.
94. Lee IJ, Choi AL, Yie MY, et al. CT evaluation of local leakage of bone cement after percutaneous kyphoplasty and vertebroplasty. *Acta Radiol* 2010;51:649-54.
95. Lee MJ, Dumonski M, Cahill P, Stanley T, Park D, Singh K. Percutaneous treatment of vertebral compression fractures: a meta-analysis of complications. *Spine (Phila Pa 1976)* 2009;34:1228-32. WA HTA: Vertebroplasty, Kyphoplasty and Sacroplasty Final Report (11-4-2010) Page 120 of 126 *WA Health Technology Assessment – HTA*
96. Leroux JL, Denat B, Thomas E, Blotman F, Bonnel F. Sacral insufficiency fractures presenting as acute low-back pain. Biomechanical aspects. *Spine (Phila Pa 1976)* 1993;18:2502-6.
97. Lieberman IH, Dudeney S, Reinhardt MK, et al. Initial outcome and efficacy of kyphoplasty in the treatment of painful osteoporotic vertebral compression fractures. *Spine* 2001; 26(14):1631-7.
98. Lieberman IH, Phillips FM, Togawa D, et al. Vertebral augmentation and the limits of interpreting complications reported in the food and drug administration manufacturer and user facility device experience database. *J Vasc Interv Radiol* 2004;15:1193-6.
99. Lin J, Lachmann E, Nagler W. Sacral insufficiency fractures: a report of two cases and a review of the literature. *J Womens Health Gend Based Med* 2001;10:699-705.
100. Lin JT, Lane JM. Sacral stress fractures. *J Womens Health (Larchmt)* 2003;12:879-88.

