

Effectiveness of Interdisciplinary Team Conference to Manage Skeletal Related Events in Rehabilitation for Patients with Cancer

YASUKO HAYASHI*¹⁾, MASANORI NAGAOKA*¹⁾, TATSUYA TAKAGI*²⁾,
ERIKO KITAHARA*³⁾, KOZO HATORI*¹⁾, ATSUHIKO TERAOKA*¹⁾, NANA IZAWA*¹⁾

*¹⁾Department of Rehabilitation Medicine, Juntendo University Graduate School of Medicine, Tokyo, Japan, *²⁾Department of Orthopedic Surgery, Juntendo University Graduate School of Medicine, Tokyo, Japan, *³⁾Division of Rehabilitation, Juntendo University Hospital, Tokyo, Japan

Objective: We started a skeletal related events (SRE) management team to conduct rehabilitation interventions safely in cancer patients with metastatic bone lesions. SRE conferences were held 24 times from April 2011 to April 2012. Based on this experience, we investigated how the conferences benefited these patients.

Participants: 78 individual patients (36 males and 42 females; aged 12-84 years, mean 63.6 years) were discussed in SRE conferences. Some became the subject of discussion repeatedly, and a total of 120 patients were discussed.

Methods: This report analyzed retrospectively the effects of SRE conferences on the patients.

Results: Primary cancers included breast cancer in 21 patients, lung cancer in 19, renal cancer in 7, liver cancer in 7, prostatic cancer in 6, esophageal cancer in 3, and gastric cancer in 3, and others in 12. No patients sustained pathological bone fracture during rehabilitation interventions. Rehabilitation achieved the goal of mobility in 75% of patients. Through substantial discussions within the interdisciplinary team, 16 patients with critical bone lesions assumed anti-gravity posture on average 4.4 days after (minimum 6 days before, maximum 23 days after) completion of radiotherapy. This was clearly earlier than the empirical schedule of around 2 weeks. The proportion of patients who were discharged to their own home increased significantly since SRE conference was started, compared to the pre-SRE conference period between 2006 and 2007.

Conclusion: The present study suggests that implementation of SRE conference for cancer patients with bone metastases is effective to improve activity level with low risk of inducing pathological fracture, and is useful to achieve patients' goals including mobility improvement and independent ADL.

Key words: rehabilitation, interdisciplinary care team, bone neoplasm

List of abbreviations

ADL; activities of daily living, SRE; skeletal related events

Cancer patients were not generally considered as subjects for rehabilitation in the past. Even now, there are not many cancer patients undergoing rehabilitation in convalescent phase rehabilitation units that target mainly chronic phase stroke patients. However, the number of rehabilitation requests for cancer patients is increasing in acute care hospitals, accompanying an increase in number of cancer patients. The effect of cancer on survival

is not uniform for all cancer types. Cancers with relatively favorable 5-year survival rate include breast cancer, uterine cancer, prostate cancer and thyroid cancer¹⁾. With the advances in therapeutics, the relative 5-year survival rate for all cancer patients is 59% in Japan¹⁾, while two-thirds of the cancer patients are reported to be cured in the United States²⁾. On the other hand, even for rapidly progressing cancers with poor survival prognosis, there are still considerable needs for rehabilitation in these patients considering the disuse syndrome after surgery or chemotherapy and the quality of the remaining life (such as dysphagia caused by

Corresponding author: Masanori Nagaoka

Department of Rehabilitation Medicine, Juntendo University Graduate School of Medicine
2-1-1 Hongo, Bunkyo-ku, Tokyo 113-8421, Japan

TEL: +81-3-3813-3111 (ext. 71411 (PHS)) E-mail: nagaokam@juntendo.ac.jp

[Received Jan. 27, 2014] [Accepted Apr. 30, 2015]

mucosal edema after radiotherapy).

To address these situations, the revision of medical treatment fees by the Japanese Government in 2010 has added “cancer patient rehabilitation fee” to the list of procedures remunerable by health insurance. According to a study that examined what terminal cancer patients desired in their activities of daily living (ADL), the needs related to mobility were the highest³⁾. On the other hand, pain and pathological fracture associated with metastatic bone tumor pose problems with rehabilitation for terminal cancer patients, and spinal paralysis due to vertebral metastasis has a high risk of deteriorating the prognosis of cancer patients, especially impeding discharge to their own homes⁴⁾.

In managing the progress of rehabilitation in patients with metastatic bone tumor, our hospital has established a skeletal related events (SRE) management team and started activities from April 2011. The purpose of SRE management is to prevent risks of inducing pathological fracture that would aggravate the patient’s functional status, and to improve or maintain the QOL of cancer patients. In this study, we investigated retrospectively the activities of the rehabilitation team and the impact of the activities on the outcome of patients with metastatic bone tumors.

Methods

1. Activities of the SRE management team

The SRE management team (SRE team) started trial activities from April 2011. From September 2011, the activities were officially approved by the hospital as a part of the activities of the Cancer Treatment Center. Activities of the SRE team include (1) SRE round made by an orthopedic surgeon specialized in tumors (also affiliated to division of rehabilitation; TT) and therapists; (2) examinations requested through departments of rehabilitation and orthopedics; and (3) SRE conference. The SRE conference is managed by the rehabilitation division and is held approximately twice a month in the Cancer Treatment Center. One orthopedic surgeon, rehabilitation doctors (physiatrists), physiotherapists, occupational therapists, attending doctors, ward and outpatient clinic nurses, palliative care team, medical social workers and pharmacist attend the conference. The goal and plan for each patient are discussed by the team

consisting of multiple health care providers. Details of the team activities have been reported⁵⁾.

