Utilization of rehabilitation services for inpatient with cancer in Taiwan: A descriptive analysis from National Health Insurance database.

Heui-Fen, Lin¹,², Ying-Tai Wu¹,², Jau-Yih Tsauo¹,²,³§

¹ School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, Floor 3, No 17, Xuzhou Rd., Zhongzheng District, Taipei, Taiwan
² Division of Physical Therapy, Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, No.7, Chung Shan S. Rd., Taipei, Taiwan
³ Physical Therapy Center, National Taiwan University Hospital
No.7, Chung Shan S. Rd., Taipei, Taiwan

§Corresponding author: Jau-Yih Tsauo, PT, PhD, Professor.
School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, Floor 3, No 17, Xuzhou Rd., Zhongzheng District, Taipei, Taiwan.
Tel: 8862-33668130 Fax: 8862-33668161
E-mail: jytsauo@ntu.edu.tw

Email addresses:

HFL: d96428001@ntu.edu.tw
YTW: ytw@ntu.edu.tw
JYT: jytsauo@ntu.edu.tw
Abstract

Background
Cancer is a major cause of morbidity and mortality throughout the world. Studies have demonstrated a high prevalence of functional impairments among cancer patients. Rehabilitation has been proposed as a strategy to restore patients’ functional independence. Both the increasing number of cancer patients and the growing need for rehabilitation may result in increased utilization of rehabilitation services. This study aimed to investigate utilization of rehabilitation services among hospitalized cancer patients in Taiwan from 2004 to 2008.

Methods
Annual case numbers and total inpatient expenditures for patients with a cancer diagnosis between 2004 and 2008 were calculated from the National Health Insurance Research Database (NHIRD). Rehabilitation service used among hospitalized cancer patients and noncancer patients and distributions of rehabilitation service delivery among hospital departments in Taiwan were also analyzed.

Results
The percentages of inpatients with a diagnosis of cancer from 2004 to 2008 were 14.01%, 14.94%, 15.61%, 16.50%, and 17.10%, respectively. During 2004, 5.25% of all inpatients received rehabilitation services. This percentage increased slightly to 5.62% by 2008. Of patients with a cancer diagnosis, 2.26% to 2.62% received rehabilitation services from 2004 to 2008. However, 5.68% to 6.24% of noncancer inpatients received rehabilitation services during this period. Of patients who received rehabilitation services, only 6.44% had a cancer diagnosis in 2004, and 7.96% in 2008. Sixty-one percent of rehabilitation services were delivered in orthopedics
(25.6%), neurology (14.4%), rehabilitation (11.9%), and neurosurgery (9.2%) departments.

**Conclusions**
In Taiwan, the utilization of rehabilitation services during hospitalization increased from 2004 to 2008. Although this trend was also noted for cancer patients, the utilization of rehabilitation services by cancer patients was relatively low. Despite the benefits of rehabilitation, the actual rehabilitation needs of cancer patients may remain unmet.

**Key words:** Cancer, Rehabilitation, Utilization, Taiwan
**Background**

Cancer is a major cause of morbidity and mortality throughout the world. Although the incidence of cancer is increasing, improvements in early diagnosis and treatment have significantly increased survival rates in recent years. Cancer treatments may result in physical and mental impairment, including dysfunction of the nervous system, musculoskeletal system, and internal organ systems. Cancer-related fatigue and deconditioning have also been frequently reported as side effects of cancer and cancer treatments. The impairments and symptoms experienced by cancer patients typically contribute to disability and loss of function. Studies have demonstrated a high prevalence of functional impairments among cancer patients with different diagnoses and with different treatment situations [1-8]. In cancer care, increasing attention has been given to improving functional recovery after treatment, thereby increasing the quality of life of cancer survivors. Rehabilitation has been proposed as a strategy to restore patients’ functional independence and to improve their psychological function [4, 8-10]. Moreover, it has been recommended that oncology inpatients receive physical therapy services during their hospital stays if possible to prevent deconditioning [11].

Inpatient rehabilitation has been shown to improve functional status in individuals with disability resulting from impairments caused by cancers or related treatments [11-18]. The receipt of rehabilitation programs or exercise intervention by hospitalized cancer patients at acute medical, surgical oncology, or hospice units has been found to be safe and to enhance physical and psychological functioning [11, 15-17, 19-22]. Increased satisfaction of patients, families, and staff were also reported [11, 15, 16]. Cancer patients benefit as much as noncancer patients participating in
comprehensive rehabilitation programs at rehabilitation units or centers [23, 24].
Thus, it appears that there will be an increased need for rehabilitation to help patients
recover from functional impairment and disability caused by the disease itself as well
as treatment side effects.

