Discharge status and post-discharge healthcare costs after skeletal-related event hospitalizations among medicare patients with bone metastatic solid tumors or multiple myeloma

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Article info
Article history:
Received 8 April 2020
Revised 28 September 2020
Accepted 30 September 2020
Available online 21 October 2020

Keywords:
Bone metastasis
Costs
Discharge status
Medicare
Multiple myeloma
Skeletal-related event
SRE

Abstract
Background: Previous studies have quantified direct inpatient costs of skeletal-related events (SREs); however, costs associated with subsequent post-SRE care have not been examined.

Methods: We identified two study cohorts using 2011–2015 Medicare 20% sample data: patients diagnosed with 1) bone metastases from solid tumors or 2) multiple myeloma (MM), both with SRE-related hospitalization discharge dates January 1, 2011-September 30, 2015. We assessed discharge status and costs from discharge to the earliest of death, end of Medicare enrollment, or December 31, 2015. Discharge status was defined as: skilled nursing facility (SNF), rehabilitation facility, hospice, home health agency (HHA), long-term care (LTC) nursing home, LTC hospital, or rehospitalization within or after 30 days. Percentage, stay duration, and Medicare costs were calculated for each setting. All analyses were descriptive.

Results: We identified 7988 bone metastases patients and 4277 MM patients discharged from index SRE-related hospitalizations; corresponding mean ages were 76.9 and 76.6 years. The largest proportion of bone metastases patients were discharged to SNF (32.9%), then HHA (13.7%), hospice (13.5%), and LTC (11.3%); the pattern was similar for MM patients (SNF, 35.9%; HHA, 18.2%; hospice, 7.2%; LTC, 1.5%). Almost 10% of patients in both cohorts were re-hospitalized within 30 days. Mean Medicare cost per patient per facility stay was $10,000 for hospice, and from $15,517 for LTC nursing home to $49,729 for LTC hospital for MM patients.

Conclusion: Most elderly cancer patients (>75%) require healthcare facility support after SRE-related hospitalization, with substantial associated costs. Post-discharge management is clinically and economically important.

1. Introduction

About 330,000 US adults developed bone metastases from solid tumors in 2012 [1]. These patients are at high risk for painful and costly bone complications, termed skeletal-related events (SREs), which include bone fractures, spinal cord compression, and radiation or surgery to the bone [2–4]. Patients with multiple myeloma (MM) are similarly at risk of SREs as a result of destructive bone lesions that are a defining characteristic of the disease [5]. >32,000 individuals were diagnosed with MM in 2019, with an estimated prevalence of >130,000 [6].
depending on hospital discharge status. Post-SRE hospitalization management and care is important, especially for older patients who require more comprehensive care. Medicare generally requires hospitals to engage in discharge planning to determine discharge locations for patients; however, because studies of post-discharge status after an SRE-related hospitalization are rare, data for use in such planning are lacking. A study of post-discharge status after total knee arthroplasty using Medicare data showed that 21% of patients were discharged to home, 38% to home health care, 31% to extended-care facilities, and 10% to rehabilitation [14]. In the general Medicare population, among >137 million hospital discharges, 26.3% were discharged to skilled nursing facilities (SNFs) or inpatient rehabilitation facilities [15]. In the current analysis, we aimed to understand discharge status and related post-discharge costs subsequent to an index SRE-related hospitalization among two cohorts of Medicare beneficiaries frequently affected by SREs: bone metastatic solid tumor patients and MM patients.