2. Items analyzed

Information of the clinical courses of the patients discussed in SRE conferences was extracted from patients’ electronic medical records. Patients’ information was converted into a database using FileMaker Pro12. The following items were reviewed: age, gender, diagnosis, date of first SRE conference, major items discussed, success or failure of discussed items, subsequent clinical course; and for inpatients, dates of admission and discharge, outcome (discharge to home, transfer to other hospital, death, unknown), and date of last outpatient visit after discharge. Based on these records, a retrospective analysis was conducted to examine the significance of conducting SRE conference for cancer patients, especially those with metastatic bone tumors. The effectiveness of SRE conference was evaluated by comparing the data after introducing SRE conferences with the data of metastatic patients during the pre-SRE conference period from 2005 to 2007⁴⁾. At this stage of the study, interventions were conducted within the scope of routine clinical activities; therefore the present study has not been subjected to ethical review for clinical studies.

Mean age, duration from onset to first SRE conference, and duration from first SRE conference to last visit by type of cancer were analyzed by ANOVA. Significance of differences in outcome (discharge to home, or transfer to other hospital) was analyzed by χ^2 test. Differences in ages and frequency of paresis and cancer diagnoses between pre-SRE and SRE conference periods were analyzed by Mann Whitney test and χ^2 test. A *p* value less than 0.05 was considered statistically significant. All statistical analyses were conducted using the statistical software GraphPad Prism 6.

Results

1. Cases discussed at SRE conferences

Between April 2011 and April 2012, a total of 24 SRE conferences were conducted. The net number of patients studied was 78 (36 males and 42 females; ages ranging from 12 to 84 years, mean 63.6 years), and the gross number was 120, because some patients became subject of discussion repeatedly. In

principle, the target subjects were patients with a definitive diagnosis of metastatic bone tumor, but the number included 7 patients for whom differential diagnosis was required.

The primary cancers were breast cancer in 21 patients, lung cancer in 19, renal cancer in 7, liver cancer in 7, prostate cancer in 6, esophageal cancer in 3, gastric cancer in 3, and others in 12. The mean ages by type of cancer ranged from 56 to 67 years, with no difference among cancer types (ANOVA, $p = 0.4073$) (Table-1). Mean durations from primary cancer detection to SRE conference following onset of bone metastasis were 2,211 days (approximately 6 years) for breast cancer, 1,533 days (approximately 4.2 years) for prostate cancer,

1,350 days (approximately 3.7 years) for renal cancer, and 1,119 and 1,047 days (approximately 3 years) for hepatocarcinoma and gastric cancer, respectively, with a significant difference among cancer types (ANOVA, $p = 0.0031$). On the other hand, the durations were short for esophageal cancer with a mean of 241 days (less than 1 year), lung cancer with a mean of 376 days (approximately 1 years) and other cancers with a mean of 584 days (approximately 1.6 years).

Among the patients discussed in SRE conferences, 68 were inpatients and the remaining 10 were outpatients (Figure-1). Fifty of 68 inpatients underwent rehabilitation, while the remaining 18 inpatients and all 10 outpatients did not

Table-1 Characteristics of patients by cancer type (data as of May 2013) and comparison to data of pre-SRE period (2005-2007)

	N	Age		Duration from onset to SRE conference (days)		Duration from SRE conference to last follow-up (days)*			
		Mean	(Min-Med-Max)	Mean	(Min-Med-Max)	N	Mean	(Min-Med-Max)	
SRE conference period	Breast cancer	21	63.2	(43-66-83)	2211	(294-1545-8019)	14	369	(52-354-656)
	Lung cancer	19	66.8	(42-67-84)	376	(53-111-1565)	13	329	(3-430-656)
	Kidney cancer	7	65.3	(50-66-81)	1350	(38-871-5357)	4	438	(29-513-698)
	Hepatocarcinoma	7	63.7	(56-64-77)	1119	(106-787-3341)	5	193	(36-134-509)
	Prostate cancer	6	66.3	(54-66.5-79)	1533	(51-562-5525)	4	268	(30-192-656)
	Esophageal cancer	3	67.3	(62-68-72)	241	(185-199-339)	2	28	(26-28-30)
	Gastric cancer	3	64	(51-68-73)	1047	(37-262-2343)	2	120	(78-120-161)
	Others	12	55.9	(12-55-77)	584	(68-303.5-1553)	6	195	(12-162-411)
	Total	78	63.6 [†]	(12-66-84)	1166	(37-332-8019)	50	289	(12-265-747)
	in-hospital death	11	66.8	(43-71-79)	1010	(53-339-5357)	11	32	(12-29-78)
Number of paresis	28 (36%) [‡]								
Pre-SRE conference period	Breast cancer	9	58.6	(42-58-83)					
	Lung cancer	17	66.5	(40-70-82)					
	Kidney cancer	4	67.3	(58-65-81)					
	Hepatocarcinoma	3	65.7	(51-70-76)					
	Prostate cancer	6	80	(62-82-92)					
	Esophageal cancer	3	81	(60-91-92)					
	Gastric cancer	4	55.3	(37-56-72)					
	Others	19	64.6	(42-65-85)					
	Total	65	66.1 [†]	(37-67-92)					
	in-hospital death	24	69.9	(40-72-91)					
Number of paresis	32 (49%) [‡]								

