# MSTS Metastatic Disease Task Force

Final Report

*Submitted June 2023 by Felasfa Wodajo, on behalf of the MSTS Metastatic Bone Disease Task Force*

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### Top Ten Recommendations

7. Add to MSTS Webinar series topics on metastatic bone disease, targeted at society members and orthopaedic surgeons
8. Collaborate with Society of Interventional Radiology and Society of Interventional Oncology to educate MSTS membership on indications and techniques of percutaneous thermal ablation
9. MSTS should champion improved reimbursement and funding for physicians and centers specializing in the complex reconstructive procedures
10. Standardization of protocols for minimally invasive spine procedures, e.g., vertebroplasty and cementoplasty

## All Recommendations

**Annual Meeting**

1. Include a MBD disease section every year at the Annual Meeting and Specialty Day
2. Establish working group sessions within different topics in MBD
3. Identify a responsible person to supervise follow-up of recommendations

**Disparities**

1. Harness MSTS Registry to identify actual socioeconomic disparities in MSTS member patients
2. Use NCI resources to identify partner opportunities for MSTS
3. Form a "multidisciplinary cancer disparity committee" with American Society of Clinical Oncology (ASCO) and American Society of Radiation Oncology (ASTRO)
4. Identify representative patient's advocacy groups of minorities with MBD
5. Start a fund or advocate with hospital systems, government, and industry to help make implants more accessible where there are gaps in insurance coverage

**Education**

1. Include a MBD disease section every year at the MSTS Annual Meeting and Specialty Day
2. Select "Best of MSTS" papers/abstracts annually from metastatic bone disease topics for presentation at ASCO or ASTRO annual meetings
3. Add to MSTS Webinar series topics on metastatic bone disease, targeted at society members and orthopaedic surgeons
4. Include a regular panel at Specialty Day or Annual Meeting with colleagues from radiation and medical oncology, interventional radiology and palliative care/pain management
5. Increased multidisciplinary presence at society meetings specific to metastatic bone disease, for instance, a "live" tumor board panel
6. Develop a multidisciplinary panel to deliver an instructional course lecture like presentation at the annual meetings for AAOS, ASTRO, and ASCO

7. Add hands-on training at MSTS Annual Meetings or Specialty Day to incorporate education on novel techniques for management of MBD
8. Understand better challenges in management of patients with MBD for providers focused on symptomatic support, through inter-societal communication and smaller scale institutional outreach
9. Partner with patient support and patient advocacy organizations to understand the challenges that patients with metastatic bone disease face
10. Partner with global societies, including ISOLS/ESMOS and regional societies in Asia, Middle East, Latin America, Africa, and Australia/South Pacific to share current and future MSTS Webinar series

**Novel Procedures**

1. The Society should take an active role in establishing indications and optimization of techniques for percutaneous fixation of pathologic fractures of the pelvis/sacrum
2. Promote research into the role of percutaneous techniques in periarticular regions of the hip and shoulder
3. Collaborate with Society of Interventional Radiology and Society of Interventional Oncology to educate MSTS membership on indications and techniques of percutaneous thermal ablation
4. Promote the development of devices to facilitate percutaneous ablations and curettage for MBD
5. Work with industry partners to optimize implants for percutaneous stabilization procedures
6. Work with industry partners to develop/optimize intramedullary implant designs that allow for percutaneously injected cement
7. Facilitate collaborative investigation of carbon fiber implants
8. Collaborate with ASTRO to develop research protocols and clinical guidelines on hypofractionation and stereotactic therapy, and timing of radiation therapy for MBD

**Practice Management**

1. MSTS should champion improved reimbursement and funding for physicians and centers specializing in the complex reconstructive procedures
2. Partner with patient support and patient advocacy organizations to help patients with metastatic bone disease
3. Build an education campaign for community physicians and orthopedic surgeons as to the importance of MBD, including recommendations of when to refer to specialty trained orthopaedic oncology surgeons
4. MSTS representation regarding metastatic bone disease at annual meetings of the Association of Clinical Oncology (ASCO) and Association of Therapeutic Radiation Oncology (ASTRO)

5. Develop clinical practice guidelines for evaluation and management of metastatic bone disease with multi-society involvement

**Spine**

1. Promote early implementation of radiation therapy for metastatic bone disease of the spine
2. Standardization of indications for stereotactic radiotherapy (SBRT), radiofrequency ablation and cryoablation
3. Standardization of protocols for minimally invasive spine procedures, e.g., ertebroplasty and cementoplasty
4. Dissemination of clinical tools that incorporate metastatic disease treatment modalities such as algorithms, nomograms, scoring systems, risk scores, prognostic models, etc. to help guide treatment and surgical decisions
5. Creation of patient registries and risk instruments to guide interventions
6. Advance the field to where interventions in the sacrum are as clearly delineated as other regions of the spine
7. Study further the role of upfront radiotherapy for asymptomatic or minimally symptomatic spinal metastases

# Report

## Executive Summary

In March of 2022, the Executive Committee of the Musculoskeletal Tumor Society approved the formation of a multidisciplinary task force to advise the Society on how to better serve patients with metastatic bone disease, and the Society can take a more prominent role in this critically important aspect of musculoskeletal oncology. The Task Force that was formed consisted of orthopedic oncologists, spine surgeons, radiation oncologists, medical oncologists, and interventional radiologists. The Task Force worked in six committees to produce recommendations on the following topics: Annual Meeting, Disparities, Education, Novel Procedures, Practice Management and Spine. Each recommendation included an expected timeline and a predicted difficulty of execution.

From a total of nearly 40, the Task Force selected the ten recommendations below as the most important to highlight. Numbers 1-6 were selected by each committee as its top recommendation. Numbers 7-10 were the others most highly rated by the entire Task Force.

1. **Annual Meeting**: Include a multidisciplinary section on metastatic bone disease(MBD) at every Annual Meeting and Specialty Day with novel updates in management. This should be research, and generally not case series.
2. **Disparities**: MSTS should work in partnership with the American Society of Clinical Oncology (ASCO) and the American Society of Radiation Oncology (ASTRO) to form a “multidisciplinary cancer disparity committee” to help understand better and address the factors (e.g., access, cultural, genetic) that lead to disparities in oncologic outcomes.
3. **Education**: Select “Best of MSTS” papers/abstracts annually from metastatic bone disease topics for presentation at ASCO or ASTRO annual meetings to help disseminate Society members’ research efforts. These can be abstracts chosen from the annual MSTS meeting or the most cited MBD papers from the previous year, with a focus on MSTS member authorship.
4. **Novel Procedures**: The Society should take an active role in the organization and promotion of research to establish indications and optimize techniques for percutaneous fixation of pathologic fractures of the pelvis and sacrum. Specific issues to investigate could include implant utilization (e.g., screws vs. photodynamic balloons), construct design for optimization of pelvic ring stability and evaluation of intraoperative imaging technique.
5. **Practice Management**: MSTS should champion an education campaign to raise awareness and educate community physicians, including orthopedic surgeons, as to the importance of MBD. This can lead to the creation of guidelines for appropriate referral of patients with MBD to specialty trained orthopaedic oncology surgeons.

6. **Spine**: Local non-surgical interventions, such as stereotactic beam radiotherapy (SBRT), radiofrequency ablation and cryoablation have changed the treatment landscape of oligometastatic disease. MSTS should champion standardization across oncologic subspecialties of indications for these interventions to optimize the use of resources and to maximize patient outcomes.
7. **Education**: Add periodic topics to existing MSTS Webinars, as well as other video platforms, targeted at Society members and other orthopaedic surgeons on the evaluation and management of metastatic bone disease. To increase viewership, other specialties can be targeted, such as medical oncology and radiation oncology.
8. **Novel Practices**: Percutaneous ablation, such as cryoablation, radiofrequency and microwave ablation, are being used with increasing frequency for local control of MBD lesions. MSTS should collaborate with the Society of Interventional Radiology and Society of Interventional Oncology to educate the MSTS membership about indications and techniques for these interventions.
9. **Practice Management**: Working with the AAOS, AMA, government, and insurance entities, the MSTS should champion improved reimbursement for physicians and centers specializing in complex reconstructive procedures for surgical management of patients with metastatic bone disease. These complex patients often necessitate significantly greater work per injury/ procedure than a corresponding patient without MBD.
10. **Spine**: MSTS should champion the standardization and dissemination of protocols for minimally invasive vertebroplasty and cementoplasty for management of symptomatic spinal lesions in the vertebral bodies.

