Inpatient Treatment Patterns and Healthcare Expenditures for Hepatocellular Carcinoma among Population with Urban Basic Health Insurance in China

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Outline

- Background
- Objectives
- Methods
- Results
- Conclusions
- Study Limitations
Hepatocellular Carcinoma (HCC) represented a significant disease burden in China:

- 3rd most common cancer
- 2nd leading cause of cancer-related death in China
- Estimated 500,000 newly diagnosed annually

China Health Insurance Research Association (CHIRA), in collaboration with 60 local social insurance agencies, has collected urban Basic Health Insurance (BHI) enrollee’s hospitalization data for this study.
Objectives

◆ To summarize current HCC treatment patterns and costs during hospitalization among China’s urban BHI beneficiaries

◆ To describe the utilization of varied systemic therapies for HCC

◆ To identify trends in HCC treatment patterns and costs from 2008 to 2010
Methods

◆ Study Population:
  - Inpatients aged 18 and over with BHI coverage
  - Inpatients between 2008~2010
  - With discharge diagnosis of HCC (ICD-10 Codes: C22.0 and C22.9)
Methods

◆ Multistage Stratified Sampling Approach:
  - Sampled cities were first selected based on city level
  - Within the sampled cities, the hospitalization records were then sampled

<table>
<thead>
<tr>
<th>City Level</th>
<th>Definition</th>
<th>Cities Sampled</th>
<th>% of Sampled hospitalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>provincial level cities and provincial capitals</td>
<td>27</td>
<td>2%</td>
</tr>
<tr>
<td>Level 2</td>
<td>prefecture and sub-prefecture level cities</td>
<td>20</td>
<td>5%</td>
</tr>
<tr>
<td>Level 3</td>
<td>county-level cities</td>
<td>20</td>
<td>10%</td>
</tr>
</tbody>
</table>

Note: % of sampled hospitalizations = Sampled hospitalization records / the total hospitalization records of the city

- Within hospitalization records sampled above, HCC patients were selected based on ICD-10 codes

◆ Sample Size:

<table>
<thead>
<tr>
<th>City levels</th>
<th>National cases sampled</th>
<th>HCC cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>324,759</td>
<td>1,884</td>
</tr>
<tr>
<td>Level 2</td>
<td>151,738</td>
<td>744</td>
</tr>
<tr>
<td>Level 3</td>
<td>39,789</td>
<td>137</td>
</tr>
<tr>
<td>Total</td>
<td>516,286</td>
<td>2,765</td>
</tr>
</tbody>
</table>
**Extrapolation**

**Sample rate:**
- Municipalities and provincial capitals: 2%
- Prefecture-level cities: 5%
- County level cities: 10%

- **Total hospitalization of sample:** 2,765

- Extrapolate sampled data to the city, according to its sample ratio
- Sample cities were divided into 7 city tiers, according to its GDP, population, medical market size
- Extrapolate the city data to city tier, according to its market share in the city tier
- Aggregate the data of all city tiers

- **Total hospitalization after extrapolation:** 443,592
Methods – cont’d

◆ Key Variables:

- Patient demographics
- Insurance type
- Hospital type
- Hospital level
- Treatments/Service items
- Expenses by item
- Treatment patterns

➢ To standardize the treatments, the *2011 Diagnosis and Treatment Guideline for Primary Liver Cancers* issued by the China Ministry of Health was used.

  - Liver Resection
  - Liver Transplantation
  - Local Ablation therapy
  - Transarterial Interventional Therapy
  - Radiation Therapy
  - Molecular Targeted Drug Therapy
  - Systematic Chemotherapy
  - Traditional Chinese Medicine (TCM)
  - Palliative care
  - Others
Results

- HCC Patient Profiles
- Treatment of Choices
- Average Hospitalization Cost
- Average Cost by Service category
- Average Length of Stay and Daily Cost
HCC Patient Profiles

- **HCC Patients Characteristics after Extrapolation:**
  - Male/Female Ratio: 80.5/19.5
  - Age: 94% above age 40 and peaked at 50~69
  - Geographic: heavily concentrated in the East region (56%), followed by the Central region (30%)
  - Site of Treatment: more than half were treated in Tier 3 hospitals, and few in small/Tier 1 hospitals