N; number of patients, Min; minimum, Med; medium; Max; maximum, *; excluding cases lost to follow-up after discharge. There is no significant difference in mean age among cancer types (ANOVA, $p=0.4073$). Duration from onset to SRE conference is significantly different among cancer types (ANOVA, $p=0.0031$). Duration from SRE conference to the last outpatient follow-up is not significantly different among cancer types (ANOVA, $p=0.6130$). Comparing pre-SRE conference and SRE conference period, there are no significant differences in age [Mann Whitney test, $p=0.3525$ ([†])] and diagnosis [Chi-square test, $p=0.3382$ (**)]. Numbers of subjects with paresis are also not significantly different between two periods [Chi-square test, $p=0.3382$ ([‡])].

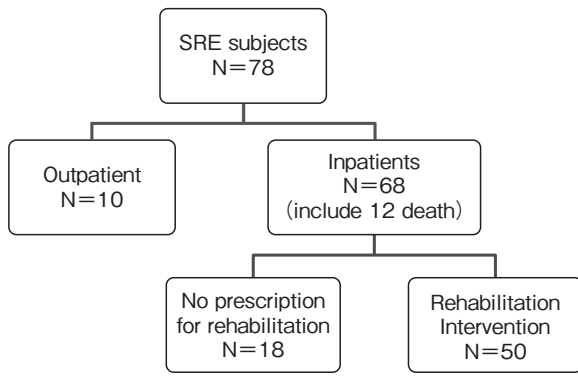


Figure-1 Breakdown of patients discussed in SRE conference

undergo rehabilitation.

2. Contents discussed in SRE conferences

During SRE conferences, various aspects concerning rehabilitation including the current bed rest level based on therapeutic strategy, methods of daily activities in bed, time of initiating anti-gravity posture following radiotherapy, and prescription of spinal orthosis and walking aid were discussed.

To illustrate how the SRE conference functions, we present one case that was discussed in SRE conferences, which has been reported in Japanese⁵⁾.

1) Case report

A 75 year-old female patient with a diagnosis of cancer of left renal pelvis with metastases to bones had been followed in the out-patient clinic for one year because of hematuria and class II urinary cytology. She was admitted to the hospital for investigation of suspected cancer of upper urinary tract, because she complained of lower abdominal pain. On admission, she had difficulties in walking due to severe pain in the lower abdomen as well as lumbar and posterior aspects of the right thigh, but no paresis. An orthopedic doctor specialized in bone tumor (TT) diagnosed that the pain was caused by metastatic bone lesions to spinal bodies. Technetium (^{99m}Tc) bone scintigraphy identified hot lesions in lower thoracic and lumbar areas. A CT scan revealed destructive lesions from Th12 to L3, particularly osteolytic changes in Th12 and L2 (Figure-2). The clinical course and discussion during SRE conferences are shown in Figure-3. On day 5 of admission, radiotherapy (30 Gy/10 fractions) was started to prevent further destruction of bones and to relieve pain. Rehabilitation was started for the prevention of disuse syndrome. Muscle strengthening exercise in recumbent position was prescribed.

At the first SRE conference (day 28 of admission) after completion of radiotherapy, taking sitting position with the aid of an electrical hospital bed

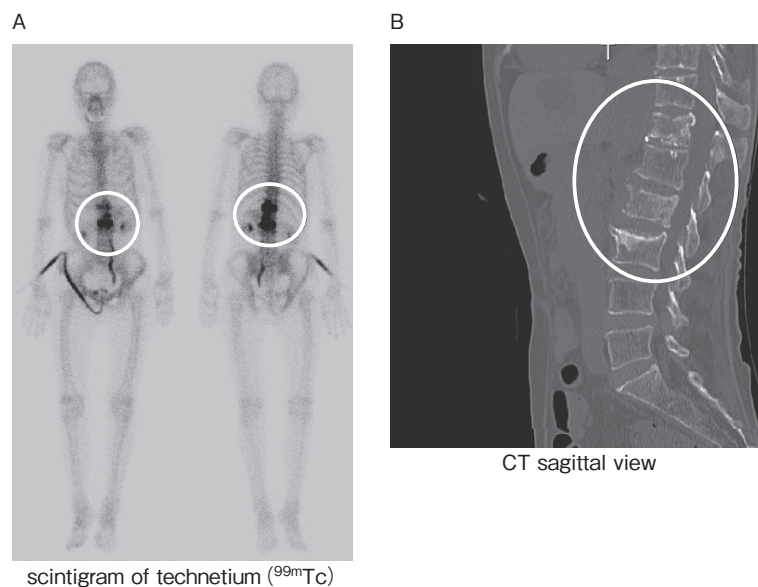


Figure-2 Scintigram (A) and CT scan (B) of presented case Modified from reference number 5.