Both the increasing number of cancer patients and the growing need for
rehabilitation may result in increased utilization of rehabilitation services. Previous
studies on rehabilitation needs or utilization, which took the form of retrospective
chart reviews, questionnaire surveys, or clinician-administered testing, were based on
small sample sizes [1-3, 6, 12-16]. Moreover, there is no information about utilization
of cancer rehabilitation services in Taiwan. The differences in utilization patterns of
rehabilitation services between cancer and noncancer patients are also unclear.

Taiwan launched a single-payer National Health Insurance (NHI) program on
March 1, 1995. The NHI system provides universal coverage and equal access to
health-care services. By the end of 2008, 99% of the population was enrolled in the
program, and 92% of all health-care facilities in Taiwan were contracted by the NHI
system [25]. The National Health Insurance Research Database (NHIRD), a large
computerized database derived from this system by the Bureau of National Health
Insurance (BNHI) and maintained by the National Health Research Institutes (NHRI,
Taiwan), is provided to researchers in Taiwan for research purposes. The NHIRD
contains registration files and original claim data for reimbursement of NHI programs
[26]. As such, it offers researchers a nationwide representative database of the health-
care system in Taiwan.

The present study aimed to investigate utilization of rehabilitation services
among hospitalized cancer patients in Taiwan by extracting and analyzing data from
the NHIRD for the period from 2004 to 2008.
Methods

Data sources and data collection
Data sets from Taiwan’s NHIRD, consisting of data file of inpatient expenditures by admissions (DD file) and file of related records in details of inpatient orders (DO file), between 2004 and 2008 were used for analysis. The DD file was extracted from the original NHI claim data with a sampling rate of 5%.

Cases of cancer were identified by the diagnosis coding of the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) or other cancer-related codes, with the first three digits from 140 to 239, or the diagnosis codes with the first three digits from A08 to A17, and the cancer-surgery-related codes with the first three digits from V57 to V58. If none of the above criteria were matched, then the case was categorized as “noncancer” in our study.

When the claim data for rehabilitation fee was not equal to zero, the subject was identified as “with rehabilitation services.” When the rehabilitation fee in the claim data was zero, the classification was “no rehabilitation.” According to the scope of benefits of NHI, the rehabilitation therapy fee includes services related to rehabilitation examination and treatment, physical therapy, occupational therapy, communication therapy, and psychosocial rehabilitation treatment. Details of rehabilitation services were obtained from the linked DO data set.

Because the data for patient and institution identities had been scrambled cryptographically by the NHIRD, this study was exempt from the requirement of institutional review board approval.

Statistical analysis
The annual number of cases with a cancer diagnosis and percentages of total admissions were calculated. Rehabilitation service used among cancer patients and noncancer patients during hospitalization and the distributions of rehabilitation
service delivery among hospital departments were also analyzed. The annual case numbers and medical expenditures were multiplied by 20 for 5% systematic sampling data sets. The SAS software, version 9.1 (SAS Institute, Inc, Cary, NC, USA) was used for data reduction and descriptive statistics.

**Results**

**Annual cases with a cancer diagnosis and utilization of rehabilitation services**

There were approximately 3 million hospital admissions annually between 2004 and 2008. The percentages of inpatients who received rehabilitation services from 2004 to 2008 were 5.25%, 5.27%, 5.37%, 5.57%, and 5.62%, respectively. A trend of an increasing number of inpatients diagnosed with cancer was found during the study period. The percentages of admission cases coded for cancer from 2004 to 2008 were 14.01%, 14.94%, 15.61%, 16.50%, and 17.10%, respectively. Of patients who received rehabilitation services, 6.44% had a cancer diagnosis in 2004, and the percentage gradually increased to 7.96% in 2008. Only 2.26% to 2.62% of patients with cancer received rehabilitation services between 2004 and 2008. Of noncancer patients, 5.68% to 6.24% received rehabilitation services during the same period (Table 1).

