



# Health service cost associated with percutaneous vertebroplasty in patients with spinal metastases

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## ARTICLE INFORMATION

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**AIMS:** To ascertain prospectively the health service cost of vertebroplasty in a cohort of consecutive patients with spinal metastases.

**MATERIALS AND METHODS:** Percutaneous vertebroplasty was performed under conscious sedation and local anaesthetic in the Interventional Suite with fluoroscopic guidance. Data were collected prospectively on standard forms. Quality of life questionnaires (EQ-5D) were filled out pre-, 6 weeks, and at 6 months post-vertebroplasty.

**RESULTS:** The majority of the procedures were performed on an outpatient basis (8/11). The median duration of the procedure was 60 min (range 40–80 min) with a further 60 min spent in the recovery room (range 10–230 min). Personnel involved included a consultant radiologist, a radiology registrar, four nurses, and two radiographers. The average cost of vertebroplasty per patient, including consumables, capital equipment, hotel/clinic costs, and staffing, was £2213.25 (95% CI £729.95). The mean EQ-5D utility scores increased from 0.421 pre-treatment to 0.5979 post-treatment ( $p = 0.047$ ). The visual analogue scale (VAS) of perceived health improved from a mean of 41.88 to 63.75 ( $p = 0.00537$ ).

**CONCLUSION:** Health service costs for percutaneous vertebroplasty in patients with spinal metastases is significantly lower than previously estimated and is in keeping with that of other palliative radiological procedures.

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## Introduction

Vertebroplasty was first described by Galibert et al.<sup>1</sup> in 1987 as a treatment for painful vertebral angioma. Since then, its use has expanded to include treatment for osteoporotic wedge fractures, spinal metastases, and spinal trauma. In 2007, a multisociety consensus statement concluded that vertebroplasty was a safe and efficacious treatment for osteoporosis.<sup>2</sup> A recent open-label, randomized trial concluded that vertebroplasty for acute

osteoporotic fractures had an acceptable cost of €22,685 per quality-adjusted life year (QALY) gained when compared to conservative management.<sup>3</sup> Little information is available regarding the cost of vertebroplasty in the setting of malignancy, in a group of patients who may have a limited life expectancy and severe intractable pain.

The National Institute for Health and Clinical Excellence (NICE) approved the use of vertebroplasty or kyphoplasty for patients with spinal metastases in November 2008.<sup>4</sup> This was based on expert opinion with costing calculated on the procedure performed under general anaesthetic with a protracted inpatient stay.

The aim of the present study was to ascertain prospectively the health service cost of vertebroplasty in a cohort of consecutive patients with spinal metastases.

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## Materials and materials

Vertebroplasty for spinal metastases has been performed at Gartnavel General Hospital by the senior author since 2001. The procedure is performed under conscious sedation and local anaesthetic in the Interventional Suite with fluoroscopic guidance. Data were collected prospectively on standard forms in a consecutive series of patients undergoing vertebroplasty for spinal metastases between August to December 2011. Quality of life questionnaires (EQ-5D) were filled out pre-, 6 weeks, and at 6 months post-vertebroplasty. The EQ-5D is a standardized instrument for use as a measure of health outcome. It is a two-page questionnaire comprising the EQ-5D descriptive system and the EQ visual analogue scale (EQ VAS). The descriptive system comprises five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. The EQ VAS records the respondent's self-rated health on a vertical, visual analogue scale, where the end points are labelled "Best imaginable health state" and "Worst imaginable health state".

Ethics committee approval was not deemed necessary by the committee chairperson.

### Measurement of costs

#### Operative costs

Theatre running costs were based on the Department of Health published national schedule of reference cost.<sup>5</sup> This was combined with variable operative costs. To obtain the most accurate data, operative costs relating to percutaneous vertebroplasty (equipment and consumables) were identified and measured prospectively. A structured questionnaire was completed during a sample of operations. For items of equipment, an estimation of their lifespan was obtained, as well as any maintenance cost and approximation of the number of times used. From this, an annual equivalent cost was estimated and divided by the annual use to obtain a cost per hour per patient. The staffing element of the theatre costs was based on the team, which reflected the grade of radiologist and assistant, as well as the number and grade of radiographic and nursing staff. Where complications were identified, the cost of each event was compiled and attached as a "complication cost".

#### Other healthcare costs

The cost of an inpatient day (including staffing, capital charges, and overheads) on a general medical ward was also based on the Department of Health figures.<sup>5</sup> For each patient, this cost was multiplied by the total inpatient stay. Drugs were costed according to the manufacturers' price lists.

The cost of imaging pre-vertebroplasty was not included in this exercise as they were performed as part of the patients' routine follow-up.

Mean cost for percutaneous vertebroplasty was calculated using individual patient data refined with the additional, more detailed information from the procedure cost questionnaire. The cost data were analysed by intention to treat.

### Health status

The EQ-5Q questionnaire was used for the economic evaluation to permit the calculation of QALYs. Data were collected pre- and 6 weeks post-vertebroplasty for 10 patients. Data were also collected after at least 6 months to assess long-term change, if any. The EQ-5D is a generic measure of health status that defines health in terms of five broad dimensions, each with three levels (Table 1). Combinations of these dimensions and levels gives rise to 243 health states. These health states were given QOL scores by a sample of the general public and a UK tariff compiled.<sup>6,7</sup>

### Statistical analysis

Data are expressed as median with range. Summary statistics of the baseline utility score are given as mean values with standard error. The level of significance was set at 0.05. Data were processed using Microsoft® Office Excel 2003.

## Results

Of the 11 consecutive patients who underwent vertebroplasty over the 4 month period, eight were performed as planned outpatient procedures and three were referred with intractable pain whilst in hospital. Two planned outpatient procedures were performed as day-cases. Five required overnight stay in a general ward because of social circumstance or distance from home, while one stayed in hospital for 2 days as his procedure was cancelled and rescheduled. Two of the inpatients were discharged from hospital 1 and 2 days post-vertebroplasty, whereas the third patient died 2 weeks post-vertebroplasty from his primary malignancy.

Most of the patients underwent vertebroplasty for one ( $n = 5$ ) or two ( $n = 5$ ) levels. One patient had three spinal levels treated. The median duration of the procedure was 60 min (range 40–80 min) with a median duration of 60 min (range 10–230 min) spent in recovery pre- and

**Table 1**  
The EQ-5D descriptive system.

Mobility
1. No problems in walking about
2. Some problems in walking about
3. Confined to bed
Self-care
1. No problems with self-care
2. Some problems with washing or dressing myself
3. Unable to wash or dress myself
Usual activities
1. No problems with performing usual activities (eg work, study, housework, family or leisure activities)
2. Some problems with performing usual activities
3. Unable to performed usual activities
Pain/discomfort
1. No pain or discomfort
2. Moderate pain or discomfort
3. Extreme pain or discomfort
Anxiety/depression
1. Not anxious or depressed
2. Moderately anxious or depressed
3. Extremely anxious or depressed

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