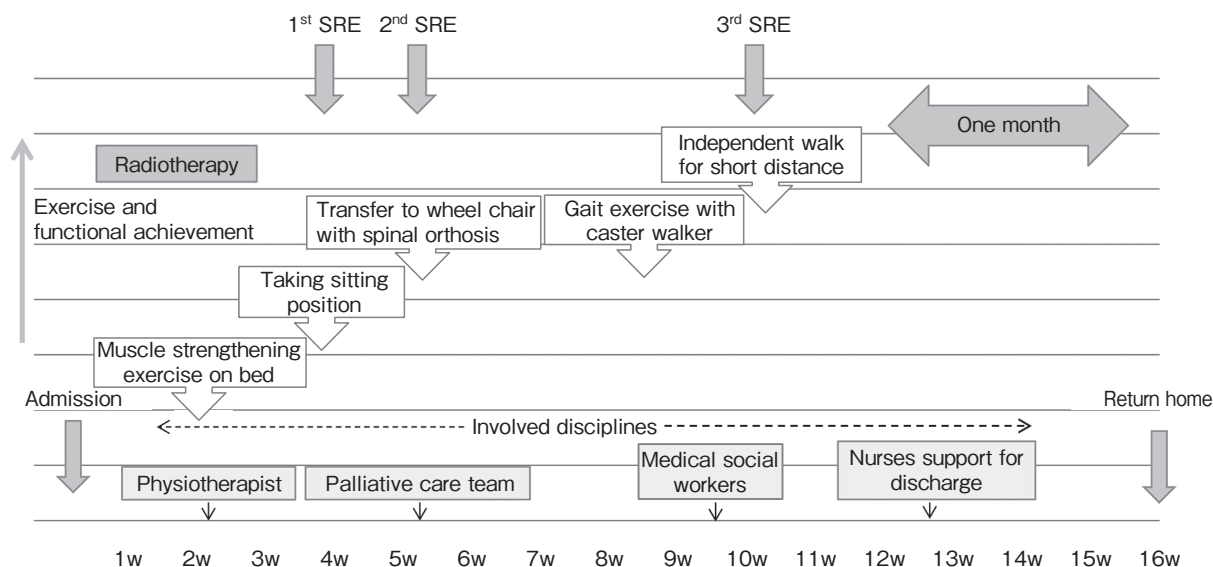


Figure-3 Clinical course of presented case
Modified from reference number 5.

was added to the rehabilitation prescription, after checking that the patient had no remarkable lumbar pain. At the conference, the urologist advised not to add any curative treatment because of her poor performance status (PS). The decision that no chemotherapy would be planned for the reason of poor physical condition was explained to the patient and her family. However, the patient and family understood that chemotherapy would be started if her physical condition improved.

At the second SRE conference (day 35 of admission), a physiotherapist reported that the level of pain decreased while the patient was in Fowler's position, and by changing from supine to sitting position. Transfer to a wheel chair was set as the next goal, after adjustment of the spinal orthotics which was already built but did not fit completely. Through successive accomplishment of the targets of rehabilitation, the patient and family hoped that chemotherapy could be started and took a more positive attitude toward training. The urologist in charge further explained that the reason for no further curative treatment was that no known effective chemotherapy was available for the type of cancer and the advanced clinical stage. He advised that the patient should be moved to a long-term care hospital, and asked medical social workers to find a suitable hospital. For several weeks, the patient and family did not accept the recommendation of the urologist in charge. During

this period, the patient was able to walk with walking aids.

At the third SRE conference (day 70 of admission), she was able to walk independently for a short distance. Finally, the patient and family accepted the decision of no chemotherapy because of the unavailability of effective regimen and advanced stage of cancer with remote metastasis. Considering her improved physical condition, the patient and her husband decided to return home instead of moving to another hospital. However, arrangements had to be made to allow them to live at home with the help of long-term care services, including renting of bed, planning of home care and nursing. It took one month to complete these preparations for discharge to home.

2) Lessons learnt

1. For patients with metastatic bone lesions but no paresis, preventive measures for pathological fracture and treatment for pain may improve functional outcome.
2. In rehabilitation for cancer patients, the goal is not clearly defined and sometimes changes depending on physical and mental conditions.
3. Even with consecutive SRE conferences conducted by a multidisciplinary team involving the patient and family, attending doctors from relevant specialties, orthopedic surgeon, physiatrist, rehabilitation staff, radiologist, nurses, and

Table-2 Contents of discussion at SRE conferences

1. Patient with a diagnosis of metastatic bone tumor	
(A) Possibility of paralysis has to be discussed	
(1) Currently no paresis	5 cases
(2) Incomplete paralysis (paresis)	24 cases
(a) Therapeutic strategy	
(b) Discussions on bed rest level, methods and time of initiation of daily activities and standing/gait training	
(3) Complete paralysis	3 cases
(a) Therapeutic strategy	
(b) For paraplegia and quadriplegia, discussions on transfer techniques (prescription of spinal orthosis, use of sliding board, prescription of wheelchair, etc.)	
(B) No risk of developing paralysis, but has risk of pathological fracture	27 cases
(1) Discussions on therapeutic strategy	
(2) Discussions on orthosis, walking stick, wheelchair, daily activities, standing/gait training	
(C) Pain control necessary	9 cases
(1) Discussions on therapeutic strategy (should radiotherapy be first priority, choice of chemotherapy, etc.)	
(2) Discussions on bed rest level, prescription of spinal orthosis, etc.	
(D) Others	3 cases
Discussions on paralysis prevention, expansion of ADL accompanying pain control, method to address change in PS	
2. Patients requiring differential diagnosis of metastatic bone tumor on diagnostic imaging	7 cases
Diagnosis by orthopedic surgeon specializing in tumor and radiologist (educational discussions for participants)	

medical social workers, the team decision making was not completely effective.