2. Methods

2.1. Study population and data Source

The study population included elderly fee-for-service (FFS) beneficiaries in the 2011–2015 Medicare 20% random sample. Medicare data include enrollment information, demographic characteristics, and medical claims from Part A, Part B, and Part D. The Medicare claims files contain information collected by Medicare to allow payment for healthcare services provided to Medicare beneficiaries in the US and its territories. Standard analytic files (SAFs) generated by the Centers for Medicare & Medicaid Services were used in this study. SAFs are available for each institutional claim type including inpatient, outpatient, SNF, home health agency (HHA), carrier, and hospice. Non-institutional Part B physician/supplier SAFs include final action claims for physician services, laboratory services (not laboratory values), and durable medical equipment (DME). Part D data include the prescription drug event file, which contains the National Drug Code for each drug, prescription dosing information, and drug costs. The 2011–2015 long-term care (LTC) Minimum Data Set (MDS) was used to identify LTC facility stays. The MDS is a standardized, primary screening and assessment tool for health status, which forms the foundation of the comprehensive assessment for all residents (regardless of payer) of LTC facilities certified to participate in Medicare or Medicaid.

2.2. Study cohorts and study design

This study included two study cohorts: (1) patients with bone metastases from solid tumors and (2) patients with MM. Patients

![Fig. 1. Study design.](image-url)
with bone metastases were identified by at least one inpatient claim or two outpatient claims on different days within a 12-month interval carrying the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for secondary malignant neoplasm of bone or bone marrow (198.5). The bone metastasis date was defined as the earliest of (1) discharge date for inpatient claims and (2) second outpatient date. This algorithm is based on two previously published studies aiming to estimate prevalence of bone metastases using a Medicare FFS sample and the Truven Marketscan and PharMetrics Plus commercial claims databases [1,16]. Solid tumor types included prostate, breast (female only), lung, and other cancers during a 12-month interval before bone metastases were identified. ICD-9-CM diagnosis codes for specific cancer types appear in Appendix A. Cancer types were defined by at least one inpatient claim or two outpatient claims on different days in the 12-month interval. The following inclusion criteria were applied: (1) evidence of bone metastases from a solid tumor and subsequent SRE-related hospitalization (i.e., index SRE hospitalization) with discharge dates (i.e., index dates) between January 1, 2011, and September 30, 2015, (2) age ≥ 66 years on the index date, and (3) continuously enrolled in Medicare Parts A and B for ≥ 12 months before and on the index date. The following exclusion criteria were applied: (1) evidence of two or more solid tumors, (2) death on the index date, and (3) enrollment in a Medicare Advantage plan anytime during the study period.

Similarly, we defined patients with MM based on a validated algorithm requiring a combination of ICD-9-CM diagnosis codes (Appendix B) and diagnostic tests or treatment [17]. The following inclusion criteria were applied: (1) evidence of MM between January 1, 2011, and June 30, 2015; (2) evidence of subsequent SRE-related hospitalization (i.e., index SRE hospitalization) with discharge date (i.e., index dates) between January 1, 2011, and September 30, 2015; (3) age ≥ 66 years on the index date; and (4) continuously enrolled in Medicare Parts A and B for ≥ 12 months before and on the index date. The following exclusion criteria were applied: (1) death on the index date and (2) enrollment in a Medicare Advantage plan during the study period.

The detailed study design is displayed in Fig. 1. For both study cohorts, the baseline period was 1 year prior to the index date. During the baseline period, patient demographics, Medicare/Medicaid dual eligible status, pre-index SRE-related hospitalizations (including the index SRE hospitalizations), and Charlson comorbidity index (CCI) were defined. The follow-up period was from the index date to the earliest of date of death, end of Medicare enrollment in both Part A and B, enrollment in a Medicare Advantage program, or December 31, 2015. During the follow-up period, we identified post-discharge facilities after index SRE hospitalizations and assessed lengths of stay and Medicare costs during the stays. We also assessed re-hospitalization within and after 30 days.

2.3. Defining SREs

We used a claims-based algorithm to define SREs. Different methods have been used to identify SREs using claims in previous studies. In a recent study, Aly et al. compared different methods of identifying SREs from claims using Medicare-SEER data [18]. The current study adopted the method developed by Aly et al. and defined SREs with a 21-day window. SRE types included: spinal cord compression, fracture, and surgery or radiation to the bone. Codes and algorithms appear in Appendix C.