A similar distribution of rehabilitation services provided to patients in different departments between 2004 and 2008 was found. Sixty-one percent of rehabilitation services were delivered to patients in orthopedics (25.6%), neurology (14.4%), rehabilitation (11.9%), and neurosurgery (9.2%) wards. Physical therapy accounted for more than 70% of rehabilitation services.
Annual medical expenditures and annual claims for inpatients rehabilitation services

Annual medical expenditures for inpatient care are shown in Table 2. There were 145.9 billion points in 2004 and 159.9 billion points in 2008. The reimbursement from NHI for one point is about 0.8 to 1.0 NTD, according to medical claims review. Annual inpatient medical expenditures increased 9.6% from 2004 to 2008. Annual inpatient medical care for cancer patients accounted for 18.7% of total inpatient medical expenditures in 2004, increasing to 22.2% in 2008. Annual claims for inpatient rehabilitation services amounted to 923 to 994 million points during 2004 to 2008, accounting for 0.6% of total inpatient medical expenditures. Average inpatient medical expenditure per admission gradually increased from 48,304 points to 52,475 points from 2004 to 2008. The average medical expenditure for cancer patients was higher than that for noncancer patients. However, the average expenditure for rehabilitation services for cancer patients was lower than those for noncancer patients (Table 3).

Rehabilitation utilization among cancer and noncancer patients, and the proportion of inpatients with a cancer diagnosis by department in 2008

Figure 1 shows the prevalence of rehabilitation utilization among cancer and noncancer patients as well as the proportion of patients with cancer by department in 2008. The average rehabilitation utilization rates were 6.24% in noncancer patients and 2.62% in cancer patients. Five departments with high rehabilitation utilization and 10 departments with high percentage of cancer cases were chosen for illustration. High rehabilitation utilization was noted for rehabilitation, orthopedics, neurology, neurosurgery, and plastic surgery departments regardless of whether or not patients had cancer. Among the 10 departments with a high prevalence of cancer cases, the patients in the department of family medicine had higher rehabilitation utilization rates in both cancer (2.87%) and noncancer (10.29%) patients than average.
Utilization of rehabilitation services was relatively low in the other departments, such as hematology/oncology (cancer 1.97%, noncancer 2.73%), chest (cancer 2.48%, noncancer 4.20%), gastrointestinal (GI) medicine (cancer 1.06%, noncancer 1.37%), GI surgery (cancer 1.37%, noncancer 2.59%), general surgery (cancer 1.47%, noncancer 3.26%), and colorectal surgery (cancer 1.04%, noncancer 0.72%). Higher-than-average rehabilitation service utilization among cancer patients was found for the departments of ears, nose, and throat (4.37%) and thoracic surgery (5%).

**Discussion**

This population-based study was based on a nationwide insurance registration. It was conducted to analyse the utilization pattern of inpatient rehabilitation services in Taiwan, with particular focus on patients with cancer. We found a trend of increasing percentages of inpatients with a diagnosis of cancer from 2004 to 2008, as well as a trend of increasing percentages of cancer patients receiving rehabilitation services during hospitalization. This may indicate growing awareness of the rehabilitation needs of cancer patients. Of patients receiving rehabilitation services, we also found an increasing percentage of those with cancer. This correlates with the growing population of patients with cancer. However, the utilization of rehabilitation services among cancer patients (2.26-2.62%) was much lower than that among noncancer patients (around 6%). The percentage of patients with a cancer diagnosis who received rehabilitation was less than half that of those without a cancer diagnosis.

Lower utilization of rehabilitation services by cancer patients than by noncancer patients also indicated by the average rehabilitation fee. This might be because of the duration and frequency of utilization. The average rehabilitation fee of noncancer patients was similar from 2004 to 2008 (5,696–6,083 points), while that of cancer patients was higher.
patients was much lower, ranging from 4,047 points in 2004 to 5,114 points in 2008. It showed a narrowing of the discrepancy in the receipt of rehabilitation services between cancer and noncancer patients.

The utilization of rehabilitation services among hospitalized cancer patients in our study seemed far below that reported in the literature. The rehabilitation needs of 55 patients admitted to a medical oncology unit were examined by Movsas et al [6]. They found that 48 (87%) patients had rehabilitation needs on admission. The medical records of 100 patients with newly diagnosed lung cancer were reviewed by Podnos et al [3]. A total of 114 referrals for supportive services were made involving 64 patients. Thirty-one percent of the referrals were for pulmonary rehabilitation, and 19% were for physical or occupational therapy. In a study by Montagnini et al [18], the records of 100 patients discharged from a palliative-care unit were reviewed to assess the utilization of physical therapy. Thirty-seven patients received a formal physical therapy assessment, and 18 patients underwent physical therapy.