101. Liu JT, Liao WJ, Tan WC, et al. Balloon kyphoplasty versus vertebroplasty for treatment of osteoporotic vertebral compression fracture: a prospective, comparative, and randomized clinical study. *Osteoporos Int* 2010;21:359-64.
102. Lindsay R, Silverman SL, Cooper C, et al. Risk of new vertebral fracture in the year following a fracture. *Jama* 2001;285:320-3.
103. Lieberman IH, Dudeney S, Reinhardt MK, Bell G. Initial outcome and efficacy of "kyphoplasty" in the treatment of painful osteoporotic vertebral compression fractures. *Spine (Phila Pa 1976)* 2001;26:1631-8. WA HTA: Vertebroplasty, Kyphoplasty and Sacroplasty Final Report (11-4-2010) Page 119 of 126 WA Health Technology Assessment – HTA
104. Liu, J.T., Liao, W.J., Tan, W.C., Lee, J.K., Liu, C.H., Chen, Y.H., Lin, T.B. (2010). Balloon kyphoplasty versus vertebroplasty for treatment of osteoporotic vertebral compression fracture: a prospective, comparative, and randomized clinical study. *Osteoporos Int.* 21(2), 359-364. doi: 10.1007/s00198-009-0952-8. Epub 2009 Jun 10.
105. Lovi, A., Teli, M., Ortolina, A., Costa, F., Fornari, M., Brayda-Bruno, M. (2009). Vertebroplasty and kyphoplasty: complementary techniques for the treatment of painful osteoporotic vertebral compression fractures. A prospective non-randomised study on 154 patients. *Eur Spine J*, 18 Suppl 1,95-101. doi: 10.1007/s00586-009-0986-9. Epub 2009 May 13.
106. McDonald RJ, Gray LA, Cloft HJ, Thielen KR, Kallmes DF. The effect of operator variability and experience in vertebroplasty outcomes. *Radiology* 2009; 253:478-85.
107. Management of osteoporosis in postmenopausal women: 2010 position statement of the North American Menopause Society. *Menopause* 2010 Jan-Feb;17(1) :25-54; quiz 5-6.
108. Mark D. Percutaneous Vertebroplasty or Kyphoplasty for Vertebral Fractures Caused by Osteoporosis or Malignancy. In: *BCBS Tec Assessment Program, ed.*; 2008:1-38.
109. Martin G. Radvany, MD, Kieran J. Murphy, MD FRCPC, Steven F. Millward, MD, et al. Research Reporting Standards for Percutaneous Vertebral Augmentation. *J Vasc Interv Radiol* 2009; 20:1279-1286.
110. Martin JB, Wetzel SG, Seium Y, et al. Percutaneous vertebroplasty in metastatic disease: transpedicular access and treatment of lysed pedicles initial experience. *Radiology* 2003;229:593-7.
111. Martin JB, Jean B, Sugiu K, et al. Vertebroplasty: clinical experience and follow-up results. *Bone* 1999 Aug; 25(2 suppl): 11S-15S.
112. Mary E. Jensen M, J. Kevin McGraw, John F. Cardella, Joshua A. Hirsch. Position Statement on Percutaneous Vertebral Augmentation: A Consensus Statement Developed by the American Society of Interventional and Therapeutic Neuroradiology, Society of Interventional Radiology, American Association of Neurological Surgeons/Congress of Neurological Surgeons, and American Society of Spine Radiology. *Journal of Vascular and Interventional Radiology* July 2009;(Vol.20, Issue 7, Supplement, pages S326-S331).
113. Masala S, Ciarrapico AM, Konda D, Vinicola V, Mammucari M, Simonetti G. Cost effectiveness of percutaneous vertebroplasty in osteoporotic vertebral fractures. *Eur Spine J* 2008;17:1242-50.
114. Mathis JM, Ortiz AO, Zoarski GH. Vertebroplasty versus kyphoplasty: a comparison and contrast. *AJNR Am J Neuroradiol* 2004;25:840-5. WA HTA: Vertebroplasty, Kyphoplasty and Sacroplasty Final Report (11-4-2010) Page 123 of 126 WA Health Technology Assessment – HTA
115. Mendel E, Bourekas E, Gerszten P, Golan JD. Percutaneous techniques in the treatment of spine tumors: what are the diagnostic and therapeutic indications and outcomes? *Spine (Phila Pa 1976)* 2009;34:S93-100. WA HTA: Vertebroplasty, Kyphoplasty and Sacroplasty Final Report (11-4-2010) Page 122 of 126 WA Health Technology Assessment – HTA
116. Million R, Hall W, Nilsen KH, Baker RD, Jayson MI. Assessment of the progress of the back-pain patient 1981 Volvo Award in Clinical Science. *Spine (Phila Pa 1976)* 1982;7:204-12.
117. Ming JH, Zhou JL, Zhou PH, Zhou JP. Comparison of therapeutic effect between percutaneous kyphoplasty and pedicle screw system on vertebral compression fracture. *Chin J Traumatol* 2007;10:40-3.
118. Movrin, I., Vengust, R., Komadina, R. (2010). Adjacent vertebral fractures after percutaneous vertebral augmentation of osteoporotic vertebral compression fracture: a comparison of balloon kyphoplasty and vertebroplasty. *Arch Orthop Trauma Surg*, 130(9), 1157-1166. doi: 10.1007/s00402-010-1106-3. Epub 2010 May 7.
119. Mudano AS, Bian J, Cope JU, et al. Vertebroplasty and kyphoplasty are associated with an increased risk of secondary vertebral compression fractures: a population-based cohort study. *Osteoporos Int* 2009;20:819-26.
120. Nakano M, Hirano N, Ishihara H, Kawaguchi Y, Watanabe H, Matsuura K. Calcium phosphate cement-based vertebroplasty compared with conservative treatment for osteoporotic compression fractures: a matched case-control study. *J Neurosurg Spine* 2006;4:110-7.
121. National Collaborating Centre for Cancer. Metastatic Spinal Cord Compression. Diagnosis and Management of Adults at Risk of and with Metastatic Spinal Cord Compression. In: *(NICE) NifHaCE, ed.*; 2008:39.
122. Nussbaum DA, Gailloud P, Murphy K. A review of complications associated with vertebroplasty and kyphoplasty as reported to the Food and Drug Administration medical device related web site. *J Vasc Interv Radiol* 2004; 15:1185-92.