2.4. Defining discharge status from the index SRE hospitalization

As required by Medicare, discharging hospitals report patient discharge status using Discharge Disposition codes (e.g., code 03 identifies a SNF). However, in our exploratory analysis we found that the admitting facility subsequent to the index SRE hospitalization was not always the same as was indicated by the Discharge Disposition code provided by the discharging hospital, possibly due to claim error [19]. Therefore, we used the actual admitting facilities subsequent to index SRE hospitalizations to define discharge status.

Discharge status after the index SRE hospitalization was defined as admission to: SNF, rehabilitation facility, hospice, HHA, LTC hospital, LTC nursing home, re-hospitalization for any reason within 30 days, or re-hospitalization after 30 days.
Except for LTC nursing homes, facilities were identified from Medicare Part A institutional claims and admissions were mutually exclusive. LTC nursing homes were identified from MDS data. Some patients were admitted to an LTC nursing home directly from the index SRE hospitalization. Only a few patients (less than 1%) were admitted directly to home without being admitted to any facility (including re-hospitalization) during follow-up.
2.5. Defining Medicare costs in an admitting facility after discharge from the index SRE hospitalization

The definition of Medicare costs was the same for all facilities except LTC nursing homes. Using SNFs as an example: When a patient was admitted to a SNF, Medicare costs included those for the SNF itself, outpatient services, physician visits/DME, and pharmacy costs defined from Medicare Part D claims. We included both Medicare paid amounts and patient or third party paid amounts, i.e., Medicare allowable. We calculated total Medicare allowable costs in a SNF and mean cost per SNF, dividing the total cost in the SNF by its total number of patients. Costs were adjusted to the 2015 US dollar.

Costs for LTC nursing homes were estimated by multiplying the length of LTC nursing home stays in days by the 2015 national daily nursing home cost of $235 per day [20]. We included other Medicare-covered costs such as outpatient services, physician visits/DME, and pharmacy during the LTC nursing home stay in the total cost.

2.6. Statistical analyses

All analyses were descriptive. For patient characteristics, we report number and percentage for categorical variables and mean (standard deviation [SD]) for continuous variables. For discharge status, we report number, percentage, and length of stay for each facility. The length of stay is reported as mean, SD, median, and interquartile range. For Medicare costs, we report mean, median, and SD cost for each facility.

3. Results

3.1. Patient characteristics

We identified 7988 (not including 405 deaths at discharge) patients with bone metastases from solid tumors and a subsequent SRE-related hospitalization. Separately, we identified 4277 (not including 170 deaths at discharge) patients with MM and a subsequent SRE-related hospitalization. Sample selection for both study cohorts is shown in Fig. 2 with inclusion and exclusion criteria. Baseline characteristics for both study cohorts are presented in Table 1.

For bone metastases patients, mean (SD) age was 76.9 (7.3) years; 49.6% were women, 88.0% white, and 8.1% black. Mean (SD) length of pre-index SRE-related hospitalization (including the index SRE hospitalization) at baseline was 8.4 (9.1) days and mean (SD) CCI was 9.4 (1.9). Among the cancer types defined during the 1 year prior to the bone metastases diagnosis date, 19.8%
had breast cancer, 21.8% prostate cancer, 30.0% lung cancer, and 28.4% other cancers. As shown in Table 2, the mean (SD) length of the index SRE hospitalization was 8.2 (8.9) days overall. Index SRE hospitalizations were longest for patients discharged to LTC hospitals, mean (SD) 16.6 (13.4) days, followed by patients discharged to SNFs, mean (SD) 9.4 (7.0) days. For patients with MM, mean (SD) age was 76.6 (7.1) years; 55.7% were women, 82.5% white, and 13.3% black. Mean (SD) length of pre-index SRE-related hospitalization (including the index SRE hospitalization) at baseline was 10.6 (10.4) days and mean (SD) CCI 5.6 (3.3). As shown in Table 2, the mean (SD) length of index SRE hospitalization was 8.0 (7.6) days overall. Index SRE hospitalizations were longest for patients discharged to LTC hospitals, mean (SD) 21.1 (17.1) days, followed by patients discharged to LTC nursing homes, mean (SD) 11.3 (16.7) days.

