The burden of illness for metastatic synovial sarcoma and myxoid round cell liposarcoma: a SEER-Medicare analysis

Huifen Wang[1], Molly Purser[1], Lindsey Powers Happ[1], Samantha St. Laurent[2], Monica Kobayashi[3], Shibani Pokras[1]

[1]GlaxoSmithKline, Collegeville, PA, USA; [2]GlaxoSmithKline, Waltham, MA, USA (at time of this work); [3]GlaxoSmithKline, Durham, NC, USA

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Introduction

- Synovial sarcoma (SS) and myxoid round cell liposarcoma (MRCLS) are rare subtypes of soft tissue sarcoma (STS). SS comprises approximately 5–10% of STS. MRCLS comprises approximately 20–30% of liposarcomas, which make up a subset of STS[1,2]
- SS and MRCLS differ from other STS subtypes in aspects such as time to recurrence, survival rates, sensitivity to chemotherapy, and typical patient age range[1–5]
- Due to the rarity of SS and MRCLS, and the lack of ICD-9/10 codes, previous literature has focused on understanding the healthcare resource utilization (HCRU) and associated costs of patients with metastatic STS[1,2,6–8]
- As the HCRU and associated costs for patients with SS and MRCLS may not be comparable to the overall STS population, specific data in SS and MRCLS, particularly among patients with metastatic disease, is required for payer resource/budget planning
- The linked Surveillance, Epidemiology, and End Results (SEER)-Medicare claims database is a unique data source as it allows identification of STS subtypes through SEER and costs for these patients through Medicare. Information from this database could improve the understanding of the economic burden of these diseases

Objectives

- The primary objective was to describe the all-cause and cancer-related HCRU, and the associated costs in patients with metastatic SS (mSS) or metastatic MRCLS (mMRCLS) following metastatic diagnosis
- Exploratory objectives included describing longitudinal treatment patterns and outcomes in patients with mSS or mMRCLS

Methods

- Eligible patients in the SEER-Medicare dataset (2007–2015):
  - had a local or metastatic SS or MRCLS diagnosis. SS and MRCLS patients were uniquely identified using the SEER dataset, which uses ICD-O codes
  - metastatic patients included both distant and nodal metastasis, and met one of the following conditions: were metastatic at diagnosis indicated by M1 (TNM) or Stage IV; had nodal involvement (N1 or higher [TNM] or regional/distant summary stage) and no surgery of the primary site
  - localized patients met one of the following conditions: had nodal involvement as defined above and had surgery of the primary site (including resections); or were missing summary stage (with unknown nodal involvement by TNM) and had surgery of primary site. Patients with local tumors were required to have a metastatic cancer diagnosis later in the Medicare claims
  - were aged ≥65 years at metastatic diagnosis (index date)
  - had ≥6 months of Medicare Part A and B coverage pre-index and ≥1 month of follow-up post-index
- Patients were excluded from analysis if they had 1 or more of the following:
  - Health Maintenance Organization (HMO) coverage from 6 months prior to the initial SS or MRCLS diagnosis to death or end of study due to incomplete claims data
  - contradictory initial diagnosis codes at the same date (e.g., localized or regional SS or MRCLS diagnosis and secondary neoplasm claims)
  - no surgery following a diagnosis of localized SS or MRCLS
  - any other primary cancer diagnosis within 6 months of an index diagnosis of mSS or mMRCLS
  - received Medicare benefits due to end-stage renal disease
  - no claims or activity in Medicare files within the period of cancer diagnosis
- All-cause and cancer-related HCRU and costs, treatment patterns, and median overall survival (mOS) were summarized overall and by line of therapy (LOT)
- LOTs of interest included index to end of follow-up (EOF), index to 1L, 1L, and 2L+
  - Each LOT was defined as the combination of therapeutic agents initiated within a 30-day window from the start of the LOT; addition of new therapeutic agents outside of this window were considered the start of a new LOT
  - Treatments received after a gap of more than 182 days were also considered the start of a new LOT
  - The end of a LOT was defined as a 6-month gap from the end date of the previous treatment regimen
  - Chemo/immunotherapy not otherwise specified were not included in the LOT analysis because these are inpatient claims and their exact administration dates were not recorded due to the nature of medical billing. Any analyses of systemic therapies by LOT in the current study did not include inpatient systemic therapies
- HCRU and costs were reported by cancer-related care in SS and MRCLS and summarized by LOT. Costs were summarized as mean or median per patient per month (PPPM)
  - There are no specific ICD-9/10 diagnosis codes for SS and MRCLS, so HCRU or costs specific to these diagnoses could not be identified in Medicare claims; thus, care was assigned as cancer-related† if any of the following occurred: ICD-9/10 diagnosis code for a primary malignancy, malignancy-related pain, or aftercare following surgery for a neoplasm in the first or second diagnosis position, or the admitting diagnosis code; a claim for systemic therapy (including chemo/immunotherapy not otherwise specified); a claim for cancer-directed radiation therapy or surgery
  - Total costs included the sum of costs from inpatient stays, outpatient visits, home health aide (HHA) services, hospice services, gross prescription drug costs, and physician services
  - Costs for systemic therapies by LOT did not include those incurred in the inpatient setting because inpatient systemic therapies could not be determined for LOT due to lack of administration dates on inpatient pharmacy claims