4. Finally the patient accomplished her wish of returning home, but it took four months. This suggests that the team did not necessarily function efficiently for this patient.

Among patients who were discussed in multiple conferences, improvement of activity level as treatment progressed resulting in a change of the initial rehabilitation goal was observed in some patients. For the 78 patients studied, we retrospectively analyzed the contents discussed at the initial SRE conference from the electronic medical records and were able to classify the patients according to the criteria proposed by Katagiri⁶⁾ as shown in Table-2.

3. Effects of SRE conference on outcome of patients with metastatic bone tumor

- 1) Frequency of pathological fracture associated with rehabilitation intervention

Among 50 patients who underwent rehabilitation intervention, no case of pathological fracture caused by rehabilitation intervention during the hospitalization period was observed. However, in one inpatient (case 56), fracture occurred in the acetabulum with metastasized lesion during an overnight stay at home. Also, five outpatients (cases 11, 18, 31, 45 and 55) were at risk of pathological fracture, and were discussed in SRE conferences regarding treatment strategies. These 5 outpatients also did not have any pathological fracture.

2) Could the progression of paresis be prevented?
At the time of initial SRE conference, a total of 29 patients were discussed regarding the issue of paresis, comprising 5 patients who had no paresis, but development of paresis was anticipated from the lesion site, and 24 patients who had already developed mild paralysis (incomplete paresis). Among them, rehabilitation intervention was implemented in 20 patients (no paresis in 2, incomplete paralysis in 18), and the outcome of these patients were analyzed (Figure-4).

Of two patients without paresis, one achieved the rehabilitation goal (no development of paresis, pain control, discharge to home) but one showed deterioration of general condition. Of 18 patients with some symptoms of paresis, 12 not only achieved the goal (no deterioration of paresis) but also paresis improvement and attainment of walking capability; one showed no change of paresis; one showed progression of paresis; two showed deterioration of

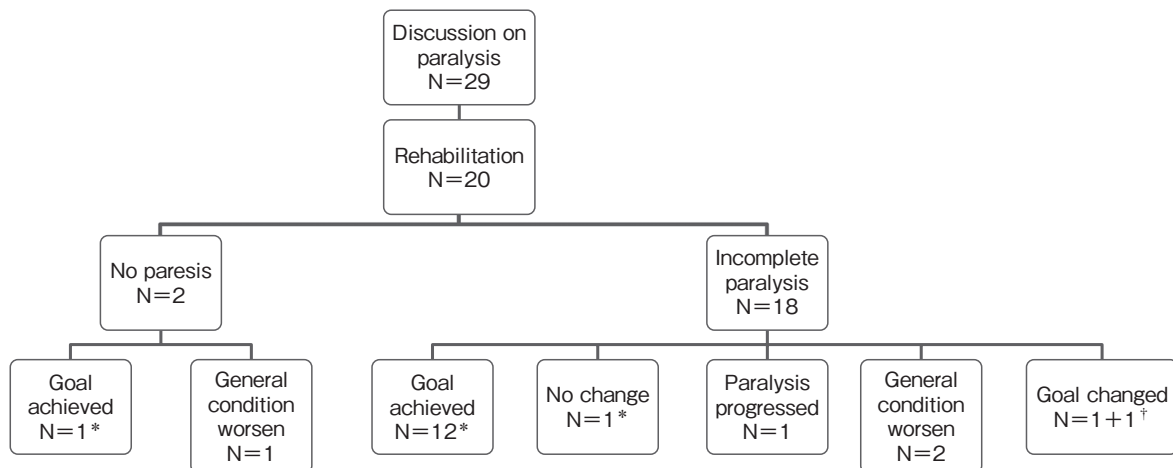


Figure-4 Outcome of rehabilitation in patients discussed at SRE conferences

The groups that achieved maintenance of functional level or improvement of paresis are marked with asterisks. One patient who attained the goal by modifying the program is marked with obelisk (†).

general condition; and two had a change of goal. The 12 patients who achieved goal comprised 8 who recovered from paresis and 4 who maintained functions or had improved capability by walking aids. For the 2 patients with goal change, both had the initial goal of paresis improvement, but 1 changed the rehabilitation goal to palliative intervention and the other to achieve mobility by selecting walking aids instead of aiming at functional recovery (Figure-4).

3) Role of SRE conference in improving ADL: duration between radiotherapy completion and permission of anti-gravity posture

Among the patients discussed at SRE conferences, 16 patients who had spinal metastasis were prescribed bed rest during radiotherapy. We analyzed these patients regarding the duration from the beginning of radiotherapy to permission of anti-gravity posture (Figure-5). The time of the beginning of anti-gravity posture ranged from 6 days before (minus mark in figure) to 23 days after completion of radiotherapy, with a mean duration of 4.4 days.