123. Oh GS, Kim HS, Ju CI, Kim SW, Lee SM, Shin H. Comparison of the results of balloon kyphoplasty performed at different times after injury. *J Korean Neurosurg Soc* 2010 Mar;47(3)L:199-202.
124. O'Neill TW, Cooper C, Cannata JB, et al. Reproducibility of a questionnaire on risk factors for osteoporosis in a multicentre prevalence survey: the European Vertebral Osteoporosis Study. *Int J Epidemiol* 1994; 23:559-65.
125. Ostelo RW, Deyo RA, Stratford P, et al. Interpreting change scores for pain and functional status in low back pain: towards international consensus regarding minimal important change. *Spine (Phila Pa 1976)* 2008;33:90-4.
126. Oxford Centre for Evidence-based Medicine Levels of Evidence. 2009. (Accessed 9/27/10, at <http://www.cebm.net/?o=1025>.)
127. Padovani B, Kasriel O, Brunner P, Peretti-Viton P. Pulmonary embolism caused by acrylic cement: a rare complication of percutaneous vertebroplasty. *AJNR Am J Neuroradiol* 1999;20:375-7.
128. Patrick DL, Deyo RA, Atlas SJ, Singer DE, Chapin A, Keller RB. Assessing health-related quality of life in patients with sciatica. *Spine (Phila Pa 1976)* 1995;20:1899-908; discussion 909.
129. Pflugmacher R, Taylor R, Agarwal A, Melcher I, Disch A, Haas NP, et al. Balloon kyphoplasty in the treatment of metastatic disease of the spine: a 2-year prospective evaluation. *Eur Spine J* 2008 Aug;17(8):1042-8.
130. Ratliff J, Nguyen T, Heiss J, Root and spinal cord compression from methylmethacrylate Vertebroplasty. *Spine* 2001; 26(13):E300-2.
131. The role of vertebral augmentation in myeloma: International Myeloma Working Group Consensus Statement. MA Hussen et al, *Leukemia*, Volume 22, Number 8, August 2008.
132. Röllinghoff, M., Siewe, J., Zarghooni, K., Sobottke, R., Alparslan, Y., Eysel, P., Delank, K.S. (2009). Effectiveness, security and height restoration on fresh compression fractures a comparative prospective study of vertebroplasty and kyphoplasty. *Minim Invasive Neurosurg.* 52(5-6), 233-237. doi: 10.1055/s-0029-1243631. Epub 2010 Jan 14.
133. Ross PD. Clinical consequences of vertebral fractures. *Am J Med* 1997;103: 30S-42S; discussion S-3S.
134. Rousing R, Andersen MO, Jespersen SM, Thomsen K, Lauritsen J. (2009). Percutaneous vertebroplasty compared to conservative treatment in patients with painful acute or subacute osteoporotic vertebral fractures: three-months follow-up in a clinical randomized study. *Spine*, 1;34(13),1349-54. doi: 10.1097/BRS.0b013e3181a4e628.
135. Rousing, R., Hansen, K.L., Andersen, M.O., Jespersen, S.M., Thomsen, K., Lauritsen, J.M. (2010). Twelve -months follow-up in forty-nine patients with acute/semiacute osteoporotic vertebral fractures treated conservatively or with percutaneous vertebroplasty: a clinical randomized study. *Spine*, 35(5),478-482. doi: 10.1097/BRS.0b013e3181b71bd1.
136. Santiago, F.R., Abela, A.P., Alvarez, L.G., Osuna, R.M., García Mdel, M. (2010). Pain and functional outcome after vertebroplasty and kyphoplasty. A comparative study. *Eur J Radiol*, 75(2),e108-113. doi: 10.1016/j.ejrad.2010.01.010. Epub 2010 Feb 6.
137. Schofer, M.D. Efe, T., Timmesfeld, N., Kortmann, H.R., Quante M. (2009). Comparison of Kyphoplasty and Vertebroplasty in the treatment of fresh vertebral compression fractures. *Arch Orthop Trauma Surg.* 129(10), 1391-1399. Doi:10.1007/s00402-009-0901—1. Epub 2009 May 27.
138. Silverman SL. The clinical consequences of vertebral compression fracture. *Bone* 1992;13 *Suppl* 2:S27-31.
139. Smith DK, Dix JE. Percutaneous sacroplasty: long-axis injection technique. *AJR Am J Roentgenol* 2006; 186:1252-5.
140. Standard for the Performance of Percutaneous Vertebroplasty. *American College of Radiology*. Reston, Virginia. January 2001.
141. Ström O, Leonard C, Marsh D, Cooper C. Cost-effectiveness of balloon kyphoplasty in patients with symptomatic vertebral compression fractures in a UK setting. *Osteoporos Int* 2010 Sep;21(9) :1599-608.Epub 2009 Nov 19.
142. Strub WM, Hoffmann M, Ernst RJ, Bulas RV. Sacroplasty by CT and fluoroscopic guidance: is the procedure right for your patient? *AJNR Am J Neuroradiol* 2007; 28:38-41.
143. Taillandier J, Langue F, Alemanni M, Taillandier-Herliche E. Mortality and functional outcomes of pelvic insufficiency fractures in older patients. *Joint Bone Spine* 2003; 70:287-9. WA HTA: Vertebroplasty, Kyphoplasty and Sacroplasty Final Report (11-4-2010) Page 121 of 126 WA Health Technology Assessment – HTA
144. Tanigawa N, Komemushi A, Kariya S, et al. Relationship between cement distribution pattern and new compression fracture after percutaneous vertebroplasty. *AJR Am J Roentgenol* 2007;189:W348-52.
145. Taylor RS, Fritzell P, Taylor RJ. Balloon kyphoplasty in the management of vertebral compression fractures: an updated systematic review and meta-analysis. *Eur Spine J* 2007; 16:1085-100.
146. Tozzi P, Abdelmoumene Y, Corno AF, Gersbach PA, Hoogewoud HM, von Segesser LK. Management of pulmonary embolism during acrylic vertebroplasty. *Ann Thorac Surg* 2002; 74:1706-8.
147. Uhthoff HK, Jaworski ZF. Bone loss in response to long-term immobilisation. *J Bone Joint Surg Br* 1978;60-B: 420-9.
148. Vase L, Riley JL, 3rd, Price DD. A comparison of placebo effects in clinical analgesic trials versus studies of placebo analgesia. *Pain* 2002; 99:443-52.

