Metastatic spinal cord compression as an oncology emergency—getting our act together

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Abstract

Background. Metastatic spinal cord compression is a dreaded complication of cancer affecting 5–10% of patients requiring urgent treatment. A clinical practice improvement project was carried out to review and fine tune the clinical pathway for the acute management of patients with metastatic spinal cord compression.

Objective. To improve the quality of care for metastatic spinal cord compression over 6 months by ensuring that >90% of patients receive definitive treatment within 24 h of radiological diagnosis.

Method. Using clinical practice improvement project methodology, the clinical pathway of 17 patients treated with radiotherapy for metastatic spinal cord compression within the last 6 months were reviewed to identify gaps and delays in the system. Interventions to form a multidisciplinary acute spinal cord crisis team, fine tune clinical referral processes and formulate a standardized treatment protocol were then implemented. Post-intervention of 22 subsequent patients were monitored for time to start steroids and radiation therapy, length of stay and hospitalization bill.

Results. With the interventions implemented, the mean response time to start steroidal therapy was reduced from 8.4 to 2.6 days and radiotherapy from 9.9 to 3.9 days. These translated into shorter mean length of stay from 23.8 to 14.7 days and smaller hospitalization bill size from Singapore$13 723 to 8808.

Conclusion. A clinical practice improvement project, to improve the quality of care for patients with metastatic spinal cord compression, can shorten response time to start steroidal therapy and definitive radiotherapy resulting in shorter length of stay and smaller hospitalization bill.

Keywords: clinical pathway, metastatic spinal cord compression, multidisciplinary, radiotherapy, steroids
care for patients presenting with metastatic spinal cord compression at the radiotherapy center focusing mainly on improving clinical processes and response times. To accomplish this, we set two stretch goals to be achieved over 6 months:

(i) ensuring at least 90% of patients receive definitive treatment within 24 h of clinical suspicion and radiological confirmation of diagnosis and
(ii) ensuring at least 90% compliance to a standardized treatment protocol.

**Method**

Led by a senior radiation oncologist, a multidisciplinary project team comprising a radiation therapist, diagnostic radiologist, medical oncologist and an orthopedic surgeon met to discuss the quality of care rendered to patients who presented with metastatic spinal cord compression at an acute care public tertiary hospital, which also provides a multidisciplinary cancer service. Using the clinical practice improvement program (CPIP) methodology of planning, doing, studying and acting on a clinical problem, we first conducted a preliminary review of all 17 patients with metastatic spinal cord compression patients treated with radiotherapy within the last 6 months from January to June 2004. Baseline individual patient parameters that were recorded and tracked included date of clinical suspicion for metastatic spinal cord compression, date of magnetic resonance imaging diagnosis, response time and dose-schedules for administration of steroids and radiotherapy or surgery, length of stay and hospital bill (Table 1). The findings of the preliminary review confirmed our concern that the quality care, in terms of baseline

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**Figure 1** Magnetic resonance image of metastatic spinal cord compression.

**Table 1** Baseline and post-intervention data set for patients treated by radiotherapy for metastatic spinal cord compression

<table>
<thead>
<tr>
<th>Data set</th>
<th>Baseline (n = 17)</th>
<th>Post-intervention (n = 22)</th>
<th>p-value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to starting steroidal therapy (days)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>1–31</td>
<td>1–25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>8.4</td>
<td>2.6</td>
<td>&lt;0.03</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>2.0</td>
<td>1.0</td>
<td></td>
<td>Only one patient in the entire series underwent surgery</td>
</tr>
<tr>
<td>Time to start RT or surgery (days)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>1–49</td>
<td>1–26</td>
<td>&lt;0.223</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>9.9</td>
<td>3.9</td>
<td></td>
<td>One patient in each group was treated as an outpatient</td>
</tr>
<tr>
<td>Median</td>
<td>4.0</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of stay (days)</td>
<td></td>
<td></td>
<td>&lt;0.036</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0–68</td>
<td>0–26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>23.8</td>
<td>14.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>20.0</td>
<td>16.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitalization bill (Singapore $)</td>
<td></td>
<td></td>
<td>&lt;0.081</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0–30 539</td>
<td>0–16 901</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>13 723</td>
<td>8808</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>13 121</td>
<td>8473</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
response time to start steroids and radiotherapy for patients with metastatic spinal cord compression, was far from satisfactory needing urgent interventions for improvement.

To identify the possible gaps and delays in the acute management of patients presenting with metastatic spinal cord compression patients, we traced the entire clinical pathway from clinical suspicion to definitive treatment with either spinal surgery or radiotherapy (Fig. 2). Issues raised and discussed included delays in evaluation and reporting, staff and logistical constraints, lack of awareness of an oncology emergency and indecision on therapy options. In line with CPIPM, we listed all the issues, voted on them individually and reached the consensus to focus on the processes related to the reporting of the magnetic resonance imaging diagnosis, delays encountered in multidisciplinary consultations and the lack of a standardized treatment plan (Figs. 3 and 4).

To address the issues identified above, interventions were then planned to fine tune the clinical pathway for metastatic spinal cord compression to improve the quality of care with a three-prong approach:

(i) setting up a multidisciplinary acute cord crisis team,
(ii) expediting the multidisciplinary reporting and referring processes and
(iii) formulating a standardized treatment protocol for the acute management of metastatic spinal cord compression patients.