The full descriptions of these top 10 recommendations, along with their proposed timelines and levels of difficulties, are below.

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# Introduction

Patients with metastatic bone disease (MBD) receive care by multiple specialists, often without one physician or specialty taking ownership, during this perilous portion of their cancer journey. As the leading national society for the study and treatment of musculoskeletal malignancies, the Musculoskeletal Tumor Society (MSTS) can and should take a more prominent role on behalf of this large patient population.

All MSTS members care for patients with metastatic disease, and many Society members are involved in basic and clinical research on MBD. The goal of the MSTS Metastatic Bone Disease Task Force is to unify these strands into a strategic plan that will serve as a "road map" for the Society to follow in decision making and resource allocation.

## Method

In Dec 2019, the Executive Committee of Musculoskeletal Tumor Society (MSTS) voted to establish a task force to make recommendations as to how the Society can further advance the care of patients with metastatic bone disease (MBD) and enhance its role as a thought leader in MBD. Subsequently, two unforeseen events delayed the implementation of this recommendation, the COVID 19 pandemic and the decision by the American Academy of Orthopedic Surgeons (AAOS) to discontinue providing adminstrative services for orthopedic specialists societies, including MSTS.

In March 2022, the Executive Committee (EC) of the MSTS again voted to create a Metastatic Bone Disease Task Force. The outgoing chair of the MSTS Guidelines and Evidence Based Medicine Committee, Felasfa Wodajo, was selected to lead the Task Force.

The structure for the Task Force as approved by the EC is as follows: three members to represent standing MSTS committees (Annual Meeting, Education and Practice Management), the MSTS vice president to represent the presidential line and nine at-large MSTS members. In addition, the Task Force actively solicited Advisory Members from other specialities, including medical oncology, interventional radiology, radiation oncology and spine surgery.

In May 2022, an email was sent to all MSTS members requesting volunteers to join the Task Force. The call was met with an enthusiastic response, with nearly 30 members expressing interest. Through a a blinded process, an ad-hoc committee of three (Task Force chair, MSTS President & President elect) evaluated the applicants' stated interest and experience with MBD and selected nine at-large MSTS members to sit on the Task Force.

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## Committees

The Task Force held its first virtual meeting on August 23, 2022. Members were invited to submit their committee preferences. Using these submissions, the Chair assigned members to committees as well as selecting the leads for each committee. Task Force members were provided a description of each committee's charge and a list of questions to help prompt their work (appendix). Members of the the Task Force were assigned to work in the following seven committees:

1. Annual Meeting
2. Disparities
3. Education
4. Industry Partnerships
5. Novel Procedures
6. Practice Management
7. Spine

Each committee had a *lead* who was be responsible for affirming input from each member, communication and adhering to deadlines. Each Task Force member served on two committees.

## Timeline

The timeline below was shared with the Task Force at the outset and has been maintained with only minor modifications.

1. December 2022 - February 2023: Committees produce a first draft of their recommendations
2. March 2023: Drafts are circulated among all Task Force members for comments and suggestions, which are submitted electronically and anonymously. Each committee will amend their recommendations, as appropriate
3. April 2023: The Task Force reconvenes via teleconference to discuss the amended Task Force recommendations and arrive at consensus for each. Committee leads will amend their reports, as appropriate
4. May 2023: The Task Force chair will compile an initial draft and share with committee leads
5. June 2023: The Task Force chair will submit a draft to the MSTS Executive Committee (EC)
6. July 2023: The EC approved draft will be distributed to MSTS members for comments. Using this feedback, committee leads will amend their reports, as appropriate.
7. Aug-Sep 2023: The final report will be submitted for approval by the MSTS Executive Committee and presented at the Annual Meeting (Oct 2023)

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## Task Force Members

Below is the complete list of Task Force members. The list of committee members and their leads is available in the appendix.

**MSTS**

*Committee Representatives*

1. Annual Meeting committee – Juan Pretell
2. Education committee – Rosanna Wustrack
3. Practice Management committee – Andrea Evenski

*At large*

1. Alexander Christ
2. Alex Lazarides
3. Santiago A. Lozano Calderon
4. Dipak Ramkumar
5. Jonathan A. Forsberg
6. Howard G. Rosenthal

*Presidential Line*

1. Michelle Ghert – Vice President (after 7/1/23, Ben Miller)
2. Carol Morris – Immediate MSTS past president (after 7/1/23, Michael Mott)

*Chair*

1. Felasfa Wodajo

## Advisory Members

*Interventional Radiology*

1. Gina Landinez, Interventional Radiology, University of California, San Francisco (UCSF)
2. Tony Brown, Radiology Imaging Associates, Denver CO

*Medical oncology*

1. Phil Saylor, Massachusetts General Hospital (MGH)

*MSK Radiology*

1. Alexander Lam, UCSF
2. Connie Chang, MGH

*MSTS*

1. Daniel Lerman
2. Lor Randall

*Radiation Oncology*

1. Steve Braunstein, UCSF
2. Greg Biedermann, Univ Missouri
3. Serguei Castaneda, Miami Cancer Institute

*Spine surgery*

1. Mothasem Al Maaieh, Univ Miami
2. Brandon Carlson, Kansas Univ

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# Top Ten Recommendations

Below are the top recommendations as submitted by each of the six committees. The Industry Relations committee did not submit recommendations, and this topic was deferred to MBD Task Force, Part II. Following these are another four of the Task Force's most highly rated recommendations. The recommendation number is seen in parentheses, referencing the complete list of recommendations visible in the next section.

**Key**

Timeline

1. Achievable in near term(< 2 years)
2. Intermediate term (2-5 years)
3. Long term (>5 years)

Difficulty

1. Easily achievable
2. Somewhat challenging
3. Difficult

**Annual Meeting (A1)**

Include a MBD disease section every year at the Annual Meeting and Specialty Day with novel updates in management. This should be research, and generally not case series. In these sessions colleagues from other specialties including but not limited to medical oncology, radiation oncology, interventional radiology, pain management, etc could be invited to be active participants

Timeline: 1 (near term)

Difficulty: 2 (somewhat challenging))

**Disparties (D3)**

Patients with MBD benefit from multidisciplinary care. There is evidence of differences in oncological outcomes among minority groups, although these disparities have been decreasing. The remaining disparities are likely multifactorial in origin and involve care within the different provider specialties. MSTS should work on partnership with American Society of Clinical Oncology (ASCO) and American Society of Radiation Oncology (ASTRO) to form a "multidisciplinary cancer disparity committee" that will help understand better and address the factors (i.e. access, cultural, genetic) that lead to these disparities. An initial workshop should be considered to initiate this process.

Timeline 1: Around 2 years.

Difficulty 2: This will be a mid-term process which will include first liaising with the disparity committees of ASCO and ASTRO to establish a working relationship between MSTS and these committees. Although longer term, this Recommendation is considered a priority.

**Education (E2)**

Select “Best of MSTS” papers/abstracts annually from metastatic bone disease topics for presentation at ASCO or ASTRO annual meetings to disseminate society membership’s research efforts on the topic area. These can be abstracts chosen from the annual MSTS meeting or the most cited MBD papers from the previous year with a focus on MSTS member authorship. This can be reciprocal with ASCO/ASTRO as well and clinical oncology and radiation oncology topics on MBD can be highlighted at MSTS Annual Meetings.

Timeline: 1

Difficulty: 2

**Novel Procedures (NP1.a)**

The Society should take an active role in the organization/promotion of research to establish indications and optimization of techniques for percutaneous fixation of pathologic factures of the pelvis/sacrum. Specific issues to investigate could include implant utilization (screws vs. photodynamic balloons), construct design for optimization of pelvic ring stability and the evaluation of intraoperative imaging technique. This inquiry could lead to the develop of scoring system to help guide intervention based upon disease specific, patient specific and fracture pattern related factors. Concurrently, we recommend the establishment of educational courses/labs to help disseminate procedural techniques that have developed by various Society members and colleagues.