4) Outcome: discharge to home

Of the 78 patients discussed in SRE conferences between April 2011 and April 2012, we excluded those who were outpatients at the time of examination (10 patients) and those who died during the

study (12 patients), and classified the remaining 56 patients (27 males and 29 females; age range 12 to 84 years, mean 63.7 years) by outcome into discharge to home and transfer to other hospital. As a result, 48 patients (86%) were discharged to home and 8 patients (14%) were transferred to other hospital (Figure-6). When outcome was examined by classifying the 56 patients according to the main issue discussed, 19 of 20 patients examined for the issue of pathological fracture, 18 of 23 for the issue of paresis, and 11 of 13 for other issues were discharged to home. On the other hand, those transferred to other hospital comprised 1 discussed for the issue of pathological fracture, 5 for the issue of paresis, and 2 for other issues. When paralysis became complete, the probability of transferring to other institution was increased. Of 3 patients with complete paralysis, 2 were transferred to other hospital, and 1 died while in hospital.

5) Comparing data with those of patients with spinal metastasis from pre-SRE conference period (Table-1)

During the period of 2005 to 2007 before SRE conference was implemented, 65 cancer patients were referred to rehabilitation because of metastasis to the vertebral bones (38 males and 27 females; age range 37-92 years, mean 66.1 years). Comparing patients in the pre-SRE and SRE conference periods, mean age was apparently slightly older in

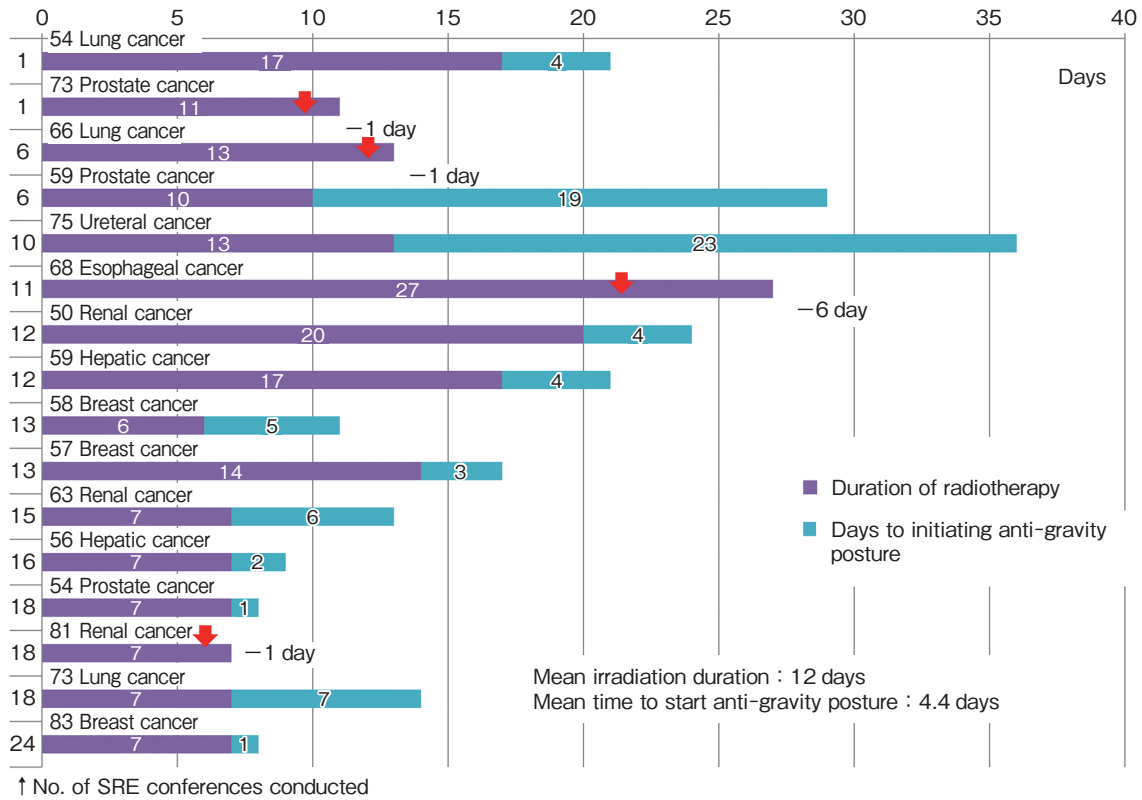


Figure-5 Duration of radiotherapy and the time of starting anti-gravity posture in patients with metastatic bone cancer Modified from reference number 5.