Reasons for underutilization of rehabilitation services may include failure to identify functional impairments by acute-care staff, lack of appropriate rehabilitation referral, lack of awareness of rehabilitation services, and lack of knowledge about rehabilitation services among family members [5, 6]. Underutilization of rehabilitation services may also be due to the medical complexity of cancer cases in acute-care settings. In a nationwide survey of the status of cancer rehabilitation in Japan, 50.8% of institutions gave “absence of prescriptions for rehabilitation by attending physicians” as the reason for the delay in introducing rehabilitation for cancer patients; other reasons were “insufficient staff” (30.4%) and “institution and facilities not prepared” (27.1%) [27]. These barriers can be overcome by educational...
efforts and by promoting interdisciplinary cooperation of clinical staff in oncology [6, 17].

The present study found that rehabilitation services were delivered predominantly in departments of orthopedics, neurology, rehabilitation, and neurosurgery regardless of whether or not patients had cancer. This was not a surprise given the scope of traditional physical medicine and rehabilitation. Another important reason was country-specific, in that according to the reimbursement regulation of the NHI program, only these physicians may directly request physical therapy. Sixty-one percent of rehabilitation services were delivered to patients in the wards mentioned above. The other physicians had to consult a physiatrist to request rehabilitation services. High caseloads, indirect availability, and lack of professionals specialized for cancer rehabilitation may contribute to low utilization in other departments with high cancer prevalence such as hematology/oncology.

Higher-than-average rehabilitation utilization rates among cancer patients were found in departments of family medicine; ears, nose, and throat; and thoracic surgery. Similar rates of utilization of rehabilitation services (5%) for cancer and noncancer patients were noted for the thoracic surgery department. This may be due to similar use of pulmonary rehabilitation by both cancer and noncancer patients. Most hospitals place their hospice-care unit in the family medicine department. The percentage of cancer patients in the family medicine department increased from 25% to 31% from 2004 to 2008, and the rehabilitation utilization rate of cancer patients in this department increased from 2.03% in 2004 to 2.87% in 2008. The growth rate of cancer patients receiving rehabilitation (41%) was much greater than that of cancer patients in the department (24%). This finding may suggest increasing utilization of rehabilitation services in the hospice-care unit.
The NHIRD has inherent disadvantages, including lack of clinical data, demographic data, disease severity data such as cancer stages, and important outcome variables. Thus, we cannot assess the outcomes or effects of rehabilitation services, or the correlation of disease severity and rehabilitation service use. Cancer cases were identified from admission diagnoses in our study. We could not determine whether or not the cancer patients were newly diagnosed, or whether or not they were admitted for cancer-related problems.

The databases used in our study are cross-sectional in nature. Longitudinal study of utilization of rehabilitation services after cancer diagnosis by using representative sampling data sets is warranted. Comparison of rehabilitation utilization patterns between inpatient care and the ambulatory-care setting is suggested for further analysis.

**Conclusions**

In this study, we found a rise in utilization of rehabilitation services during hospitalization among people with cancer in Taiwan. However, rehabilitation interventions for cancer patients are still overlooked and underutilized, despite high levels of functional disability in these patients. Further research is needed on the delivery of services to meet cancer-specific rehabilitation needs. Moreover, establishing an interdisciplinary care team for cancer patients may increase the feasibility of cancer rehabilitation.

**Authors' contributions**

HFL designed the concept and conducts of the study, obtained, analysed and interpreted data, and drafted the manuscript. JYT assisted in study design, data analysis, and data interpretation, and provided critical revision of the manuscript for important intellectual concepts. YTW assisted in study design and in interpreting the
data and commended on the manuscript. All authors have approved the final submitted manuscript.

Acknowledgements

This study is based in part on data from the National Health Insurance Research Database provided by the Bureau of National Health Insurance, Department of Health, and managed by the National Health Research Institutes. The interpretations and conclusions contained herein do not represent those of the Bureau of National Health Insurance, Department of Health, or National Health Research Institutes.

Competing interest

All authors declare that they have no conflicts of interest.

References


Figures

Figure 1 Distributions of cancer patients and rehabilitation utilization among cancer and non-cancer inpatients by year 2008.

Tables

Table 1 Annual numbers of cases from 2004 to 2008.

Table 2 Annual medical expenditure of inpatient care from 2004 to 2008.

Table 3 Average medical expenditure and rehabilitation fee* of inpatient care in cancer and non-cancer cases from 2004 to 2008.
Table 1  Annual numbers of cases from 2004 to 2008.