149. Venmans A, Klazen CA, Lohle PN, et al. Percutaneous Vertebroplasty and Pulmonary Cement Embolism: Results from *VERTOS II*. *AJNR Am J Neuroradiol*.
150. Venmans A, Klazen CA, van Rooij WJ, de Vries J, Mali WP, Lohle PN. Postprocedural CT for perivertebral cement leakage in percutaneous vertebroplasty is not necessary-results from *VERTOS II*. *Neuroradiology* 2010.
151. Voormolen, M.H., Mali, W.P., Lohle, P.N., Fransen, H., Lampmann, L.E., van der Graaf, Y., Juttman, J.R., Janssens, X., Verhaar, H.J. (2007). Percutaneous vertebroplasty compared with optimal pain medication treatment: short-term clinical outcome of patients with subacute or chronic painful osteoporotic vertebral compression fractures. The *VERTOS* study. *AJNR Am J Neuroradiol*, 28(3), 555-560.
152. Wardlaw, D., Cummings, S.R., Van Meirhaeghe, J., Bastian, L., Tillman, J.B., Ranstam, J., Eastell, R., Shabe, P., Talmadge, K., Boonen, S. (2009). Efficacy and safety of balloon kyphoplasty compared with non-surgical care for vertebral compression fracture (FREE): a randomised controlled trial. *Lancet*, 21;373(9668),1016-1024. doi: 10.1016/S0140-6736(09)60010-6. *Epub* 2009 Feb 24.
153. Watts NB, Harris ST, Genant HK. Treatment of painful osteoporotic vertebral fractures with percutaneous Vertebroplasty or kyphoplasty. *Osteoporosis Int*. 2001; 12(6):429-37.
154. Weber M, Hasler P, Gerber H. Insufficiency fractures of the sacrum. Twenty cases and review of the literature. *Spine (Phila Pa 1976)* 1993;18:2507-12.
155. West S, King V, Carey TS, et al. Systems to Rate the Strength Of Scientific Evidence. Rockville, MD: *Agency for Healthcare Research and Quality*; 2002.
156. Whitlow CT, Mussat-Whitlow BJ, Mattern CW, Baker MD, Morris PP. Sacroplasty versus vertebroplasty: comparable clinical outcomes for the treatment of fracture-related pain. *AJNR Am J Neuroradiol* 2007;28:1266-70.
157. Zampini JM, White AP, McGuire KJ. Comparison of 5766 Vertebral Compression Fractures Treated With or Without Kyphoplasty. *Clin Orthop Relat Res*; 2010.
158. Zhou JL, Liu SQ, Ming JH, Peng H, Qiu B. Comparison of therapeutic effect between percutaneous vertebroplasty and kyphoplasty on vertebral compression fracture. *Chin J Traumatol* 2008;11:42-4.
159. Other carriers' medical policies
160. Noridian Carrier Advisory Committee Members and the Part A Pain workgroup.