3.2. Discharge status from the index SRE hospitalization

As shown in Fig. 3, the largest proportion of patients from the bone metastases cohort were discharged to SNF (32.9%), followed by HHA (13.7%), hospice (13.5%), and LTC (11.3%). The pattern was similar for the MM cohort (SNF, 35.9%; HHA, 18.2%; hospice, 7.2; LTC, 1.5%). Almost 10% of both cohorts were re-hospitalized within 30 days of discharge.

3.3. Length of stay at each admitting facility after discharge from index SRE hospitalization

Median and inter-quartile range of lengths of stay at each admitting facility after discharge from index SRE hospitalizations are shown in Fig. 4 for both study cohorts. For bone metastases patients, the longest length of stay was for HHA, with a median of 44 days, followed by SNF (median 27 days), and LTC hospital (median 21 days). For MM patients, the longest length of stay was for HHA (median 41 days) followed by LTC hospital (median 23 days), and SNF (median 21 days).

3.4. Medicare cost at each admitting facility after discharge from index SRE hospitalization

Mean Medicare costs per patient for each admitting facility after discharge from the index SRE hospitalization are presented.
in Fig. 5. Except for HHA, the primary cost (>80%) was for the facility itself. For bone metastases patients, the most expensive facility was LTC hospital (mean cost per patient $46,479), followed by rehabilitation facilities (mean cost $25,312), and SNFs (mean cost $23,801). Mean cost per patient for other facilities (not including hospice, mean $6781) ranged from $15,864 to $21,798. For MM patients, the most expensive facility was LTC hospital (mean cost per patient of $49,729), followed by rehabilitation facilities (mean cost $21,242). Mean costs for other facilities (not including hospice, mean $8494) ranged from $15,517 to $19,510. Detailed mean, median, and SD costs per patient per facility overall and by each service category of services are reported in Table 3.

Total Medicare costs by discharge facility are reported in Table 4, with ranges from $2.18 million (LTC hospital) to $62.57 million (SNF) for bone metastases patients, and from $1.01 million (LTC nursing home) to $28.95 million (SNF) for MM patients. Estimated total Medicare costs for all facilities combined were $152.46 million for 7923 bone metastases patients and $74.69 million for 4054 MM patients.

4. Discussion

In this study, we examined post-discharge healthcare resource use and costs for patients with SRE-related hospitalizations in two cohorts: elderly patients with bone metastases from solid tumors and elderly patients with MM, using Medicare 20% sample data for 2011–2015. Percentages of patients discharged to institutional post-acute care (i.e., SNF and rehabilitation facility) were 40.3% (32.9% SNF and 7.4% rehabilitation) and 45.5% (35.9% SNF and 9.6% rehabilitation) for patients with bone metastases and MM, respectively. These percentages are higher than in the general Medicare population, reported to be 26.3% in 2015 [15]. Percentages of discharges to SNF alone in our study were 32.9% for bone metastases patients and 35.9% for MM patients. In the general Medicare population, the percentage discharged to SNFs from hospital was reported to be about 20% in 2016 [21]. Percentages of discharges to rehabilitation facilities alone in our study were 7.4% for bone metastases patients and 9.6% for MM patients. In the general Medicare population, the percentage discharged to SNFs from hospital was reported to be about 4% in 2015 [22]. In addition, about 9%-10% of patients were readmitted to hospital within 30 days of discharge from the index SRE hospitalization. The mean length of index SRE hospitalizations was about 8 days for the two cohorts, longer than in the general elderly Medicare population, reported as 5.8 days in 2015 [23]. Post-discharge SNF stays were much longer than in general Medicare population: 40.5 days for bone metastases patients and 31.2 days for MM patients, versus 26.5 days in 2015 for elderly Medicare patients [23].