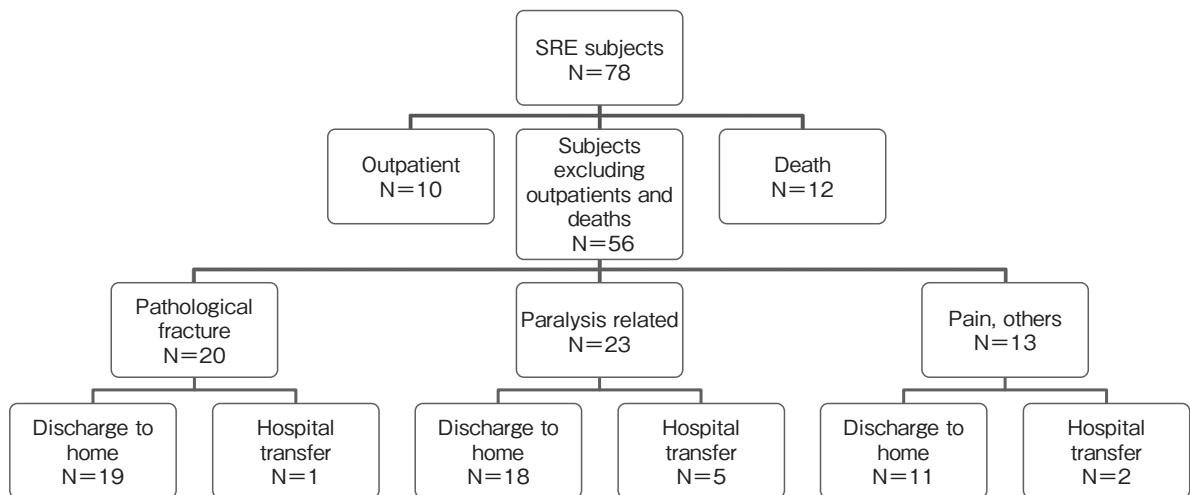


Figure-6 Outcome at discharge (discharge to home or transfer to other hospital) in patients discussed at SRE conferences

pre-SRE group (66.1 years) than in SRE group (63.6 years), but the difference was not significant (Mann Whitney test, $p=0.3535$). The cancer with the highest frequency was breast cancer in SRE period and lung cancer in pre-SRE period, but there was no significant difference in frequency of cancer type (χ^2 test: $p=0.3382$). The frequency of paresis

was also not significantly different between pre-SRE period (32 of 65 patients, 49%) and SRE period (28 of 78 patients, 36%) (unpaired t test, $p=0.1092$).

Among 65 patients in the pre-SRE period, 21 were discharged to home and 16 were transferred to other hospital. Analysis by chi-squared test

Table-3 Influence of SRE conference on frequency of discharge to home

	Pre-SRE conference period	SRE conference period	Total
Discharge to home	21	48 (18*)	69 (39*)
Transferred to hospital	16	8 (5*)	24 (21*)
Total	37	56 (13*)	93 (50*)

Comparing between pre-SRE conference and SRE conference periods, there is a significant difference in the rate of discharge to home (chi-square test, $p=0.0032$) but no significant difference if only cases of paralysis are included (*) (chi-square test, $p=0.104$).

showed a significantly higher rate of discharge to home among patients discussed at SRE conferences (48 patients discharged to home and 8 patients transferred to other hospital) than that in pre-SRE period (χ^2 test: $p=0.0032$) (Table-3). When analysis was conducted in the subset of patients with paresis, the rate of discharge to home in pre-SRE period (18 patients discharged to home and 5 patients transferred to other hospital) was not significantly higher than in SRE period (χ^2 test: $p=0.1042$).

6) Follow-up after SRE conference (Table-1)

Of 78 patients studied, 11 died in hospital. Among the remaining 67 patients, we excluded those who were transferred to other hospital and those who were changed to domiciliary care at discharge, and investigated the status of outpatient visit of the remaining 50 patients from the electronic medical records. As of May 2013, a record of outpatient visit was found in 5 of 14 patients with breast cancer, 4 of 13 with lung cancer, 3 of 4 with renal cancer, 1 patient each with hepatocarcinoma and prostate cancer, and 2 of 6 with other cancers, with a total of 16 patients.

When the duration from SRE conference to the last follow-up was investigated, the mean duration was over 1 year for breast cancer, lung cancer, and renal cancer. The duration for hepatocarcinoma, esophageal cancer and gastric cancer was less than 200 days, although the number of patients was small. There was no significant difference among cancer types (ANOVA, $p=0.6130$). The functional status of outpatients at the time of study was unknown.

Discussion

The greatest expectation of cancer patients from rehabilitation relates to the capability of mobility.

On the other hand, the presence of bone metastatic lesions increases the risks of pathological fracture and progression to paralysis. For the medical care providers, to what extent rehabilitation training should be conducted actively is a question that has to be decided constantly. Usually, the decision is made based on the opinion or experience of the rehabilitation doctor or the attending doctor. In some cases, the opinions of orthopedic surgeon and radiologist are also sought. In the SRE conference evaluated in this study, however, all parties involved in care of the patients gather together, and the conference provides a highly efficient means for collecting information and opinions from multiple disciplines to develop treatment strategy. We have a Cancer Treatment Center in our hospital, where an interdisciplinary staff discusses with doctors from different specialties regarding chemotherapy, palliative care, medical consultation, and nutritional guidance of the cancer patients. The SRE conference, being held in the Center, is characterized by active participation of many paramedics.

We found no case of pathological fracture or accelerated progression of paresis induced by rehabilitation interventions per se. One patient attained acetabular fracture during an overnight stay at home. In this case, we cannot deny the possibility that improved activity through rehabilitation was a remote cause. In the analysis of 20 patients regarding whether the initial rehabilitation goal for paralysis was achieved, functional level was maintained in 1 of 2 patients with risk but no actual paresis, and in 13 (paresis improved in 12 and maintained at the same level in 1) of 18 patients with mild paresis at the beginning of rehabilitation (total 14 of 20 patients with asterisks in Figure-4, 70%). Of the remaining 5 patients with paresis, 1 attained the goal of achieving mobility by modifying the program of using walking aid. Including this

case, rehabilitation was effective for achieving goal or maintaining and improving mobility in 75% of the patients. Bed rest is often prescribed during radiotherapy, which delays the time of assuming an anti-gravity posture. Although there is no data before the implementation of SRE conference, in the past patients were instructed to assume an anti-gravity posture gradually after completion of radiotherapy, which usually took a couple of weeks. Through substantial discussions in SRE conferences, patients with critical bone lesions assumed an anti-gravity posture at a mean of 4.4 days after completion of radiotherapy, which is clearly earlier than the empirical schedule of around 2 weeks.