[Back to Top](#)

Revision History Information

Revision History Date	Revision History Number	Revision History Explanation	Reason(s) for Change
10/01/2015	R6	<p>01/18/18-At this time 21st Century Cures Act will apply to new and revised LCDs that restrict coverage which requires comment and notice. This revision is not a restriction to the coverage determination; and, therefore not all the fields included on the LCD are applicable as noted in this policy.</p> <p>In Coverage Indications, Limitations and/or Medical Necessity, removal of:</p> <ul style="list-style-type: none"> • The medical record must contain assessment of patient condition and response to treatment at one month, three months and 6 months post procedure unless the patient is enrolled in a registry. Telephone follow up with documentation of outcomes is acceptable. Documentation of at least two (2) unsuccessful and reasonable attempts to contact the patient may substitute for the 3 or 6 moth follow up evaluations. 	<ul style="list-style-type: none"> • Other (New/Change to audit direction)

Revision History Date	Revision History Number	Revision History Explanation	Reason(s) for Change
10/01/2015	R5	<ul style="list-style-type: none"> Enrollment in a registry with an outcomes documentation schedule consistent with that described in this LCD is an acceptable substitute for medical records' follow up documentation. Any acceptable registry must be compliant with the principles established in the AHRQ's "Registries for Evaluating Patient Outcomes: A User's Guide". (See bibliography.) Noridian knows of one such registry currently available for enrollment. The link to the registry is: http://www.benchmarkmedical.com/VCF Registry/ This homepage describes the registry as well as registration resources. 	<ul style="list-style-type: none"> Other (This final LCD, effective 10/01/2015, combines JFA L34168 into the JFB LCD so that both JFA and JFB contract numbers will have the same final MCD LCD number.)
10/01/2015	R4	LCD revised to add 178 ICD codes in Group 1 to be consistent with this policy in JFA. Information in the Coverage Indications, Limitations and/or Medical Necessity and in the Documentation Requirements portions of the LCD was not changed.	<ul style="list-style-type: none"> Revisions Due To ICD -10-CM Code Changes
10/01/2015	R3	The LCD is revised to correct the link to the VCF registry.	<ul style="list-style-type: none"> Other (Correct the link to the VCF Registry referenced in the LCD.)
10/01/2015	R2	The LCD is revised to remove the deleted CPT codes 22520, 22521, 22522, 22523, 22524, 22525, 72291, 72292 and replaced with 22510, 22511, 22512, 22513, 22514 and 22515.	<ul style="list-style-type: none"> Revisions Due To CPT/HCPCS Code Changes
10/01/2015	R1	This LCD is renamed to "Percutaneous Vertebral Augmentation" for the comment period ending 3/4/2014. The original LCD title was "Vertebroplasty, Vertebral Augmentation; Percutaneous".	<ul style="list-style-type: none"> Provider Education/Guidance Creation of Uniform LCDs Within a MAC Jurisdiction

[Back to Top](#)

Associated Documents

Attachments N/A

Related Local Coverage Documents N/A

Related National Coverage Documents N/A

Public Version(s) Updated on 01/24/2018 with effective dates 10/01/2015 - N/A [Updated on 07/08/2016 with effective dates 10/01/2015 - N/A](#) [Updated on 10/21/2015 with effective dates 10/01/2015 - N/A](#) [Updated on 10/09/2015 with effective dates 10/01/2015 - N/A](#) [Updated on 12/15/2014 with effective dates 10/01/2015 - N/A](#) [Updated on 07/22/2014 with effective dates 10/01/2015 - N/A](#) [Updated on 03/31/2014 with effective dates 10/01/2015 - N/A](#) [Back to Top](#)

Keywords

- 22510
- 22511
- 22512
- 22513
- 22514
- 22515
- Percutaneous
- Vertebral
- Augmentation
-
-

Read the [LCD Disclaimer](#) [Back to Top](#)