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Research Paper

Pathologic fracture and healthcare resource utilisation: A retrospective study in eight European countries

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ABSTRACT

Background: Skeletal-related events (SREs; pathologic fracture [PF], spinal cord compression and radiation or surgery to bone) are common complications of bone metastases or bone lesions and can impose a considerable burden on patients and healthcare systems. In this study, the healthcare resource utilisation (HRU) associated with PFs in patients with bone metastases or lesions secondary to solid tumours or multiple myeloma was estimated in eight European countries.

Methods: Eligible patients were identified in Austria, the Czech Republic, Finland, Greece, Poland, Portugal, Sweden and Switzerland. HRU data were extracted from hospital charts from 3.5 months before the index PF (defined as a PF preceded by a 6.5-month period without a SRE) until 3 months after the last SRE during the study period. Changes from baseline in the number and duration of inpatient stays, number of outpatient visits and number of procedures provided were recorded.

Results: Overall, 118 patients with PFs of long bones (those longer than they are wide, e.g. the femur) and 241 patients with PFs of other bones were included. Overall, HRU was greater in patients with long bone PFs than in those with PFs of other bones. A higher proportion of patients with long bone PFs had multiple SREs (79.7%), and more of their SREs were considered to be linked (73.4%) compared with patients with PFs of other bones (51.0% and 47.2%, respectively).

Conclusion: The increased number and duration of inpatient stays for PFs of long bones compared with those for PFs of other bones may be due in part to the requirement for complicated and lengthy rehabilitation in patients with long bone PFs. Implementing strategies to delay or reduce the number of PFs experienced by patients with bone metastases or lesions may therefore reduce the associated HRU and patient burden.

1. Introduction

Bone metastases affect up to two-thirds of patients with advanced solid tumours such as breast, prostate or lung cancer [1], and osteolytic bone lesions are typical of multiple myeloma [2]. Individuals with bone metastases or lesions are at a high risk of experiencing skeletal-related events (SREs), including pathologic fractures (PFs), spinal cord compression and radiation or surgery to bone [3–6].

PFs have commonly been reported in the placebo arms of clinical trials that evaluated the effect of bisphosphonates in patients with bone metastases secondary to advanced cancers [7–9] and have been shown to be detrimental to patients' quality of life [10]. Statistically significant declines in the physical and emotional well-being of patients have been reported after experiencing PFs [11]. Patients with PFs often require

AbbreviationsHRUhealthcare resource utilisationICDInternational Classification of DiseasesPFpathologic fractureSDstandard deviationSREskeletal-related event

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substantial orthopaedic treatment, including rehabilitation and supportive care, such as pain relief, and therefore utilise considerable healthcare resources. Furthermore, the occurrence of PFs has been correlated with reduced survival rates in patients with bone metastases [12].

Several studies worldwide have revealed that HRU and costs associated with SREs, including PFs, in patients with bone metastases or lesions are substantial [13–16]. However, these studies have focused either on single countries or on small numbers of European countries. Increasing healthcare providers' knowledge of the HRU associated with PFs in patients with bone metastases or lesions in Europe would highlight the potential economic value of using treatments that prevent or delay SREs. Such treatments may also reduce HRU and maintain patients' quality of life. This study aimed to estimate the HRU associated with PFs in patients with bone metastases secondary to solid tumours or lesions secondary to multiple myeloma in eight European countries.

2. Methods

This was a multinational, retrospective study to assess hospital-related HRU associated with PFs in patients with bone metastases or lesions from Austria, the Czech Republic, Finland, Greece, Poland, Portugal, Sweden and Switzerland. Patients eligible to participate in the study were aged 20 years or older, had bone metastases secondary to breast, lung or prostate cancer, or bone lesions due to multiple myeloma. Patients also had to have experienced an index PF (defined as a PF preceded by a SRE-free period of at least 6.5 months) during the study period (from 1 July 2004 to 1 July 2009) to be included. Exclusion criteria included current enrolment or previous participation in a denosumab clinical trial, death less than 2 weeks after the index PF and patient chart data of insufficient quality. Relevant patient charts were identified at each site from electronic or paper patient lists using the International Classification of Diseases (ICD) Ninth Revision (ICD-9) and Tenth Revision (ICD-10) codes. Data from consecutive patient charts for those fulfilling the inclusion criteria and not meeting the exclusion criteria were captured during the study period. The patient chart with the most recent PF was analysed first (even if this is not the most recent Index SRE), then the second most recent was analysed (i.e. systematically in reverse consecutive order) until the planned number of PFs were documented on a country level.