With the recognition that a multidisciplinary approach offers the best clinical outcome for metastatic spinal cord compression patients, it was important that the acute cord crisis team comprised representatives from the various relevant clinical disciplines, namely radiation oncology, medical oncology, diagnostic radiology and orthopedic surgery. This was particularly pertinent in formulating an evidence-based standardized treatment protocol for adoption across all disciplines through consensus building after a comprehensive literature review [1–8]. The agreed protocol incorporated the main treatment modalities of initial steroidal therapy and definitive radiotherapy or surgery with emphasis on urgency [5] and standardization of dose-schedules for definitive therapy to be started within 24 h of diagnosis. The use of a validated surgical scoring instrument was also introduced in the protocol for instant preoperative assessment [6] of all patients to expedite surgical decisions. To facilitate the multidisciplinary referring processes, the radiotherapy center became the reporting and clinical coordination center for the acute management of all new metastatic spinal cord compression patients upon radiological diagnosis.

With the above interventions implemented in July 2004, the subsequent 22 patients who presented with metastatic spinal cord compression from July 2004 to May 2005 were managed using the revised clinical pathway and treatment protocol. Individual patient parameters were recorded and tracked as before and compared with the baseline data set. Using the Mann–Whitney U-test, the median values for response time to start of steroids and radiotherapy or surgery, length of stay and hospital bill were compared between the two cohorts of patients presenting before and after interventions were implemented.

Results

Data from the two cohorts of metastatic spinal cord compression patients treated before and after implementations of the project interventions were analysed and compared (Table 1). With the interventions in place, the mean overall response time to start steroidal was reduced from 8.4 to 2.6 days and radiation therapy from 9.9 to 3.9 days (Fig. 5). The median values of these parameters also improved marginally from 2.0 to 1.0 and 4.0 to 2.0 days for start of steroidal

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![Figure 2](image-url) Clinical pathway for patients with metastatic spinal cord compression.
therapy and radiotherapy, respectively, the former being statistically significant.

The improvements in response time to initiate steroids and radiotherapy translated into shorter mean length of stay from 23.8 to 14.7 days and smaller mean hospital bill from Singapore $13,723 to $8,808 (Fig. 6). The median values also improved from 20 to 16.5 days for length of stay and Singapore $13,121 to $8,473 for hospitalization bill, the former being statistically significant.

**Discussion**

Metastatic spinal cord compression remains a dreaded and urgent complication of cancer encountered in clinical practice. The physical and emotional trauma of developing complete paraplegia in patients with spinal cord compression should be prevented as much as possible. Hence, no effort should be spared in early detection and prompt intervention with definitive treatment [5].

Although providing the best chance of a favorable clinical outcome, the multidisciplinary [8] approach in the acute clinical management of patients presenting with metastatic spinal cord compression is often affected by the lack of coordination resulting in unacceptable delays. The baseline results from our preliminary review of 17 patients indeed confirmed that our initial response time to start steroidal therapy and definitive treatment with radiotherapy or surgery should be
shorter in the acute management of an oncology emergency. Hence, the need for a project specifically aimed at improving the quality of clinical care for patients presenting with metastatic spinal cord compression.

As shown in this clinical quality project, a thorough and critical review of the existing clinical pathway can help to identify specific issues and reveal areas that need interventions for improvement. Tracing the work processes in detail allowed for fine tuning of routine practices such as redirecting the urgent radiological reporting of metastatic spinal cord compression to the radiotherapy center and activation of a dedicated acute cord crisis team for immediate response to the patient. In addition to coordinate the clinical processes between different disciplines involved in the acute management of metastatic spinal cord compression, the multidisciplinary team was also responsible for developing the treatment protocol so as to standardize and expedite initial evaluation and treatment as an emergency.

In adopting the CPPIPM to run this project, specific goals has to be set as a part of the overall objective to improve the quality of clinical care. Although the stretch goals of ensuring >90% of our patients received definitive treatment within 24 h with compliance to the treatment protocol were not achieved, the project interventions did bring about objective reduction in mean response times to start steroidal treatment and definitive radiotherapy compared with the baseline data. Although these improvements were less obvious when the median values were compared, they nonetheless translated into shorter lengths of stay and hospitalization bill sizes for the patients. In addition to the patients receiving prompt and appropriate treatment, these interventions also helped to free up hospital beds and resources with cost savings to the patients as well as the health-care system.

A shortcoming of this clinical quality project is the lack of data on neurological outcome alongside the improvements seen in response time to treatment delivery of steroids and radiotherapy. Without a previous prospective clinical protocol, it was difficult to record and track neurological status for the comparison of functional outcomes between the two groups of patients treated before and after implementation of interventions. In any case, the focus of this project was to review and improve clinical pathway processes with emphasis on objectively measured response time to initiate treatment rather than neurological outcomes. Notwithstanding some obvious caveats, length of stay was used as a surrogate marker of clinical outcome on the basis that poor neurological outcome would normally necessitate longer hospital stay.

**Conclusion**

The acute management of patients presenting with metastatic spinal cord compression spans various clinical disciplines requiring close coordination in an urgent setting. Our clinical practice improvement program project aimed at improving the quality of care revealed and identified delays and lapses in the clinical pathway that may compromise clinical outcome. With the formation of a dedicated multidisciplinary acute spinal cord crisis team and the use of a standardized protocol as interventions to fine tune the clinical pathway, we were able to reduce response time to start steroidal therapy and definitive radiotherapy. This in turn resulted in shorter length of stay and a smaller hospitalization bill for patients with metastatic spinal cord compression.

In summary, the application of a clinical practice improvement project based on the methodology of planning, doing, studying and acting on a clinical quality problem has been helpful in assessing, auditing and improving our standard of care in the acute management of metastatic spinal cord compression as an oncology emergency.

**References**


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