**Gender and Age Distribution**

**Site of Treatment - Case # & Proportion**
Treatment of Choices - Overview

**Treatment of Choices:**

- **79.3%** of HCC inpatient hospitalizations sample chose active treatment (systematic therapy, local therapy, radiotherapy and surgical therapy). After extrapolation, **32%** HCC inpatient hospitalizations were to receive palliative care*

- Systematic therapy was the most commonly used (**71.8%** of sample, and **62.0%** after extrapolation), including chemo, traditional Chinese medicine, targeted therapy, and other therapy (eg. Immunological therapy/Anti-viral agents)

- Local therapy was more commonly used (**30.7%** of sample, **24.1%** after extrapolation), in which Transarterial Interventional Therapy (TACE, TAI, TAE) was commonly used (**26.9%** of sample, **21.3%** after extrapolation), while local ablation was used in **5.4%** of sample and **4.0%** after extrapolation.

- The usage of surgical therapy (liver resection and transplantation), as well as radiotherapy was rather limited

- *In this study, we have defined the palliative treatment for those patients that did not undergo any active treatment as listed above

<table>
<thead>
<tr>
<th>Treatment Choice as % of Cases</th>
<th>Sample</th>
<th>After Extrapolation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total of HCC hospitalization</strong></td>
<td>2,765</td>
<td>443,592</td>
</tr>
<tr>
<td><strong>Palliative Therapy</strong></td>
<td>571</td>
<td>140,303</td>
</tr>
<tr>
<td><strong>Active treatment</strong></td>
<td>2,194</td>
<td>303,290</td>
</tr>
<tr>
<td><strong>Systematic Therapy</strong></td>
<td>1,986</td>
<td>275,188</td>
</tr>
<tr>
<td>Traditional Chinese Medicine</td>
<td>1,642</td>
<td>233,869</td>
</tr>
<tr>
<td>Others</td>
<td>895</td>
<td>104,725</td>
</tr>
<tr>
<td>Systematic Chemotherapy</td>
<td>332</td>
<td>44,153</td>
</tr>
<tr>
<td>Molecular Targeted Drug Therapy</td>
<td>10</td>
<td>1,074</td>
</tr>
<tr>
<td><strong>Local Therapy</strong></td>
<td>850</td>
<td>106,814</td>
</tr>
<tr>
<td>Transarterial Interventional Therapy</td>
<td>743</td>
<td>94,298</td>
</tr>
<tr>
<td>Local Ablation</td>
<td>148</td>
<td>17,573</td>
</tr>
<tr>
<td><strong>Surgical Therapy</strong></td>
<td>110</td>
<td>9,261</td>
</tr>
<tr>
<td>Liver Resection</td>
<td>109</td>
<td>9,239</td>
</tr>
<tr>
<td>Liver Transplantation</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>84</td>
<td>10,724</td>
</tr>
</tbody>
</table>

*In this study, we have defined the palliative treatment for those patients that did not undergo any active treatment as listed above.*
Concomitant therapies
- Concomitant therapies (up to 5) were commonly used for 35% of cases after extrapolation.

Choices of Systematic Treatment:
- In systematic therapy, TCM was the predominant choice (82.7% of sample and 85.0% after extrapolation) due to perception of low-cost, less side effects and ability to mix with other treatment.
- 38.1% hospitalizations (45.1% of sample) adopted other systematic therapy after extrapolation.
- Only about 16% adopted chemo where the agent selection is rather limited.
- Few targeted therapies were observed, possibly because the users were enrolled in individual patient assistance programs that separated from BHI reimbursement system.

Concomitant Choice as % of Cases after extrapolation:
- Palliative Therapy: 32%
- Mono: 33%
- Concomitant@2: 24%
- Concomitant@3: 10%
- Concomitant@4: 1%

Systematic Treatment of Choices:

<table>
<thead>
<tr>
<th>Treatment Patterns</th>
<th>% of total HCC systematic treatment cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample</td>
</tr>
<tr>
<td>Traditional Chinese Medicine (TCM)</td>
<td>82.7%</td>
</tr>
<tr>
<td>Others</td>
<td>45.1%</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>16.7%</td>
</tr>
<tr>
<td>Targeted Therapy</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

* In this study, we have defined the palliative treatment for those patients that did not undergo any active treatment as listed above.
Treatment of Choices after extrapolation—by City Level