Timeline: 2

Difficulty: 2

**Practice Management (PM3)**

MSTS should champion an education campaign to create awareness and help to educate community physicians, both orthopedic and not, as to importance of MBD. This campaign can lead to the creation of educational materials and clinical guidelines that can be disseminated throughout local communities. These guidelines can help to educate the community physician regarding treatment of the MBD patient and recommendations of when to refer patients with metastatic bone disease to specialty trained orthopaedic oncology surgeons. The MSTS should work to define which patients would be most appropriate for early referral, including a rubric for defining “high risk” patients.
Such an educational campaign will increase appropriate referrals to Orthopaedic Oncology specialists.

Timeline: 2 (months)

Difficulty: 2

**Spine (S2)**

Standardization of local non-surgical interventions:

Advancements in radiotherapy (SBRT) and interventional musculoskeletal radiology interventions such as radiofrequency ablation and cryoablation have changed the landscape of oligometastatic disease in histologies such as breast, thyroid, and renal cell carcinoma. Standardization across oncologic care subspecialties for the indications of these interventions is paramount for the optimization of resources and maximization of patient quality of life and function. Registry data after standardization is necessary to determine the oncologic impact of these interventions in disease free survival and overall survival, particularly in the histologies mentioned above. Registry and research data will allow to determine the impact in function and quality of life potentially achievable with these interventions. The role of radiation even in not symptomatic lesions is increasing particularly for lesions of the thoracic and lumbar spine. Treatment of all metastatic bone lesions seem to bear an impact in overall survival. This paradigm shift needs standardization of effective dose and protocols, histology specific, while considering their impact when combined with other interventions. Dissemination of this information across specialties is an absolute necessary to achieve this goal.

Timeline: 2

Difficulty: 2

**Other Top Recommendations (4)**

### Education (E3)

Add periodic topics to existing MSTS Webinar series targeted at society members and orthopaedic surgeons in general, on evaluation and management of metastatic bone disease topics. Can try to increase viewership by targeting medical oncology, radiation oncology, etc. Additional platforms include:
a. AAOS Video Theater for technique related topics
b. MSTS YouTube Channel—would need to create
c. VuMedi
d. MSTS repository

Timeline: 1

Difficulty: 2

### Novel Practces (NP2.a)

Percutaneous ablations are being used with increasing frequency to facilitate local control of MBD lesions. Cryoablation, radiofrequency and microwave ablation are utilized, predominately by our Interventional Radiology colleagues, for persistent pain due to tumor growth, periosteal reaction, and soft tissue extension in radioresistant disease. We recommend collaboration with Society of Interventional Radiology and Society of Interventional Oncology to educate the MSTS membership about indications and techniques for these interventions.

Timeline: 1

Difficulty: 1

**Practice Management (PM1)**

Working with the AAOS, AMA, government, and insurance entities, the MSTS should champion improved reimbursement and funding for physicians and centers specializing in the complex reconstructive procedures and surgical management of patients with metastatic bone disease patients. These complex patients often necessitate significantly greater work per injury/procedure than a corresponding patient without MBD.
a. Establishing new procedural terminology codes (CPT) for percutaneous and open treatment including codes for tumor control, adjuvant/ablative treatment, local drug delivery, and surgical restoration of osseous integrity.
b. These codes should specifically emphasize the use for oncological procedures only, to reflect the increased effort/workload associated with the surgical care of this complex patient population and to further highlight the differences in effort between codes used for orthopaedic trauma and those used for MSK oncology.
c. Work to establish adequate representation of effort for each of these codes either by way of time measurement, or with use of modifiers to establish complexity. This “time of work” model, seen in Canada, could be explored to capture actual work effort involved in these patients.
d. Consider establishing quality metrics for appropriate management, like sepsis bundles or CLABSI bundles to help ensure that all providers/institutions caring for these patients, are following well-established, evidence-based recommendations at minimum. Examples of such quality metrics can include initiation of antiresorptive for prevention of skeletal related events.

Timeline 3

Difficulty :3

**Spine (S3)**

Definition, Standardization and Dissemination of Minimally Invasive procedures for management of symptomatic lesions

Vertebroplasty and cementoplasty continue to demonstrate to be an alternative in the management of symptomatic lesions of the spine located in the vertebral bodies. Current guidelines are relatively homogenous as well as the indications for treatment of symptomatic stable compression fractures without neurological involvement. Radiation treatment protocols are available for the treatment of symptomatic lesions with or without neurologic associated symptoms. It is the opinion of the group that this area is a good point to define, standardize, and disseminate protocols of treatment. This exercise can be extrapolated to other areas where more controversy exists.

Timeline: 1

Difficulty: 1

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# Annual Meeting

## Members

- Jonathan Forsberg
- Michelle Ghert
- Carol Morris
- Juan Pretell, *lead*

## Background

Multidisciplinary care of patients with metastatic disease has shown better outcomes, even though, care is palliative. New therapies are prolonging life in many patients with advanced cancers, including those with metastatic bone metastases (MBD). Therefore, MBD is increasing rapidly in prevalence. Orthopedic oncologists are well positioned to lead the surgical management of these patients in coordination with other subspecialities including mainly medical oncologists and radiation oncologists. Therefore, MBD topics, particularly novel treatment updates, should be an integral element of MSTS Academic Conferences.

Currently, some topics of interest are presented during our meeting in the format of oral presentations and posters, but without a specific focus including multiple topics that are not necessarily related. With this format, it is difficult to identify “gaps” in the management of this condition. Also, several webinars have been offered by our society with very good acceptance by the members but there has been lack of focus on MBD topics, this can be an opportunity to have a different route to spread these topics among the members of our society.

The purpose of this working group is to identify opportunities and formulate recommendations to the Society to make of our meeting a source of information that can easily reach it’s attendees and help better manage patients with MBD.

## Summary

This working group acknowledges the efforts of the Society to include topics related to MBD during the Annual Meeting; however, we believe that the sessions are a “mixed-bag” of accepted papers. As such, it may not necessarily reflect what the committee deems an educational priority. We need to develop a program during the MSTS meeting, Specialty Day at AAOS, and through webinars during the year, in which specific time will be dedicated to discussing current advancements in therapies of the most common carcinomas, as well as the multidisciplinary approach for the management of this patient population in coordination with other specialists (med onc, rad onc).

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Recommendation A1

**Include a MBD disease section every year at the Annual Meeting and Specialty Day**

Include a MBD disease section every year at the Annual Meeting and Specialty Day with novel updates in management. This should be research, and generally not case series. In these sessions colleagues from other specialties including but not limited to medical oncology, radiation oncology, interventional radiology, pain management, etc should be invited to be active participants

Timeline: 1 (near term)

Difficulty: 2 (somewhat challenging))

Recommendation A2

**Establish working group sessions within different topics in MBD**

Establish working group sessions within different topics, being in this case Metastatic Bone Disease (MBD). This group will be formed by volunteers and the purpose will be to discuss specific topics that the society would like to have covered during the Annual meeting. As part of the working groups involving patient advocacy groups and/or patient partners to participate in these group discussions could be an option. There will be a document that will be written as a final plan from the working group.

Timeline: 1

Difficulty: 3 ( patient advocacy groups can be challenging with respect to responsiveness and availability)

Recommendation A4

**Identify a responsible person to supervise follow-up of recommendations**

Identify a responsible person to supervise that the activities and recommendations of the Committee are follow up and done.

Timeline: 1

Difficulty: 1

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# Disparities

## Members

- Andrea Evenski
- Juan Pretell
- Rosie Wustrack
- Michelle Ghert, *lead*

## Background

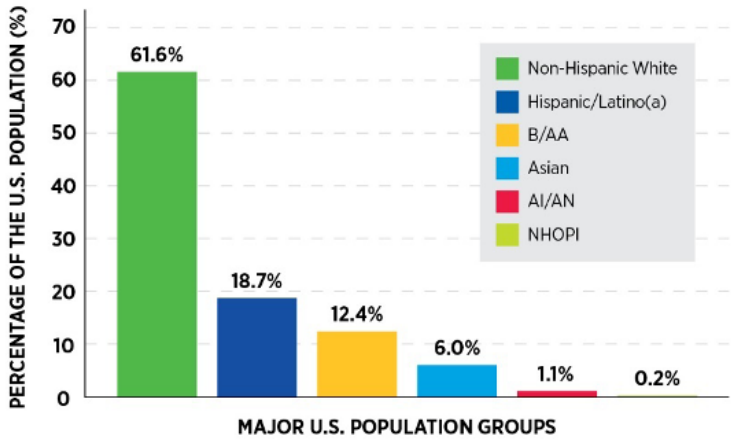
Cancer health disparities are adverse differences in cancer burden experienced by racial and ethnic minorities and other medically underserved populations that include those living in rural areas; individuals from sexual and gender minorities; and those living in persistent poverty.