We estimated post-discharge costs after an index SRE hospitalization for the two study cohorts. For bone metastases patients and for MM patients, the most expensive post-discharge care took
Table 3
Medicare Cost of Each Facility After Discharge from a SRE-related Index Hospitalization by Source of Cost and by Study Cohorts, Mean Medicare Allowable Per Patient Per Facility, in 2015 $.

| Facility admission type after discharge from a SRE-related hospitalization | Patients Bone Metastases from Solid Tumors | Multiple Myeloma |
|---|---|---|
| Facility | OP visit & DME cost ($) | Pharmacy cost ($) | Total cost ($) | OP visit & DME cost ($) | Pharmacy cost ($) | Total cost ($) |
| SNF | 19,244 | 1426 | 2511 | 621 | 23,801 | 14,590 | 2,258 |
| Rehabilitation facility | 22,562 | 118 | 2464 | 168 | 25,312 | 18,663 | 1,185 |
| Hospice | 6,173 | 94 | 416 | 108 | 6781 | 7227 | 314 |
| HHA | 4779 | 4245 | 6675 | 377 | 46,479 | 42,043 | 531 |
| LTC hospital | 40,752 | 222 | 5128 | 377 | 46,479 | 42,043 | 531 |
| LTC nursing home | 15,436 | 98 | 2411 | 80 | 17,007 | 15,846 | 141 |
| Re-hospitalizations within 30 days after SRE discharge | 13,312 | 160 | 2411 | 80 | 17,007 | 15,846 | 141 |
| Median: Medicare allowable amount ($) | 13,524 | 137 | 1565 | 0 | 16,718 | 10,984 | 0 |
| SD: Medicare allowable amount ($) | 18,039 | 3184 | 3036 | 488 | 22,277 | 12,523 | 4981 |

HHA, home health agency; LTC, long-term care; SNF, skilled nursing facility; SRE, skeletal-related event.

Table 4
Total Medicare Allowable Cost in 2015 $ of Each Facility After Discharge from a SRE Index Hospitalization by Study Cohorts.

| Facility admission type after discharge from a SRE-related hospitalization | n of SRE-related IP claims | Total Length of Stay (days) | Total Medicare allowable amounts ($) | Part D pharmacy cost ($) | Total cost ($) |
|---|---|---|---|---|---|
| Facility | OP visit & DME cost ($) | Pharmacy cost ($) | Physician & DME cost ($) |
| Skilled nursing facility | 2629 | 106,522 | 50,593,606 | 3,747,784 | 6,600,707 | 1,631,537 | 62,573,635 |
| Rehabilitation facility | 588 | 9,093 | 13,266,579 | 69,184 | 1,448,861 | 98,815 | 13,483,166 |
| Hospice | 9949 | 775 | 506 | 754 | 16,449 | 12,977 | 805 | 30,454 | 12,496,979 |
| HHA | 5107 | 11,026 | 12,731 | 8864 | 25,443 | 3697 | 11,346 | 30,454 | 12,496,979 |
| LTC Hospital | 33,686 | 702 | 4362 | 1504 | 36,832 | 25,803 | 1768 | 5048 | 3571 | 29,230 |
| LTC nursing home | 35,768 | 7969 | 5933 | 11,893 | 51,732 | 15,925 | 3568 | 4645 | 17,028 | 34,706 |
| Re-hospitalizations within 30 days after SRE discharge | 16,513 | 428 | 2656 | 531 | 18,417 | 15,686 | 704 | 2684 | 1244 | 18,784 |
| Re-hospitalizations after 30 days of SRE discharge | 18,613 | 880 | 2459 | 622 | 20,409 | 16,787 | 549 | 2463 | 1482 | 18,036 |

HHA, home health agency; LTC, long-term care; SNF, skilled nursing facility; SRE, skeletal-related event.

* Excluding those with total cost of zero.

