

## **Rehabilitation for patients diagnosed with metastatic spinal cord compression**

### **Background:**

Two-thirds of patients with cancer will develop bone metastasis [1]. Bone metastasis is initially not clinically visible, and their demonstration occurs during autopsy; therefore, the real incidence of bone metastasis is unknown [2]. Primary bone cancers are observed but are relatively rare, but bones are the most common place for metastasis from other primary tumors [3-5]. Primary tumors that most often leads to bone metastasis are in the order of incidence: prostate, breast, kidney, lung, and thyroid cancer [6]. Given the high prevalence of prostate, breast and lung cancer, they are responsible for more than 80% of cases of metastatic bone disease [6]. Up to 70% of patients with breast cancer or prostate cancer, and 15 to 30% of patients with lung, colon, bladder, or kidney cancer develop bone metastasis [7]. It is estimated that over the 10% of patients with cancer will develop a symptomatic spinal metastasis [8].

A high burden due to metastatic bone diseases does not out-rule the need for rehabilitation. Rehabilitation is found to be effective to improve physical performance and health-related quality of life even in patients with advanced levels of cancer [27]. Furthermore, in a study investigating a sample with a high symptomatic burden due to metastatic bone diseases 92% of the patients reported that they were interested in and felt able to participate in an exercise program [26]. Despite this keen interest, findings from another study highlights the potential and the lack of focus on rehabilitation interventions for this group of patients. The study reported that only 29% of patients with bone metastases were as physically active as current guidelines suggest for cancer survivors [16].

The thoracic and lumbar spine is the regions more involved with metastasis [9-11]. Other common sites are the cervical spine, pelvis, femur, humerus, ribs, and the skull [12]. More than 50% of patients with spinal metastasis have multiple levels involved, and of these 10-38% have multiple, noncontiguous segments involved [12]. When a cancer metastasis to the bone the bones is weakened, which in severe cases, can cause the bone to break without an injury [4].

Sixty percent of all bone metastasis are asymptomatic and discovered occasionally [14, 15], but the remaining 40% are symptomatic [13]. Patients with metastatic cancer significantly increase the risk of pain progression, the need for strong opioids and markedly reduce health-related quality of life

[17, 18]. Consequently, this negatively affects the patient's mood, ability to walk, sleep quality, work ability and social relationships [19-21].

When spinal bone metastasis is present most often the cancer is incurable, and the patients usually have a relatively short life expectancy [16]. One-year survival after bone metastasis is highly dependent on the primary cancer with the lowest survival rate observed in patients with lung cancer (10%) and the highest rate observed in patients with breast cancer (51%) [22]. The relatively short life expectancy is obvious when looking at the three-year survival which ranges from 2% for lung cancer, 12% for prostate to 25% for breast cancer [22].

The choice of optimal treatment therefore should be based on whether the expected outcome outweighs the disutility and risk to the patient of undergoing the treatment [23]. In clinical practice, this choice is often guided by assessment of predicted survival based on prognostic scoring systems such as the Tokuhashi score [23-25].

Patients with malignant spinal cord compression (MSCC) is a subset of the patients diagnosed with spinal bone metastasis. The condition is a result of the progression of a malignant disease and neoplastic metastasis to the spine or epidural space, causing true displacement and compression of the spinal cord [28, 29]. Untreated MSCC will result in loss of gait function, and therefore the diagnose is considered an indication for urgent treatment even in a palliative care setting [32, 33].

The MSCC population is extensively heterogeneous, however, one of the quality statements for adults with MSCC is that all patients should have a management plan that includes an assessment of ongoing care and rehabilitation needs [30]. Furthermore, the clinical guideline for these patients states that admission to a specialist rehabilitation unit to those patients with MSCC who are most likely to benefit, for example, those with a good prognosis, a high activity tolerance and strong rehabilitation potential should be offered [31]. However, the potential benefits of specialist in-patient neurological and functional rehabilitation must be weighed against the time required to achieve these (often small) gains, general health, and ability and wish to return home for patients MSCC. These board defined quality statements and recommendations could be the reason for the clinically observed heterogeneity among patients who are offered and who accept admission to a specialist rehabilitation unit.

**Methods:**

This is a retrospective observational quality improvement study based on retrospective chart reviews.

**Participants:**

All patients ( $\geq 18$  years) diagnosed with MSCC (DG952) referred to the surgery at the orthopedic departments at Copenhagen University Hospital, Rigshospitalet in 2017 to 2018 will be considered eligible for inclusion. Patients will be identified from a list log organized by the orthopedic departments.

**Data:**

A retrospective chart review will provide information regarding type of cancer, primary tumor site, cancer stage), bone metastasis site, comorbidities, number of in-hospital and out-of-hospital admission days, performance status, rehabilitation needs, rehabilitation potential, predicted life-expectancy (based on prognostic scoring systems such as the Tokuhashi score), activity tolerance, patients preferences for rehabilitation, formal education, civil status, sex and age will be obtained from the patient journal.

**Research questions:**

To which extend (percentage) has an assessment of rehabilitation needs been conducted and documented in the patient's journal?

What is the proportion of patient discharged to other hospitals, specialized rehabilitation units, nursing homes and their own home respectively.

Does type of cancer, primary tumor site, cancer stage, bone metastasis site, number of comorbidities, number of in-hospital and out-of-hospital admission days, performance status, rehabilitation needs, rehabilitation potential, predicted life-expectancy, activity tolerance, patient's preferences for rehabilitation, education level, civil status, sex and age predict where patients are discharged to?

**Data management and statistical analysis:**

Individual patient journal charts will retrospectively be reviewed in a sequential manner and data will be extracted to a priory developed data extraction template. Data will be extracted based on a pilot tested and standardized abstraction form. Data will be extracted and handled in the Research

Electronic Data Capture (REDCap) database.

Continuous variables will be summarized as means with standard deviation or median and range, as appropriate. Categorical variables will be summarized by absolute frequencies and percentages. The relationship between discharge site and the possible influencing variables will be investigated using logistic regression models. Results will be presented as odds ratios with 95% confidence intervals.

An alpha level below 0.05 will be considered statistically significant and all analysis will be conducted in STATA (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP.)

### **Ethics:**

As no patients have given consent to participate in this quality improvement and development study the acceptance for conducting this retrospective chart review retrospective must be given either by the local management or by the Danish Patient Safety Authority due to Danish law (Sundhedsloven §42). No patients will be contacted for further information's and the study will comply with ethical principles for medical research as described in the Helsinki Declaration. The Danish data protection agency before the study is initiated have approved the handling of data.

### **Patient and Public Involvement:**

To secure the relevance of the research questions these will be discussed with the patient organization for spinal cord injured patients in Denmark (RYK - Rygmarvsskadede i Danmark). Furthermore, patient representatives will be included in the dissemination of the findings.

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