We analyzed outcome by dividing patients into discharge to home and transfer to other hospital. Analysis was conducted on 56 patients after excluding 10 patients who were outpatients when discussed at SRE conferences and 12 patients who died during the study. Of 56 patients, 48 (86%) were discharged to home. Comparing to the outcome of 37 patients (excluding deaths and patients being in hospital from a total of 65 patients) who underwent rehabilitation because of spinal metastasis in a pre-SRE conference period (2005 to 2007), 21 patients were discharged to home and 16 were transferred to other hospital⁴⁾, and the rate of discharge to home was significantly higher in the group discussed at SRE conferences. In general, whether a patient can be discharged to home depends also on the social background such as family structure and economic situation, and multifactorial analysis is necessary. Furthermore, while bone metastasis generally indicates stage 4 cancer, outpatient visit could be confirmed in 16 of 50 patients as of May 2013. The mean duration from SRE conference to the time of last follow-up exceeded one year for breast cancer, lung cancer and renal cancer. The duration for hepatocarcinoma, esophageal cancer and gastric cancer was around 200 days although the number of patients was small.

Besides the beneficial findings described above, SRE conference could provide a productive and educational milieu for different disciplines of rehabilitation within a setting of acute hospital as our university hospital. Considering the structure of the team, multidisciplinary and interdisciplinary teams are applicable in acute hospitals such as our

hospital⁷⁾. In multidisciplinary team, attending doctor sends discrete orders to various specialists, and horizontal communication among various specialists has been considered to be insufficient. For patients discussed in SRE conference, it is important to have mutual communication between different specialists to share common understanding of patient's needs and goals as illustrated in the case report. Accordingly, interdisciplinary team may be a suitable style for the SRE team⁸⁾. Reviewing the prolonged hospitalization of the presented case, we need to promote more active participation of each discipline attended the SRE conferences.

Study limitations

This study has some limitations. First, patients with bone metastases are treated with bisphosphonates⁹⁾, strontium-89 and radiotherapy for bone metastasis, chemotherapy for the primary cancers, as well as analgesics for pain control. Therefore the consequences and outcome shown in this study are not achieved by rehabilitation alone. Further studies taking into consideration of the above treatments are needed to examine the optimal treatments for these patients. Second, the present study did not evaluate the effects on QOL and psychological state of the study patients. In a previous study, early palliative care in patients with non-small cell lung cancer improved the scores of the Functional Assessment of Cancer Therapy-Lung (FACT-L) scale (a QOL scale) and the Hospital Anxiety and Depression Scale¹⁰⁾. The present study was a retrospective analysis of the data obtained from routine clinical care. In the future, a prospective clinical study with clinical trial registration and ethical approval is required to investigate the impact of rehabilitation based on SRE conference on patients' QOL and mood.

Conclusion

The present study suggests that implementation of SRE conference for cancer patients with bone metastases is efficient to improve activity with low risk of increasing the frequencies of falls and pathological fracture, and is useful to achieve the patients' desired goals including mobility improvement and independent ADL.

References

- 1) Japan Cancer Statistics 2012: Foundation for Promotion of Cancer Research, 2012.
- 2) Longo DL: Approach to the patient with cancer. In: Longo DL, Fauci AS, Kasper DL, *et al*, eds. Harrison's Principles of Internal Medicine, 18th ed. 2012. Retrieved May 17, 2013 from <http://www.accessmedicine.com/content.aspx?aID=9114033>.
- 3) Tsuneto A: Study on the status of terminal cancer patients. Terminal Care, 1996; 6: 482-490. (in Japanese)
- 4) Hayashi Y, Kitahara E, Terakado A, *et al*: Development and application of guideline of rehabilitation for patients with cancers in their advanced stages: factors worsening to spinal paraplegia in vertebral metastasis. JMDD, 2008; 18: 43-49. (in Japanese)
- 5) Nagaoka M, Hayashi Y, Takagi T, *et al*: Introduction of SRE meeting and their effects on the rehabilitation of cancer patients. JMDD, 2013; 23: 51-59. (in Japanese)
- 6) Katagiri H: Palliative care conducted by cancer rehabilitation team, rehabilitation for metastatic bone tumor. MB Med Reha, 2012; 140: 19-27. (in Japanese)
- 7) King JC, Blankenship KJ, Schalla W, Mehta A: Rehabilitation team function and prescriptions, referrals, and order writing. In: Frontera WR, ed. DeLisa's Physical Medicine and Rehabilitation: Principles and Practice, 5th ed. Philadelphia: Lippincott Williams & Wilkins, 2010: 359-412.
- 8) Lisa AB: Cancer rehabilitation: does it make a difference? Rehabilitation Nursing, 2003; 2: 42-47.
- 9) Kinnane N: Burden of bone disease. Eur J Oncol Nursing, 2007; 11: 528-531.
- 10) Temel JS, Greer JA, Muzikansky A, *et al*: Early palliative care for patients with metastatic non-small-cell lung cancer. N Engl J Med, 2010; 363: 733-742.