Research has identified complex factors, such as socioeconomic, cultural, social, and environmental factors, that influence each other to drive and perpetuate cancer health disparities. In the United States, racial differences in oncological outcomes have been reported for almost all cancer type. These differences have been observed not only for localized disease, but also when metastasis have occurred (Siegel R et al. 2011). The economic burden of health disparities, including cancer health disparities, is enormous, as illustrated by an estimated loss of $3.2 billion in earnings in 2015 because of disparities in premature cancer deaths between Black and White individuals.

Even though, a significant “gap” exists regarding oncological outcomes, in recent decades, overall cancer incidence and mortality rates have declined for all racial and ethnic minorities in the United States. The disparity in overall cancer mortality rates between Black people and White people has narrowed from 26 percent in 2000 to 13 percent in 2019, and there is a growing recognition of the heterogeneity among individuals within each of the racial and ethnic minority groups, highlighting the need for disaggregated cancer data to develop effective strategies for achieving health equity.

FIGURE 1

## Percent Representation of Racial and Ethnic Minorities in the U.S. Population




The major population groups are shown as percent of the U.S population based on the U.S. Census 2020. Numbers represent percent of the U.S. population: non-Hispanic White, 61.6; Hispanic or Latino[a], 18.7; Black or African American (B/AA)[b], 12.4; Asian[b], 6.0; American Indian or Alaska Native (AI/AN)[b], 1.1; and Native Hawaiian or Other Pacific Islander (NHOPI)[b], 0.2.

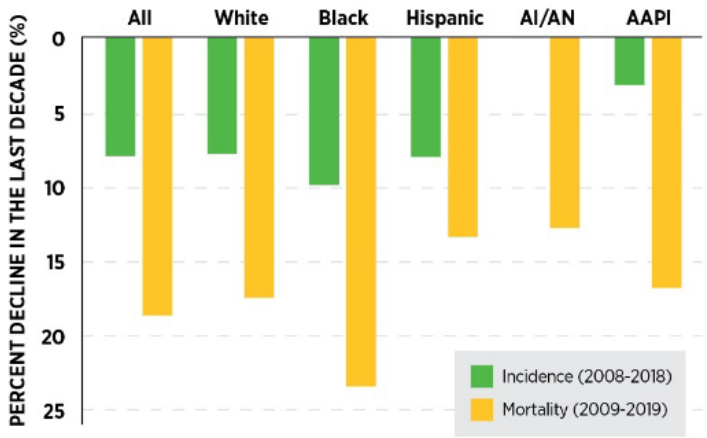
[a] Hispanic people may be of any race, so are also included in applicable race categories.

[b] Includes persons reporting only one race.

*American Association for Cancer Research® (AACR) Cancer Disparities Progress Report 2022*

FIGURE 2

## Declining Overall Cancer Incidence and Mortality Across U.S. Racial and Ethnic Population Groups




Since the early 1990s, cancer incidence and deaths have declined across all population groups. The x-axis shows the entire U.S. population (All) as well as major U.S population groups [White; Black; Hispanic; American Indian or Alaska Native (AI/AN); and Asian American and Pacific Islanders (AAPI)]. The y-axis represents percent decline during the most recent 10 years for which cancer incidence (2008-2018; green bars) and cancer mortality (2009-2019; yellow bars) data are available.

Data source: NCI SEER

*American Association for Cancer Research® (AACR) Cancer Disparities Progress Report 2022*

Recommendation D1

**Harness MSTS Registry to identify actual socioeconomic disparities in MSTS member patients**

Harness the MSTS Registry to identify actual socioeconomic disparities in MSTS member care of patients with MBD with respect to outcomes, referrals, presenting disease stage, etc.

Timeline 3: long term

Difficulty 1: MSTS Registry is now live

Recommendation D2

**Use NCI resources to identify partner opportunities for MSTS**

Review NCI Center to Reduce Cancer Health Disparities online presence, programs, research, and networks to determine if there are partner opportunities for MSTS or if MSTS can build upon their work and make the resources more specific to MBD patients.

Timeline 1: immediate

Difficulty 1: easily achievable

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Recommendation D3

**Form a "multidisciplinary cancer disparity committee" with American Society of Clinical Oncology (ASCO) and American Society of Radiation Oncology (ASTRO)**

Patients with MBD benefit from multidisciplinary care. There is evidence of differences in oncological outcomes among minority groups, although these disparities have been decreasing. The remaining disparities are likely multifactorial in origin and involve care within the different provider specialties. MSTS should work on partnership with American Society of Clinical Oncology (ASCO) and American Society of Radiation Oncology (ASTRO) to form a "multidisciplinary cancer disparity committee" that will help understand better and address the factors (i.e. access, cultural, genetic) that lead to these disparities. An initial workshop should be considered to initiate this process.

Timeline 1: Around 2 years.

Difficulty 2: This will be a mid-term process which will include first liaising with the disparity committees of ASCO and ASTRO to establish a working relationship between MSTS and these committees. Although longer term, this Recommendation is considered a priority.

Recommendation D4

**Identify representative patient's advocacy groups of minorities with MBD**

Try to identify representative patient's advocacy groups of minorities with MBD and work with them to identify potential factors influencing these disparities – doing this, we can learn the point of view of patient perspective.

Timeline 1: Around 2 years.

Difficulty 2: Could be challenging to identify first an adequate group that represents the population in question. Also, coordination for meetings can be challenging depending on the amount of people involved. The first step is to work with our own patients to learn of their individual perspectives and challenges.

Recommendation D5

**Start a fund or advocate with hospital systems, government and industry to help make implants more accessible where there are gaps in insurance coverage**

Minority groups have socio-economic issues related to insurance coverage. This can affect access to surgical implants available to treat bone lesions due to costs. MSTS might be able to start a fund or advocate with hospital systems, government and industry to help make these implants more accessible. The first step is to understand the reasons for gaps in access.

Timeline 2: Around 2-3 years.

Difficulty 3: It is possible that industry will be willing to help with this project with respect to financial.

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# Education

## Members

– Greg Biedermann, Radiation Oncology
– Connie Chang, MSK Radiology
– Alexander Lam, MSK Radiology
– Jonathan Forsberg
– Dipak Ramkumar
– Phil Saylor, Medical Oncology
– Rosie Wustrack, *lead*

## Background

This working group aims to develop a robust interdisciplinary educational program that improves the care of patients with metastatic bone disease (MBD). We acknowledge the efforts of the Society to include topics related to MBD during the Annual Meeting; however, we believe that the sessions are a “mixed-bag” of accepted papers. As such, it may not necessarily reflect what the committee deems to be our educational priorities. We aim to develop a program during the MSTS meeting, Specialty Day at AAOS, and through webinars during the year, in which specific time will be dedicated to discuss current advancements in therapies of the most common carcinomas, as well as the multidisciplinary approach for the management of this patient population in coordination with other specialists.

Recommendation E1

**Include a MBD disease section every year at the MSTS Annual Meeting and Specialty Day**

Include a MBD disease section every year at the MSTS Annual Meeting and Specialty Day with novel updates in management. This should be research and not clinical experience.

Timeline: 1

Difficulty: 1

Recommendation E2

**Select “Best of MSTS” papers/abstracts annually from metastatic bone disease topics for presentation at ASCO or ASTRO annual meetings**

Select “Best of MSTS” papers/abstracts annually from metastatic bone disease topics for presentation at ASCO or ASTRO annual meetings to disseminate society membership’s research efforts on the topic area. These can be abstracts chosen from the annual MSTS meeting or the most cited MBD papers from the previous year with a focus on MSTS member authorship. This can be reciprocal with ASCO/ASTRO as well and clinical oncology and radiation oncology topics on MBD can be highlighted at MSTS Annual Meetings.