** Total LTC nursing facility cost was estimated through multiplying days of LTC stay by 2015 US average daily nursing home cost. Patient’s daily LTC costs were $235 per day, average of daily semi-private and daily private room. Source: [http://skloff.com/cost-of-long-term-care-by-state-2015/](http://skloff.com/cost-of-long-term-care-by-state-2015/)
place at SNFs. Total Medicare allowable costs at SNFs after discharge from the index SRE hospitalization for both cohorts combined was about $91.52 million, about 40.3% of total post-discharge care. The extrapolated estimate of the same Medicare expenditures for the same patients in the entire Medicare population would be at least $457.6 ($91.52*5) million in the study period. The mean per patient cost in these patient populations after discharge from a SRE-related hospitalization was higher than for the general Medicare population across all facilities. The mean costs at SNFs were $23,801 for bone metastases patients and $18,861 for MM patients. In the general elderly Medicare population, the mean cost per SNF admission in 2015 was $11,545 [23]. The mean costs for readmission within 30 days were $17,007 for bone metastases patients and $18,737 for MM patients. In the general elderly Medicare population, the mean cost per discharge in 2015 was $11,750 [23]. Mean (median) costs at rehabilitation facilities were $25,312 ($22,312) for bone metastases patients and $21,242 ($20,640) for MM patients, versus the median cost of $11,124-$19,443 in the 2015 in general Medicare population [22]. Mean (median) costs at LTC hospitals were $46,479 ($39,917) for bone metastases patients and $49,729 ($41,512) for MM patients, versus the mean cost of $40,718 in the 2015 general Medicare population [22].

This study has strengths and limitations. To our knowledge, it is the first study to examine discharge status and post-discharge spending for cancer patients subsequent to SRE hospitalization, an important cost component to consider. Medicare is a large US federal government program; among adults aged 65 years or older, 93.7% were insured under a government plan (primarily Medicare) [24]. Therefore, our study results are representative of the US Medicare population with the same disease conditions. Regarding limitations, first, these results are limited to Medicare beneficiaries and cannot be extrapolated to the US general population. Second, this study used claims-based algorithms to define bone metastases, MM, and SREs. Although these definitions have been widely used in previous studies, the entire medical history cannot be obtained from claims data; therefore, the case estimates may be imperfect.

In conclusion, this study provides estimates of discharge status and post-discharge costs after an index SRE hospitalization for elderly Medicare patients with bone metastases from solid tumors and patients with MM in the study period 2011–2015. Compared with the general Medicare population, in the study samples, percentages of admissions to institutional post-acute care facilities such as SNFs, rehabilitation facilities, or LTC facilities were higher, stays in those facilities were longer, and resulting total Medicare costs were higher. Most elderly patients with SRE-related hospitalizations (>75%) were discharged to subsequent healthcare facilities, associated with substantial costs. Post-discharge management after SRE hospitalization is clinically and economically significant for elderly patients, has significant implications for public health, and highlights the need for primary prevention of these painful and costly events.

CRediT authorship contribution statement

Suying Li: Conceptualization, Methodology, Writing - original draft, Writing - review & editing. Haifeng Guo: Formal analysis, Writing - review & editing. Yi Peng: Formal analysis, Methodology, Writing - review & editing. Tingting Gong: Formal analysis, Writing - review & editing. Alan Fu: Conceptualization, Methodology, Writing - review & editing. Debajyoti Bhowmik: Conceptualization, Writing - review & editing. Rohini K. Hernandez: Conceptualization, Writing - review & editing. Katherine B. Carlson: Conceptualization, Writing - review & editing. Kimberly A. Lowe: Conceptualization, Writing - review & editing. Jitesh Rana: Conceptualization, Writing - review & editing. Shuling Li: Conceptualization, Methodology, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The authors thank Chronic Disease Research Group colleague Nan Booth, MSW, MPH, ESL, for manuscript editing.

Funding

This work was supported by Amgen, Inc., Thousand Oaks, California.