According to European legislation for this type of retrospective research, informed consent is generally not required. However, it was provided when specifically requested by local authorities or the institution. This study was approved by official government institutions and ethics committees, where required.

2.1. PF data collection

PFs were grouped into those affecting long bones (i.e. bones that are longer than they are wide, such as the femur) or those involving other bones. Long bone fractures are usually major clinical events, whereas fractures of some other bones may be asymptomatic and may be discovered only by routine bone scanning. In this study, all PFs were symptomatic but the HRU for these fracture types may differ. Based on epidemiology and feasibility studies, the target number was 10 patients with at least one PF of a long bone and 30 patients with at least one PF of other bones for each participating country. In addition to HRU data, patients' baseline demographics and disease characteristics were documented.

2.2. HRU attribution

Retrospective HRU data were collected from patient charts during the study period. For patients who experienced only the index PF during the study period, data were extracted from hospital charts for a period beginning 3.5 months before and ending 3 months after the index PF [17] (Fig. 1a). In order to attribute HRU in patients with multiple SREs, it was necessary to set a diagnostic window. In line with a previous study [18], a period of 3 months starting 3.5 months before the index PF was used to establish baseline HRU, and a 14-day (2 week) period immediately before the index PF was used to estimate any diagnostic HRU [18]. For patients with multiple SREs, the data-extraction period was extended until 3 months after the last SRE that the patient experienced during the study period (Fig. 1b). There was no limit to the number of SREs included in the period following the index PF. To ensure lack of carry-over of HRU from a previous SRE that occurred before the 3.5-month period immediately preceding the index PF, a clean window of an additional 3 months without a SRE was required.

If multiple SREs were present at the same anatomical site and occurred within a 21-day window, they were considered to be linked and the total HRU was attributed to the index PF. In cases in which SREs occurred at the same anatomical site but outside the 21-day window, or at different anatomical sites, the SREs were considered to be unlinked and HRU was attributed to the appropriate SRE type following chart review by an expert panel. Patients could experience several linked and/or unlinked SREs simultaneously.

Primary HRU outcome measures were: the number and duration of inpatient stays (overall and by type of hospital unit); the number of outpatient visits (overall and by healthcare provider type); the number of day-care hospital visits (visits to day-care centres were made by patients who required more prolonged treatment or investigations than outpatients, but who did not require an overnight stay); the number of emergency room visits; and the number and types of procedures provided. The proportion of patients receiving bisphosphonate medications at baseline and post-SRE (and the dose frequency) was recorded.

2.3. Statistical analyses

To estimate HRU associated with an index PF, the following calculation was used.

Estimate of HRU associated with PF
= HRU recorded during post–PF period
+ HRU during diagnosis period
–HRU recorded during the baseline period[a]

[a]Adjusted to allow for the different lengths of the periods.

Statistical analyses were descriptive in nature; data are presented as mean (standard deviation [SD]), because this better describes the total HRU for the study population.

3. Results

3.1. Patients

In total, 118 patients with long bone PFs and 241 patients with PFs of other bones were included. The baseline demographics of participants were generally consistent across all countries; however, the mean age of patients with PF of long bones was higher in Finland (74.5 [SD 4.2] years; *n*=8) and Sweden (75.8 [SD 7.4] years; *n*=9) compared with the other countries (range 61.5–68.9 years) (Table 1). Overall, the most common cancer types were breast cancer (long bones 37.3%; other bones 32.4%) and multiple myeloma (long bones 23.7%; other bones 40.7%) (Tables 1 and 2). The mean time since initial diagnosis of bone metastases or lesions was approximately 1 year in both patients with long bone PFs and those with PFs of other bones. The mean duration of follow-up was similar for patients with long bone PFs (3.2 months; SD 1.2 months) and other bone PFs (3.3 months; SD 1.2 months). Overall, the most common fractures affecting long bones were those of the femur (58.5%) and humerus (32.2%) (Table 3). Fractures of the vertebrae were the most common fracture type in those with PFs