Timeline: 1

Difficulty: 2

Recommendation E3

**Add to MSTS Webinar series topics on metastatic bone disease, targeted at society members and orthopaedic surgeons**

Add periodic topics to existing MSTS Webinar series targeted at society members and orthopaedic surgeons in general, on evaluation and management of metastatic bone disease topics. Can try to increase viewership by targeting medical oncology, radiation oncology, etc. Additional platforms include:
a. AAOS Video Theater for technique related topics
b. MSTS YouTube Channel—would need to create
c. VuMedi
d. MSTS repository

Timeline: 1

Difficulty: 2

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Recommendation E4

**Include a regular panel at Specialty Day or Annual Meeting with colleagues from radiation and medical oncology, interventional radiology and palliative care/pain management**

Include a panel every year at either MSTS Specialty Day or the MSTS Annual Meeting that includes colleagues from radiation oncology, medical oncology, musculoskeletal/ interventional radiology and palliative care/pain management to discuss updates on metastatic bone disease.

Timeline: 1-2

Difficulty: 1-2

Recommendation E5

**Increased multidisciplinary presence at society meetings specific to metastatic bone disease, for instance, a “live” tumor board panel**

Increased multidisciplinary presence at society meetings specific to providers involved in treating patients with metastatic bone disease. For instance, a “live” tumor board panel where providers from different specialties discuss options for management (risks, benefits). May also enhance partnerships with other national organizations (ASCO, ASTRO, SIR, etc.).

Timeline: 1-2

Difficult: 2

Recommendation E6

**Develop a multidisciplinary panel to deliver an instructional course lecture like presentation at the annual meetings for AAOS, ASTRO, and ASCO**

Develop a panel of 4 to 5 members of the MBD Task Force (orthopaedic oncologists) in addition to representatives from radiation oncology, medical oncology, musculoskeletal/ interventional radiology, to create a multidisciplinary group of specialists to deliver an instructional course lecture like presentation at the annual meetings for AAOS, ASTRO, and ASCO. Begin with the AAOS annual meeting and then expand to other societies.

(a) Panel presentations can include both “introductory” and “advanced” levels and perhaps can alternate by year, or if the respective societies allow, haver more than one session. Each session can be subdivided into different topics addressing evaluation, surgical, and non-surgical management of metastatic bone disease.
(b) Expand collaboration with the American College of Physicians and American Academy of Family Physicians as at least a portion of new presentations of metastatic bone disease are seen by primary care providers. Similarly, collaboration can also be expanded to societies supporting associate providers including the American Academy of Physician Assistants (AAPA) and American Association of Nurse Practitioners (AANP)

Timeline: 2 (2-5 years)

Difficulty: 2

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Recommendation E7

**Add hands on training at MSTS Annual Meetings or Specialty Day to incorporate education on novel techniques for management of MBD**

Add hands on training at MSTS Annual Meetings or Specialty Day to incorporate education on novel techniques for management of MBD, similar to the ultrasound course that was offered at MSTS 2022. Sample topic areas could include:
a. Percutaneous treatment of periacetabular metastatic disease with cementation and cryo/radiofrequency ablation
b. Stabilization of long bones and peri-acetabular metastasis using photodynamic polymer nails

Timeline: 1

Difficulty: 2

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Recommendation E8

**Understand better challenges in management of patients with MBD for providers focused on symptomatic support, through intersocietal communication and smaller scale institutional outreach**

Seek to understand how management of patients with MBD can be difficult from the perspective of providers focused on symptomatic support (ie: difficulties with pain control, overall psychologic stressors, complexity in coordinating care). This can be done through intersocietal communication, similar to establishing partnerships with other national organization, as well as smaller scale institutional outreach (surveys, open forums, multidisciplinary meetings).

Timeline: 2

Difficulty: 1

Recommendation E9

**Partner with patient support and patient advocacy organizations to understand the challenges that patients with metastatic bone disease face**

Partner with patient support and patient advocacy organizations to understand the challenges that patients face in the process of seeking care and coping with a new diagnosis of metastatic cancer and metastatic bone disease. This can occur directly through patient support organizations or patient advocacy organizations and through professional societies of specialists that support this patient population, including interventional and non-interventional pain medicine, physical therapy, occupational therapy, psychiatric oncology, and social work.

Sample organizations can include:
a. American Cancer Society
b. Susan G. Komen Foundation
c. ASCO/Cancer.Net
d. American Academy of Pain Medicine
e. American Physical Therapy Association
f. American Occupational Therapy Association
g. American Psychosocial Oncology Society
h. National Association of Social Workers

Timeline: 1-2 (1-5 years)

Difficulty: 1-2

Recommendation E10

**Partner with global societies, including ISOLS/ESMOS and regional societies in Asia, Middle East, Latin America, Africa, and Australia/South Pacific to share current and future MSTS Webinar series**

Partner with other orthopaedic/oncological societies globally including ISOLS/ESMOS and regional societies in Asia, Middle East, Latin America, Africa, and Australia/South Pacific to market current MSTS Webinar series and future web-based and or livestreamed annual meetings.

Livestreaming MSTS annual meetings, or at least archival recorded paper presentations from the annual meeting would be a good way to share the research and studies coming out of the MSTS population. This would make the conference accessible to audiences that are not necessarily able to travel to the annual meeting location for various reasons and allows for historical archiving of past conferences, perhaps up to 5 years, for reference purposes. This would also allow annual meeting and specialty day topics to be accessible to international viewership.

Timeline: 1-2

Difficulty: 1

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# Novel Procedures

## Members

– Greg Biedermann, Radiation Oncology
– Tony Brown, Interventional Radiology
– Gina Landinez, Interventional Radiology
– Alex Lazardies
– Santiago Lozano-Calderon
– Howard Rosenthal
– Danny Lerman, *lead*

## Background

There are an estimated 400,000 new cases of metastatic bone disease (MBD) in the United States annually (Siegel, 2017). Historically, management of MBD was responsible for approximately 17% of the cost of cancer care (Schulman, 2007).

Advances in the systemic therapy of metastatic carcinoma have resulted in an increasing prevalence of MBD, and a growing population of long-term survivors living with the sequala of MBD and aggressive oncologic care. This population represents a new, and ever evolving, clinical challenge. The orthopedic oncology community has a growing responsibility to support MBD patients with reliable palliative procedures in order to help maintain their quality of life throughout the duration of their newly realized longevity.

In response to this charge, the Novel Procedures Committee suggests the below recommends in hopes to promote the collaborative development, investigation and education of nascent palliative interventions intended to support a growing population in need.

Recommendation NP1.a

**The Society should take an active role in establishing indications and optimization of techniques for percutaneous fixation of pathologic factures of the pelvis/sacrum**

The Society should take an active role in the organization/promotion of research in order to establish indications and optimization of techniques for percutaneous fixation of pathologic factures of the pelvis/sacrum. Specific issues to investigate could include: implant utilization (screws vs. photodynamic balloons), construct design for optimization of pelvic ring stability and the evaluation of intraoperative imaging technique. This inquiry could lead to the develop of scoring system to help guide intervention based upon disease specific, patient specific and fracture pattern related factors. Concurrently, we recommend the establishment of educational courses/labs in order to help disseminate procedural techniques that have developed by various Society members and colleagues.

Timeline: 2

Difficulty: 2

Recommendation NP1.b

**Promote research into the role of percutaneous techniques in periarticular regions of the hip and shoulder**

Percutaneous fixation techniques that are being developed to address pathologic fracture of the pelvis can be applied to other sites of realized or impending pathologic fracture. Following the aforementioned education/validation of the percutaneous fixation strategies, we recommend collaborative research into the role of these techniques to replace convention open procedures. The greatest opportunity for this is likely in the periarticular regions of the hip and shoulder. Can we identify a population and time period where percutaneous periarticular stabilization will minimize the risk for patients requiring larger, open interventions?

Timeline: 2

Difficulty: 2

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Recommendation NP2.a

**Collaborate with Society of Interventional Radiology and Society of Interventional Oncology to educate MSTS membership on indications and techniques of percutaneous thermal ablation**

Percutaneous ablations are being used with increasing frequency in order to facilitate local control of MBD lesions. Cryoablation, radiofrequency and microwave ablation are utilized, predominately by our Interventional Radiology colleagues, for persistent pain due to tumor growth, periosteal reaction and soft tissue extension in radioresistant disease. We recommend collaboration with Society of Interventional Radiology and Society of Interventional Oncology in order to educate the MSTS membership about indications and techniques for these interventions.