†Cancer-related HCRU is defined by codes ICD-9 140–209 or ICD-10 C00–C96 in the admitting diagnosis, line diagnosis, or in the first or second positions, or a procedure/diagnosis code indicating cancer-directed surgery, radiation, or chemo/immunotherapy.

Results

- 121 patients met the inclusion and exclusion criteria, including 62 patients with mSS and 59 patients with mMRCLS
- Baseline characteristics for the overall cohort are displayed in **Table 1**
- Among the 121 patients that met the inclusion criteria, 39 received ≥1 line of systemic therapy, and 19 proceeded with 2L+ treatments
- The most common regimens were doxorubicin-based in 1L (41%) and docetaxel-gemcitabine combination in 2L (32%). Detailed treatment regimen flow is not shown due to small sample sizes of patients under each regimen (n<11, suppressed per SEER-Medicare requirement)
- The mOS (95% CI) since the index date among all patients was 14 months (8–18) (**Figure 1A**); that from 1L initiation among patients with ≥1 LOT was 15 (7–21) (**Figure 1B**); and that from 2L initiation among patients with ≥2 LOT was 12 (6–14) months (**Figure 1C**). [Note: Censored individuals are not shown, per SEER-Medicare requirement.]
- Among all patients, 85% and 70% had ≥1 cancer-related outpatient visit and hospitalization, respectively (**Figure 2**)
- The median (Q1–Q3) number of cancer-related hospitalizations within 1L and 2L+ was 1 (1–2) and 2 (1–4), respectively; and the median duration per stay was 7 (5–13) days and 10 (5–23) days, respectively
- Cancer-related total costs represented >65% of all-cause total costs, with ~20% of cancer-related total costs for systemic therapies (**Figures 3** and **4**)
- The median (Q1–Q3) total cost of cancer-related care PPPM in 1L and 2L+ was $5,987 ($3,575–$10,832) and $6,051 ($3,344–$10,406), respectively (**Figure 3**)
- The largest cost drivers for cancer-related HCRU included physician services (1L 35%; 2L+ 34%), outpatient (1L 26%; 2L+ 27%), and inpatient services (1L 27%; 2L+ 18%) (**Figure 4**)

Table 1. Baseline characteristics for overall cohort

Patient characteristics	N or median	% or Q1–Q3
Patient total	121	100%
Age at index date	75	69.0–81.0
Gender		
Female	58	47.9%
Male	63	52.1%
Race		
White	105	86.8%
Region		
Midwest	15	12.4%
Northeast	30	24.8%
South	28	23.1%
West	48	39.7%
Follow-up (months)	12	3–28
Initially diagnosed as metastatic	29	24.0%

Figure 1. mOS by LOT (censored data not shown due to SEER-Medicare requirement)