Appendix

Appendix A

International Classification of Diseases, Ninth Edition, Clinical Modification diagnosis codes used to identify solid tumors.

| Cancer Types                                      | Diagnosis Codes |
|--------------------------------------------------|-----------------|
| Head and neck                                    | 140.x-149.x     |
| Esophagus                                        | 150.x           |
| Stomach and small intestine                      | 151.x, 152.x    |
| Colon and rectum                                 | 153.x, 154.x    |
| Liver                                            | 155.x           |
| Gallbladder                                      | 156.x           |
| Pancreas                                         | 157.x           |
| Retropertitoneum and peritoneum                  | 158.x           |
| Spleen                                           | 159.x           |
| Lung                                             | 162.x           |
| Other respiratory                                | 160.x-161.x, 163.x, 164.x-165.x |
| Bone                                             | 170.x           |
| Connective and soft tissue                       | 171.x           |
| Melanoma                                         | 172.x           |
| Female breast                                    | 174.x           |
| Male breast                                      | 1750 or 1759    |
| Sarcoma                                          | 176.x           |
| Gynecologic                                     | 179.x-184.x     |
| Prostate                                         | 185             |
| Other genitourinary                              | 186.x-189.x     |
| Central nervous system                           | 190.x-192.x     |
| Endocrine                                        | 193.x, 194.x    |
| Other and ill defined                            | 195.x, 199.x    |

Appendix B

International Classification of Diseases, Ninth Edition, Clinical Modification diagnosis codes used to identify multiple myeloma.

| Description                                      | Code    |
|--------------------------------------------------|---------|
| Multiple myeloma without mention of having achieved remission | 203.00  |
| Multiple myeloma in remission                    | 203.01  |
| Multiple myeloma in relapse                      | 203.02  |
### Appendix C

Codes and algorithm to identify skeletal-related events (SREs).

| Event | ICD-9/CPT/HCPCS Codes | Number/Type of Claims to Qualify for Case Definition |
|-------|------------------------|----------------------------------------------------|
| **Skeletal Related Events (SRE)** (will use algorithm of “base case” definition from Aly et al.) | | |
| Spinal Cord Compression: ICD-9 diagnosis codes: 336.9 (unspecified disease of the spinal cord) | | |
| ICD-10 diagnosis codes: G061, G07, G0920, G0929, G099 HPCCS codes: 63050, 63051, 22531, 22552, 63064, 63066, 61343, 52234, 63075–8, 22530, 22531, 63195, 63197, 63199, 63001, 63003, 63005, 63011, 63016, 63017, 63018, 63012, 63045, 63046, 63047, 63048, 63040, 63042, 63043, 63044, 63020, 63030, 63035, 22224, 22222, 22214, 22212, 22207, 22206, 2074 T, 2075 T, C9729, 0202 T, 22865, 0164 T, 0094 T, 0097 T, 60057, 60106, 60055, 60081, 60082, 60087, 60088, 63101, 63102, 63103, 63090, 63091, 63086, and 63085 | 1 Part A or 1 Part B |
| Pathologic Fracture: ICD-9 diagnosis codes for pathologic fracture: 733.1X (pathologic fracture) ICD-10 diagnosis codes for pathologic fracture: not listed in this table. ICD-9 diagnosis codes for other fracture: 8202, 8208, 8210, 8212, 8120, 8122, 8124, 8130, 8132, 8134, 8138, 8230, 8232, 8234, 805, 806, 8200, 800, 807, 8080, 8082, 8084, 8088, 8100, 8240, 8242, 80841, 80842, 80843, and 80849 | 1 Part A or 1 Part B indicating “pathologic fracture” and “other fracture” excluding codes suggesting concurrent accidents/fall defined as within 2 weeks ending with the fracture |
| ICD-9 diagnosis codes for other fracture: 8202, 8208, 8210, 8212, 8120, 8122, 8124, 8130, 8132, 8134, 8138, 8230, 8232, 8234, 805, 806, 8200, 800, 807, 8080, 8082, 8084, 8088, 8100, 8240, 8242, 80841, 80842, 80843, and 80849 | 1 Part A or 1 Part B indicating receipt of EBRT (2D and 3D) or radioisotopes |
| ICD-10 diagnosis codes for other fracture: not listed in this table. | 1 Part A or 1 Part B indicating any bone surgical procedure |

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