Timeline: 1

Difficulty: 1

Recommendation NP2.b

**Promote the development of devices to facilitate percutaneous ablations and curettage for MBD**

We recommend the promotion of the development of devices in order to facilitate percutaneous ablations for MBD. Currently, there are limited ablation probe lengths available, as they have been development for use in the spine. The ablation of MBD lesions in other parts of the body, particularly the pelvis, may require the development of longer ablation probes. (2) There is interest in the development of a percutaneous curettage device in order to decompress large volume lesions following ablation in order to minimize the biologic burden of residual necrotic neoplasm.

Timeline: 2

Difficulty: 2

Recommendation NP3

**Work with industry partners to optimize implants for percutaneous stabilization procedures**

We recommend that the Society works with industry partners in order to optimize implants for the aforementioned percutaneous stabilization procedures. The would include: (1) evaluating screw design in order minimize loosening and mechanical failure with cyclical loading in the setting of pathologic fracture, and (2) design features that would facilitate cement augmentation.

Timeline: 2

Difficulty: 2

Recommendation NP4

**Work with industry partners to develop/optimize intramedullary implant designs that allow for percutaneously injected cement**

Cement has been used to augment implant fixation in pathologic bone and there are biomechanical studies demonstrating the efficacy of this approach. We recommend working with industry partners in order to develop/optimize intramedullary implant designs in order to allow for the use of percutaneously injected cement in order to enhance construct stability and potentially longevity. Additionally, if there is interest amongst Society members, collaborative research initiatives could be established in order to evaluate the utility of cement augmentation and/or the role for bone modifying agents as cement additives with the intent of minimizing local osteolysis/recurrence, as is being invested in GCT.

Timeline: 2

Difficulty: 2

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Recommendation NP5

**Facilitate collaborative investigation of carbon fiber implants**

We recommend the Society facilitate collaborative investigation of carbon fiber (CF) implants. Multiple benefits of CF implants compared to conventional implants have been suggested by small series. Therefore, there is value in understanding if these proposed benefits can be substantiated via high level studies. Specifically, are differences observed in the incidence of mechanical failures and infection? Additionally, due CF implants provide a clinically significant benefit for serial imaging evaluation of local disease and facilitation of post-operative radiation therapy?

Timeline: 3

Difficulty: 2

Recommendation NP6

**Collaborate with ASTRO to develop research protocols and clinical guidelines on hypofractionation and stereotactic therapy, and timing of radiation therapy for MBD**

The MSTS should collaborate with ASTRO in order to develop research protocols and clinical guidelines related to hypofractionation, stereotactic therapy and the role of preoperative vs postoperative radiation therapy for MBD. Further work can be done to evaluate the role for combination of radiation therapy and prophylactic percutaneous stabilization procedures in settings that are high-risk for pathologic fracture. The MSTS, in combination with ASTRO and ASCO, should take an active role in evaluating the impact of radiopharmaceuticals (e.g. PSMA Lu-177, Radium-223) on MBD activity, osteolysis and biomechanics.

Timeline: 3

Difficulty: 3

**Prioritization of Recommendations**

Recommendations are presented in order of prioritization.

**References**

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# Practice Management

## Members

– Alex Christ
– Alex Lazardies
– Dipak Ramkumar
– Andrea Evenski, *lead*

## Background

With advances in medical therapies, patients with metastatic bone disease are often living longer with greater functional demands and a need for a more longitudinal care approach to the management of their bone disease. These patients are often fraught with complex medical comorbidities and compounding osseous issues. There is extensive evidence that patients treated prophylactically for their MBD have improved outcomes as compared to patients with completed pathologic fractures. Similarly, orthopaedic surgeons are often some of the first physicians to begin the workup and diagnosis of patients presenting with metastatic disease.

The traditional paradigm of “a simple prophylactic nail” may hold true in some cases, but often these patients require more complex reconstructions and a more coordinated multidisciplinary treatment approach than were typically considered in eras past. As such, this patient population deserves special consideration with a more standardized and streamlined approach to metastatic bone disease management.

Recommendation PM1

**MSTS should champion improved reimbursement and funding for physicians and centers specializing in the complex reconstructive procedures**

Working with the AAOS, AMA, government, and insurance entities, the MSTS should champion improved reimbursement and funding for physicians and centers specializing in the complex reconstructive procedures and surgical management of patients with metastatic bone disease patients. These complex patients often necessitate significantly greater work per injury/procedure than a corresponding patient without MBD.

a. Establishing new procedural terminology codes (CPT) for percutaneous and open treatment including codes for tumor control, adjuvant/ablative treatment, local drug delivery, and surgical restoration of osseous integrity.

b. These codes should specifically emphasize the use for oncological procedures only, to reflect the increased effort/workload associated with the surgical care of this complex patient population and to further highlight the differences in effort between codes used for orthopaedic trauma and those used for MSK oncology.

c. Work to establish adequate representation of effort for each of these codes either by way of time measurement, or with use of modifiers to establish complexity. This “time of work” model, seen in Canada, could be explored to capture actual work effort involved in these patients.

d. Consider establishing quality metrics for appropriate management, similar to sepsis bundles or CLABSI bundles to help ensure that all providers/institutions caring for these patients, are following well-established, evidence-based recommendations at minimum. Examples of such quality metrics can include initiation of antiresorptive for prevention of skeletal related events.

Timeline 3

Difficulty :3

Recommendation PM2

**Partner with patient support and patient advocacy organizations to help patients with metastatic bone disease**

Partner with patient support and patient advocacy organizations to understand the challenges that patients face in the process of seeking care and coping with a new diagnosis of metastatic cancer and metastatic bone disease. This can occur directly through patient support organizations or patient advocacy organizations and through professional societies of specialists that support this patient population, including interventional and non-interventional pain medicine, physical therapy, occupational therapy, psychiatric oncology, and social work. Sample organizations can include:
a. American Cancer Society
b. Susan G. Komen Foundation
c. ASCO/Cancer.Net
d. American Academy of Pain Medicine
e. American Physical Therapy Association
f. American Occupational Therapy Association
g. American Psychosocial Oncology Society
h. National Association of Social Workers
The purpose here is to once again introduce our specialty specifically to these patient advocacy and support organizations and help distinguish the nuanced care and oncological expertise that we can provide over a general orthopaedic surgeon, thereby helping to facilitate referrals.

Timeline 1-2 (1-5 years)

Difficulty : 1-2

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Recommendation PM3

**Build an education campaign for community physicians and orthopedic surgeons as to importance of MBD including recommendations of when to refer to specialty trained orthopaedic oncology surgeons**

MSTS should champion an education campaign to create awareness and help to educate community physicians, both orthopedic and not, as to importance of MBD. This campaign can lead to the creation of educational materials and clinical guidelines that can be disseminated throughout local communities. These guidelines can help to educate the community physician regarding treatment of the MBD patient and recommendations of when to refer patients with metastatic bone disease to specialty trained orthopaedic oncology surgeons. The MSTS should work to define which patients would be most appropriate for early referral, including a rubric for defining “high risk” patients.
Such an educational campaign will increase appropriate referrals to Orthopaedic Oncology specialists.

Timeline: 2 (months)

Difficulty : 2

Recommendation PM4

**MSTS representation regarding metastatic bone disease at annual meetings of the Association of Clinical Oncology (ASCO) and Association of Therapeutic Radiation Oncology (ASTRO)**

MSTS representation (with specific respect to metastatic bone disease) at annual meetings for the Association of Clinical Oncology (ASCO) and Association of Therapeutic Radiation Oncology (ASTRO).

a. Representation can include the creation of a multidisciplinary panel to present at and educate our non-surgical colleagues about the various surgical and non-surgical treatment options for metastatic bone disease; arrangement for special presentation on the "Best of MSTS" paper/poster presentations on the topic of metastatic bone disease, etc.

b. The MSTS should allow for access of its orthopaedic oncologist/membership database to members of ASCO/ASTRO, to help facilitate referrals to our specialty providers.

Increasing MSTS representation at these national meetings will further the representation of our specialty to medical and radiation oncologists that practice outside of large, tertiary medical centers, where an orthopaedic surgeon and an orthopaedic oncologist may be thought of as interchangeable specialties.