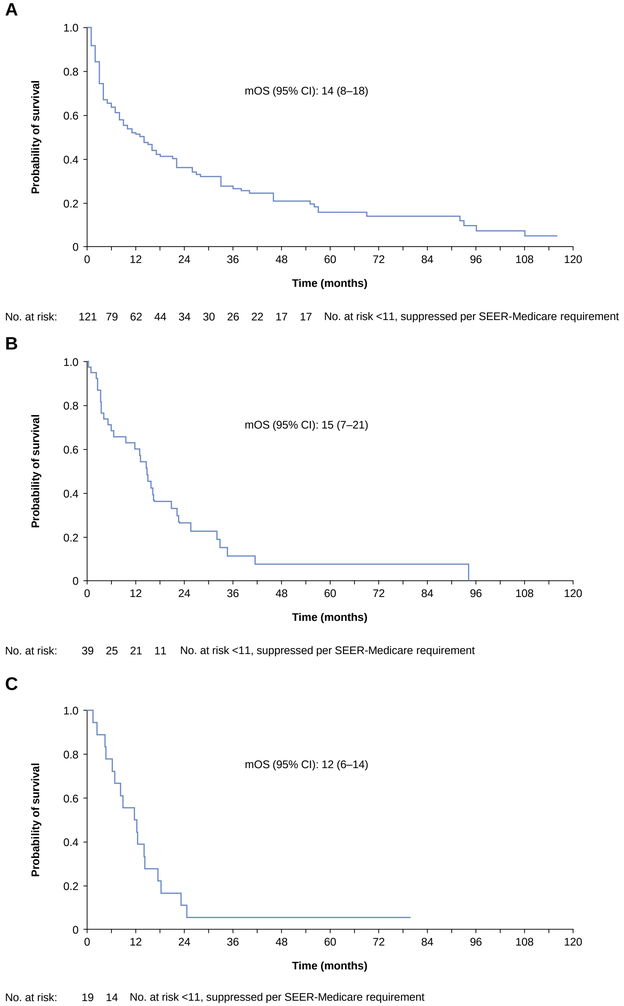


Figure 2. Cancer-related HCRU by LOT

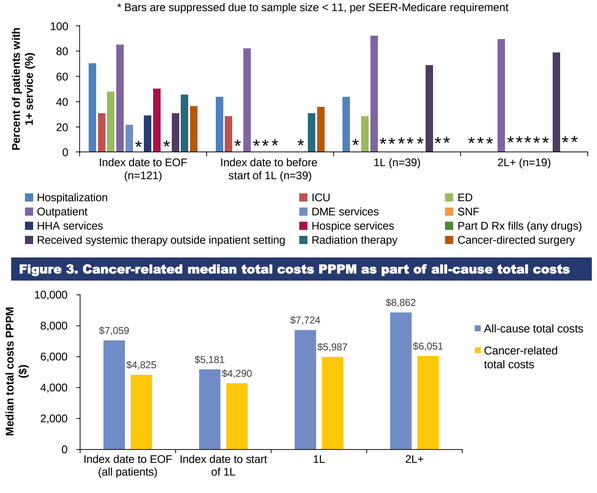
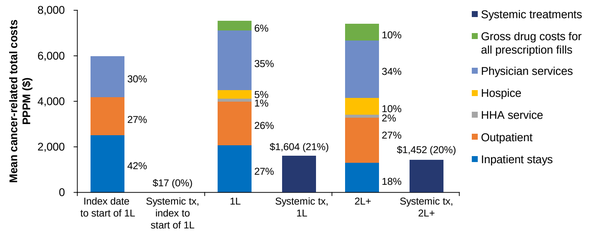


Figure 3. Cancer-related median total costs PPPM as part of all-cause total costs

Figure 4. Share of cancer-related mean total costs‡ PPPM by setting and LOT



‡Inpatient systemic therapy costs were not included in any analyses related to LOT.

Conclusions

- This study showed the HCRU and direct medical cost impact associated with mSS and mMRCLS in an elderly population with Medicare coverage
- The prognosis remained poor and emphasizes the need for effective treatments for mSS and mMRCLS
- Limitations of this study included limited sample size, especially when stratified by LOT; susceptibility of HCRU, costs, and OS analyses to outliers; inability to be generalizable to younger populations or patients outside Medicare insurance; limited capability of databases to capture cancer progression; inability to parse out systemic therapies given during inpatient stays (possibly resulting in underestimation of actual treatment costs); and the inability to capture the effects of newer treatments approved since 2016
- Despite these limitations, this study helps us understand the distinct cost and HCRU specifically associated with mSS and mMRCLS, which is challenging to estimate across other datasets

Abbreviations

1L, first-line; 2L, second-line; 2L+, second-line/later; CI, confidence interval; DME, durable medical equipment; ED, emergency department; EOF, end of follow-up; HCRU, healthcare resource utilization; HHA, home health aide; HMO, Health Maintenance Organization; ICD, International Classification of Diseases; ICD-O, ICD for Oncology; ICU, intensive care unit; LOT, line of therapy; mMRCLS, metastatic MRCLS; mOS, median overall survival; MRCLS, myxoid round cell liposarcoma; mSS, metastatic SS; PPPM, per patient per month; Q, quartile; SEER, Surveillance, Epidemiology, and End Results; SNF, skilled nursing facility; SS, synovial sarcoma; STS, soft tissue sarcoma; TNM, tumor-node-metastasis; tx, treatment.

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