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total admission cases*</td>
<td>3020.2</td>
<td>2975.9</td>
<td>2912.1</td>
<td>2968.8</td>
<td>3046.6</td>
</tr>
<tr>
<td>Cancer cases*</td>
<td>423.0</td>
<td>444.6</td>
<td>454.6</td>
<td>489.8</td>
<td>520.8</td>
</tr>
<tr>
<td>(% of admission cases)</td>
<td>(14.01%)</td>
<td>(14.94%)</td>
<td>(15.61%)</td>
<td>(16.50%)</td>
<td>(17.10%)</td>
</tr>
<tr>
<td>Cases received</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rehabilitation services*</td>
<td>158.4</td>
<td>156.8</td>
<td>156.5</td>
<td>165.4</td>
<td>171.3</td>
</tr>
<tr>
<td>(% of admission cases)</td>
<td>(5.25%)</td>
<td>(5.27%)</td>
<td>(5.37%)</td>
<td>(5.57%)</td>
<td>(5.62%)</td>
</tr>
<tr>
<td>Non-cancer cases received</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rehabilitation services*</td>
<td>148.2</td>
<td>146.7</td>
<td>156.5</td>
<td>152.9</td>
<td>157.7</td>
</tr>
<tr>
<td>(% of non-cancer cases)</td>
<td>(5.71%)</td>
<td>(5.80%)</td>
<td>(5.68%)</td>
<td>(6.17%)</td>
<td>(6.24%)</td>
</tr>
<tr>
<td>Cancer cases received</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rehabilitation services*</td>
<td>10.2</td>
<td>10.1</td>
<td>11.3</td>
<td>12.5</td>
<td>13.6</td>
</tr>
<tr>
<td>(% of cancer cases)</td>
<td>(2.41%)</td>
<td>(2.26%)</td>
<td>(2.48%)</td>
<td>(2.56%)</td>
<td>(2.62%)</td>
</tr>
<tr>
<td>(% of rehabilitation cases)</td>
<td>(6.44%)</td>
<td>(6.42%)</td>
<td>(7.21%)</td>
<td>(7.58%)</td>
<td>(7.96%)</td>
</tr>
</tbody>
</table>

* unit: thousand
Table 2  Annual medical expenditure of inpatient care from 2004 to 2008.

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total admission cases</td>
<td>145.89</td>
<td>150.24</td>
<td>150.11</td>
<td>152.24</td>
<td>159.87</td>
</tr>
<tr>
<td>Cancer patients</td>
<td>27.28</td>
<td>28.74</td>
<td>30.83</td>
<td>31.97</td>
<td>34.59</td>
</tr>
<tr>
<td>(% of total)</td>
<td>(18.70%)</td>
<td>(19.13%)</td>
<td>(20.54%)</td>
<td>(21.00%)</td>
<td>(22.20%)</td>
</tr>
<tr>
<td>Non-cancer patients</td>
<td>118.61</td>
<td>121.50</td>
<td>119.28</td>
<td>120.27</td>
<td>125.28</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>0.95</td>
<td>0.92</td>
<td>0.94</td>
<td>0.93</td>
<td>0.99</td>
</tr>
<tr>
<td>services (%)</td>
<td>(0.65%)</td>
<td>(0.61%)</td>
<td>(0.63%)</td>
<td>(0.61%)</td>
<td>(0.62%)</td>
</tr>
</tbody>
</table>

* Unit: billion points; 1 point was reimbursed about 0.8-1.0 NTD.

Table 3  Average medical expenditure and rehabilitation fee* of inpatient care in cancer and non-cancer cases from 2004 to 2008.

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average medical expenditure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cancer patients</td>
<td>64,492</td>
<td>64,653</td>
<td>67,806</td>
<td>65,269</td>
<td>66,419</td>
</tr>
<tr>
<td>non-cancer patients</td>
<td>45,668</td>
<td>47,999</td>
<td>48,538</td>
<td>48,514</td>
<td>49,600</td>
</tr>
<tr>
<td>Average rehabilitation fee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cancer patients</td>
<td>4,047</td>
<td>5,245</td>
<td>5,190</td>
<td>5,088</td>
<td>5,114</td>
</tr>
<tr>
<td>non-cancer patients</td>
<td>6,021</td>
<td>5,927</td>
<td>6,083</td>
<td>5,696</td>
<td>5,859</td>
</tr>
</tbody>
</table>

*Unit: point, 1 point was reimbursed about 0.81.0 NTD.