Timeline 1: months

Difficulty :1

Recommendation PM5

**Develop clinical practice guidelines for evaluation and management of metastatic bone disease with multi-society involvement**

Development of society/Academy clinical practice guidelines for evaluation and management of metastatic bone disease and ensure multi-society involvement including ASTRO, ASCO, and perhaps American College of Radiology. This will again help introduce our specialty specifically and ideally provide further referrals. The final guideline should be presented not only at the respective participating societies' annual meetings but should also be disseminated at the Annual Meeting of the American College of Physicians and American Academy of Family Physicians to target internists and primary care providers that are likely to be the "first gate of entry" for these patients.
a. Clinical practice guideline can be developed with assistance and statistical support from the AAOS CPG panel and include representation from multiple subspecialty stakeholders as delineated above.
b. Guidelines can incorporate surgical advances in treatment and novel surgical/ combination treatment approaches. Consensus statements can be developed and evaluation by a metastatic bone disease multidisciplinary treatment team can and should be emphasized.

Timeline: 2 (2-5 years)

Difficulty :2

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# Spine

## Members:

– Motasem Al Maaieh, Spine Surgery
– Brandon Carlson, Spine Surgery
– Serguei A. Castañeda, Radiation Oncology
– Santiago A. Lozano Calderón, *lead*

## Background

Bone metastasis are the most common malignant tumors of the spine, representing up to 90% of the masses encountered in spinal imaging studies (Ziu, 2022). Autopsy studies have demonstrated that up to 80% of patients with metastatic disease have bone metastases of the spine (Bubendorf, 2000). Most commonly these metastatic lesions originate from primary malignant tumors of the breast, prostate, lung, thyroid gland, kidneys and malignant tumors of the bone marrow such as multiple myeloma (Coleman, 2006). The most common location is the thoracic spine, followed by the lumbar and the cervical spine (Mundy, 2002). Even though many of these lesions are not symptomatic, their presence represents burden of disease, becoming in many cases a significant cause for hypercalcemia. When symptomatic, the range of clinical presentation encompasses painful intraosseous lesions through bone lesions with soft tissue extension and spinal canal invasion and cord compression in 20% of patients. With improvement in systemic therapies, the population with metastatic bone disease will continue to rise from the current 400,000 patients diagnosed yearly in the US. The significant costs related to metastatic bone disease (Siegel, 2017), 17% of the total costs of cancer care (Schulman, 2007), and the implications in terms of quality of life for the affected population, demand clear lines of treatment and recommendations for the treatment of patients with metastatic bone disease of the spine.

The following are the recommendations of the Musculoskeletal Tumor Society (MSTS) metastatic bone disease (MBD) taskforce, outlining the high priority areas for the overall strategy in the management of this patient population.

Recommendation S1

**Promote early implementation of radiation therapy for metastatic bone disease of the spine**

Prevention and Early Diagnosis:

The best and most effective approach of management in terms of patient outcomes and cost-effectiveness is the prevention and early diagnosis of metastatic bone disease of the spine. Interventions such as the use of bone antiresorptives in patients with metastatic bone disease of the spine, especially those with tumors with lytic lesions, should be further researched, standardized and implemented. Homogenous protocols of treatment with data collection in registries is not only needed but it is a must to advance the field in prevention. With the current and new upcoming targeted therapies and immunotherapy, there is an existing need to establish the effect or impact of these treatments in the occurrence and progression of metastatic bone disease of the spine. It is necessary to know how these new therapeutic agents may or may not prevent or slow down the onset or progression of metastatic bone disease of the spine. Additionally, research to standardize methods of early detection according to tumor histology, should be a priority for the MBD task force. Early detection allows for early treatment and most likely a less invasive intervention. As earlier detection and treatment initiation continues to be prioritized, a standardized evaluation for possible prophylactic surgical intervention can help prevent future spinal instability and possible neurological injury after initiating radiation and/or chemotherapies. Early surgical evaluation and treatment may also reduce the increasing number of patients with deformity sequelae after the accumulation of different modalities of treatment. As systemic treatments improve as well as overall survival, a larger number of patients with these problems will increase. Prevention and early diagnosis by spine specialist will prevent the future need of more complex and invasive corrective surgeries.
Another aspect of early detection and treatment is the role of radiation treatment in all types of metastatic bone disease. Newly published data demonstrates the effect on overall survival of metastatic bone disease patients with radiation therapy even in not symptomatic lesions. Protocols of early implementation of radiation therapy need to be sponsored and promoted with multidisciplinary communications at different levels in the community. This new evidence is particularly significant in metastatic disease of the thoracic and the lumbar spine. Therefore, the importance of this committee, reinforcing the role of radiation therapy in metastatic bone disease.

Timeline: 1

Difficulty: 2

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Recommendation S2

**Standardization of indications for stereotactic radiotherapy (SBRT), radiofrequency ablation and cryoablation**

Standardization of local non-surgical interventions:

Advancements in radiotherapy (SBRT) and interventional musculoskeletal radiology interventions such as radiofrequency ablation and cryoablation have changed the landscape of oligometastatic disease in histologies such as breast, thyroid, and renal cell carcinoma. Standardization across oncologic care subspecialties for the indications of these interventions is paramount for the optimization of resources and maximization of patient quality of life and function. Registry data after standardization is necessary to determine the oncologic impact of these interventions in disease free survival and overall survival, particularly in the histologies mentioned above. Registry and research data will allow to determine the impact in function and quality of life potentially achievable with these interventions. The role of radiation even in not symptomatic lesions is increasing particularly for lesions of the thoracic and lumbar spine. Treatment of all metastatic bone lesions seem to bear an impact in overall survival. This paradigm change needs standardization of effective dose and protocols, histology specific, while considering their impact when combined with other interventions. Dissemination of this information across specialties is an absolute necessary to achieve this goal.

Timeline: 2

Difficulty: 2

Recommendation S3

**Standardization of protocols for minimally invasive spine procedures, e.g. ertebroplasty and cementoplasty**

Definition, Standardization and Dissemination of Minimally Invasive procedures for management of symptomatic lesions

Vertebroplasty and cementoplasty continue to demonstrate to be an alternative in the management of symptomatic lesions of the spine located in the vertebral bodies. Current guidelines are relatively homogenous as well as the indications for treatment of symptomatic stable compression fractures without neurological involvement. Radiation treatment protocols are available for the treatment of symptomatic lesions with or without neurologic associated symptoms. It is the opinion of the group that this area is a good point to define, standardize, and disseminate protocols of treatment. This exercise can be extrapolated to other areas where more controversy exists.

Timeline: 1

Difficulty: 1

Recommendation S4

**Dissemination of clinical tools that incorporate metastatic disease treatment modalities such as algorithms, nomograms, scoring systems, risk scores, prognostic models, etc to help guide treatment and surgical decisions**

Delineation and standardization of different surgical techniques across subspecialties

Metastatic spinal disease surgical management tenets include stabilization and/or decompression of neurologic elements. The indications for stabilization typically depend on evaluating spinal stability based on metastatic disease extent/location, tumor morphology (lytic vs. blastic vs. mixed), presence and magnitude of fractures, and spinal region. With expanding indications for SBRT and proton therapies, prophylactic stabilization is now commonly performed to prevent catastrophic post-radiation fractures and neurologic injury. Surgeons may select different stabilization techniques dictated by each unique clinical scenario and may utilize open and/or minimally invasive techniques. Neurologic decompression is typically indicated when patients have neurologic compromise (myelopathy, functional radiculopathy, or claudication) and/or the extent of metastatic epidural disease limits the visible margin for effective and safe radiation treatments. In these scenarios, decompression is performed to debulk the tumor burden, provide space to the neurologic elements and in rare scenarios, provide complete surgical resection of oligometastatic disease with negative margins. Decompressions may be performed in isolation but are often complemented with stabilization with or without spinal fusion.
Surgical strategies are evolving as radiation and chemotherapy options continue to increase local control and long-term survival. Identification of metastatic disease radio- and chemosensitivity and the requisite expected survival is an essential important consideration for surgical decision making and strategy selection.
The complex management of spinal metastasis has led to a multitude of clinical tools, including, algorithms, frameworks, nomograms, scoring systems, risk scores, prognostic models, indices, and scores which help guide treatment and surgical decisions. To date, there is no single clinical tool that incorporates the interplay between all metastatic disease treatment modalities and accounts for the complexities of various clinical scenarios. It is relevant for this committee that dissemination of these tools and their use in the multidisciplinary care setting become the standard of care for patients with metastatic bone disease of the spine. Common and regular use of tools and criteria for indication of different modalities of treatment may allow identification of patients for a successful and predictable intervention with acceptable or lower risks.