- **About 80% hospitalizations in Level 1 proactively chose active treatment; whereas 52% hospitalizations in Level 3 received palliative care, which because the economy in Level 1 cities was more developed.**

- **Systematic therapy has been the top treatment of choice in city level 1 & 2, up to 74% in Level 1 cities, and 44% in Level 3 cities.**
**Average Hospitalization Cost after extrapolation- by City Level**

### Average Hospitalization Cost each year

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost (Mean), CNY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>8,874</td>
</tr>
<tr>
<td>2009</td>
<td>11,878</td>
</tr>
<tr>
<td>2010</td>
<td>12,923</td>
</tr>
<tr>
<td>3-year Average</td>
<td>11,243</td>
</tr>
</tbody>
</table>

**Hospitalization Cost:**

- The cost has been increased 21% annually from 2008 to 2010
- The cost was significantly higher in Level 1 cities than Level 3 (up to 2.4 folds)
- BHI played the key role with 3-year average reimbursement ratio of 68% (as % of total hospitalization cost)
- Copayment stabilized at 20% (CNY2,234), while self-paid stayed around CNY1,400 with contribution gradually declined from 16% to 12%

### Average Hospitalization Cost by City Level and Payment Type

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost (Mean), CNY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
</tr>
</tbody>
</table>

#### City level

<table>
<thead>
<tr>
<th>Year</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>60%</td>
<td>68%</td>
<td>57%</td>
</tr>
<tr>
<td>2009</td>
<td>70%</td>
<td>75%</td>
<td>69%</td>
</tr>
<tr>
<td>2010</td>
<td>68%</td>
<td>68%</td>
<td>63%</td>
</tr>
</tbody>
</table>

- 2008: Total Growth: +34%
- 2009: Total Growth: +9%
- 2010: Total Growth: +12%
**Average Hospitalization Cost after extrapolation - by Insurance Type**

**Hospitalization Cost:**
- Employee plan was the key component of BHI (81%)

**Case # by Insurance Type**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Growth</th>
<th>Average Hospitalization Cost by Insurance Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>+25%</td>
<td>Employee: 15%, Resident: 21%, Self-Paid: 64%</td>
</tr>
<tr>
<td>2009</td>
<td>+9%</td>
<td>Employee: 14%, Resident: 44%, Self-Paid: 74%</td>
</tr>
<tr>
<td>2010</td>
<td>+18%</td>
<td>Employee: 11%, Resident: 19%, Self-Paid: 70%</td>
</tr>
</tbody>
</table>
Average Cost by Service Category:

- We have separated all the expense items into different treatment categories (diagnostic, device & supply, medication, nursing care, and surgery).

- The contribution of raising hospitalization cost was not driven by any particular treatment category, as the overall contribution by each category was indeed quite stabilized over the years.

- Instead of driving by breakthroughs or expensive medication and technology, the rising HCC cost was rather a result of systematic increase in overall healthcare cost, labor cost and inflation.

![Cost Contribution by Service Category](image1.png)

![Average Cost of different category of Service by City Level](image2.png)
Inpatient Days and Daily Cost

- Across all city levels, the inpatient days per case had steadily dropped year by year, from 21.0 days in 2008 to 17.2 days in 2010, representing 18% reduction.
- The reduction in Level 3 cities was the most significant, to close the gap with Level 1&2 cities.
- Average daily cost rose sharply, with annualized growth of 36% from CNY459.7 per day in 2008 to CNY847.9 per day in 2010, as result of increasing hospitalization cost and reducing inpatient days.
Conclusions

- HCC inpatient treatment pattern varied by city level. Inpatients in Level 1 cities were more inclined to receive active treatment than those in Level 3 cities.
- Systematic therapy was the most common treatment regimen in city of level of 1 & 2, in which TCM was the predominant choice.
- During 2008-2010, hospitalization cost of HCC inpatients rose significantly, and the average daily cost increased while inpatient length of stay decreased during the same time.
Study Limitations

- The data is effective at learning costs of hospitalization; however, it is unable to study the costs of health services occurred outside inpatient settings.
- Although the sample would be representative through both the multistage stratified sampling and systematic sampling methods, there is no validation or comparison between the sampled and non-sampled populations yet.
Acknowledgement

- The HCC study is supported by research funding from Bristol-Myers Squibb (Study No. CA182089 ST).
Questions?

Thank You!