Timeline: 1

Difficulty: 2

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Recommendation S5

**Creation of patient registries and risk instruments to guide interventions**

Creation of patient registries and standard calculation risk instruments for the indication of interventions and treatment

Ultimately, evolving tools for diagnosis and prognosis are necessary to determine which interventions are the most indicated for a particular patient based on oncologic outcome and benefit as well as function and potential quality of life. The use of large datasets from registry data collection are going to be instrumental to identify factors predicting the development of metastatic bone disease of the spine. This will require the enrollment and data registration of patients without metastatic bone disease and ideally, the collection of histological, genetic, and molecular data. These different types of information will allow to create precise models powered with artificial intelligence which will ultimately, will optimize indications for different modalities of treatment and maximize resources.

Term: 3 (Long term)

Difficulty: 3 (Difficult to attain)

Recommendation S6

**Advance the field to where interventions in the sacrum are as clearly delineated as other regions of the spine**

Inclusion of the Sacrum as a key component for treatment of metastatic disease of the spine

Involvement of the sacrum, either because of metastatic bone disease or radiation osteitis, is a field that requires additional research and implementation of new modalities of treatment and techniques with the goal of decreasing mechanical pain and improving functional outcomes. The field needs to advance to a point where interventions are as clearly delineated as they are for lesions in other regions of the spine. Early intervention and minimally invasive techniques are key for elderly and frail patients affected by metastatic bone disease.

Term: 1 – Short term

Difficulty: 2 (Moderate to attain)

Recommendation S7

**Study further the role upfront radiotherapy for asymptomatic or minimally symptomatic spinal metastases**

The role of radiation in addressing asymptomatic or minimally symptomatic metastatic spine disease.

While multiple randomized studies have evaluated the efficacy of different radiotherapy regimens in the treatment of symptomatic bone lesions, few studies have examined the impact of early, upfront radiotherapy for asymptomatic or minimally symptomatic (non-opioid dependent) spine metastases and its efficacy in preventing skeletal-related events. Gillespie et al. recently reported in a phase II trial the effect of prophylactic radiation therapy for patients with asymptomatic metastatic cancer, high-risk bone metastases on the reduction of the incidence of skeletal-related events, reduction of pain and the number of hospitalizations, and its association with significantly longer overall survival compared with patients who did not receive radiotherapy (Gillespie, ASTRO 2022). This emerging evidence had a particular positive signal in the sub-group of patients with spine metastatic disease and it is currently being investigated in the Prophylactic Radiotherapy of MInimally Symptomatic Spinal Disease (PROMISSeD) trial, which is seeking to understand whether it is beneficial to patients with minimally symptomatic disease to undergo upfront radiotherapy to reduce the risks of skeletal-related events and their sequelae, including hospitalizations (ClinicalTrials.gov Identifier: NCT05534321). Additional studies and collaborations appear warranted in this area

Timeline: 3 ( Long term)

Difficulty: 3 – Difficult to attain

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# Industry Relations

## Members:

- Danny Lerman
- Howard Rosenthal
- Alex Christ
- Tony Brown, Interventional Radiology
- Phil Saylor, Medical Oncology
- Carol Morris, *lead*

The Industry Relations committee did not submit a report. This topic was completed in Task Force, Part II

# Appendix

# Sample Questions

This is an excerpt from the instructions provided to Task Force members at the outset:

Below are examples of questions the committees may use as springboards for their discussions. These should be considered as suggestions and are not intended to overly direct or restrict deliberations. Some questions may be appropriate for more than one committee. When feasible, the recommendations should align with the MSTS Strategic Plan, which will be made available. However, this does not mean committees should avoid making recommendations that might require the Society to amend its Strategic Plan at a later date, if a committee feels it is in the interests of the Society.

**Annual Meeting**

- How can MSTS consolidate or enhance offerings of in-person and web-based educational products on management of metastatic bone disease?
- Should MSTS change the format/length/content of its Annual Meeting and/or other meetings to better educate its members on MBD?

**Disparities**

- Is there evidence for racial, gender or socioeconomic disparities in the care of patients with metastatic bone disease?
- If so, are there existing organizations working to reverse these disparities and can/should the MSTS partner with them?
- In what ways can the MSTS evolve to better address disparities in cancer care?

**Education**

- How can MSTS identify potential new audiences and channels for education?
- How can MSTS consolidate or enhance offerings of in-person and web-based educational products on management of metastatic bone disease?
- How can MSTS enhance its partnerships with other national organizations e.g., American Academy of Orthopedic Surgeons (AAOS), Association of Therapeutic Radiation Oncology (ASTRO), Association of Clinical Oncology (ASCO) to enhance MBD care?
- How can MSTS develop partnerships with patient support organizations relevant to metastatic bone disease?

**Industry Partnerships**

- how can the Society identify implant and pharmaceutical vendors whose products are needed by patients with MBD
- Would it be possible to encourage these vendors to financially support MSTS education efforts and other advocacy efforts on behalf of those patients?

**Novel Techniques**

- Given the paucity of evidence for any novel procedure, should the Society play a role in assessing the value of these treatments?
- Should the Society help provide hands-on training for novel procedures?
- Are there models for multidisciplinary care of MBD that can be generalized, and should the Society play a role?
- Can/should the Society help develop algorithms for treatment of patients by interventional radiology vs. surgeons?
- Should the MSTS develop a CPGs or other practice guidance on novel techniques, e.g., Radiofrequency Ablation for bone mets? If so, should it work with Society of Interventional Radiology (SIR) or Society of Interventional Oncology (SIO)?
- Should the MSTS partner with societies such as SIR, SIO, etc.? And if so, in what manner?

**Practice Management**

- How can Society members increase referrals of patients with MBD?
- Can the Society help develop an algorithm that facilitates referrals? If so, how would this incorporate advances in treatment and prognosis of MBD patients?
- How can the Society seek opportunities to enhance reimbursement for complex reconstruction procedures that are sometimes needed in this patient population?
- Are there models for multidisciplinary care of MBD that can be generalized, and should the Society play a role?

**Spine**

- Is there a mismatch between the availability of spine specialists with oncology training and the needs of US patients with metastatic disease of the spine?
- Is the information available for non-oncologic spine surgeons adequate and appropriate for their decision making ?
- Should the MSTS partner with North American Spine Society (NASS)? Other spine oriented societies? And if so, in what manner?

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# Task Force Committees and Leads

Committee leads are in *italics*.

Annual Meeting
1. *Juan Pretell*
2. Jonathan Forsberg
3. Michelle Ghert
4. Carol Morris

Disparities
1. *Michelle Ghert*
2. Juan Pretell
3. Rosie Wustrack
4. Andrea Evenski

Education
1. *Rosie Wustrack*
2. Dipak Ramkumar
3. Jonathan Forsberg
4. Phil Saylor, Medical Oncology
5. Alexander Lam, MSK Radiology
6. Connie Chang, MSK Radiology
7. Greg Biedermann, Radiation Oncology

Industry Partnerships
1. *Carol Morris*
2. Danny Lerman
3. Howard Rosenthal
4. Alex Christ
5. Tony Brown, Interventional Radiology
6. Phil Saylor, Medical Oncology

Novel Procedures
1. *Danny Lerman*
2. Santiago Lozano-Calderon
3. Alex Lazardies
4. Howard Rosenthal
5. Gina Landinez, Interventional Radiology
6. Tony Brown, Interventional Radiology
7. Greg Biedermann, Radiation Oncology

Practice Management

1. *Andrea Evenski*
2. Dipak Ramkumar
3. Alex Lazardies
4. Alex Christ

Spine
1. *Santiago Lozano-Calderon*
2. Mothasem Al Maaieh, Spine Oncology
3. Brandon Carlson, Spine Oncology
4. Steve Braunstein, Radiation Oncology
5. Serguei Castaneda. Radiation Oncology

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