Future Opportunity for Minimally Invasive Spine Surgery and ASC Development in China

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HJY Establishment in Greater China

- Shanghai (Office)
- Ningbo (Clinical)
- Yuyao (Clinical)
- Taichung (training center)
- Taipei (Office)
HJY-PPP Hospitals & Training Center
PPP: Public Private Partnership

Ningbo Yinzhou Peiple’s Hospital

Taiwan Training Center
Taiwan Spine Center of Rhen-Ai Hospital

Yuyao Municipal People’s Hospital
Ningbo Spine Center

Office/Outpatient  OR  Inpatient
Yuyao Spine Center

Office  Outpatient  Inpatient  OR

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New Ningbo Orthopedic/Spine Center
Open in 2018
Country Profile - China

Population: 1,400,000,000 (2015)
Capital: Beijing
Religions: Daoist (Taoist), Buddhist, Christian 3-4%, Muslim 1-2%
Ethnic groups: Han Chinese 91.5% percent, The rest 8.5% (2000)
GDP: Growth 6.9 percent (2015)
  Total $11.212 trillion (2nd)
  Per capita $8,154 (75th)

Source: WHO

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life expectancy at birth m/f (years, 2015)</td>
<td>75/78</td>
</tr>
<tr>
<td>Probability of dying under five (per 1000 live births, 0)</td>
<td>not available</td>
</tr>
<tr>
<td>Probability of dying between 15 and 60 years m/f (per 1 000 population, 2013)</td>
<td>103/76</td>
</tr>
<tr>
<td>Total expenditure on health per capita (Intl $, 2013)</td>
<td>646</td>
</tr>
<tr>
<td>Total expenditure on health as % of GDP (2013)</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Note: USA: Total expenditure on health per capita: $9,146 (2013); as % GDP: 17.1% (2013)
China Population Distribution

- Beijing-Tianjin Area
- Wuhan Area
- Yangtze River Delta
- Chendu-Chongqin Area
- Zujiang Delta
China Transportation Infrastructure

High Speed Train Network

Highway Network
China Healthcare Statistics

Health Expenditures in China

Annual Average Medical Expenditures in Different Age Groups

Health Expenditures as Percent GDP (2013)

Number of Private Hospitals in China

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China Healthcare Statistics

Public and Private Hospitals by Quantity and Service Volume

- Service volume: Public:Private = 90%:10%

Hospital Acquisitions
- US$ 400mm
- 15 cases (2014)

Private to Public Hospital Ration Among Specialized Hospitals (2012)

- Orthopedics: Private:Public = 85%:15%

Compound Annual Growth Rates of Private Specialized Hospitals (2003-2012)

- Orthopedics: 15%

1. Gynecology&Obstetrics
2. Cosmetology
3. Dental

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Gain Competitive Advantage Through Differentiation

Technical Advantage
Avoid direct confrontation with public hospitals through differentiated positioning

Service Advantage
Comfortable environment
Excellent service
Respect for patient privacy

Price Advantage
Obtain scale effect through chain operation

Source: Deloitte Analysis
Comparison of Investment

<table>
<thead>
<tr>
<th></th>
<th>Acquisition of the Private Hospitals</th>
<th>Entrusted Management of the Public Hospitals</th>
<th>Acquisition of the Public Hospitals</th>
<th>Establishment of New Hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Entry Barrier</td>
<td>Low</td>
<td>Low as no property rights involved</td>
<td>Long negotiation process, higher risk of negotiation failure</td>
<td>Long process of approval and construction</td>
</tr>
<tr>
<td>• Pre-Stage Investment</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>• Property Right Involvement</td>
<td>Yes</td>
<td>No</td>
<td>Ambiguous</td>
<td>Yes</td>
</tr>
<tr>
<td>• Fostering Cycle</td>
<td>Short</td>
<td>Short</td>
<td>Short</td>
<td>Long</td>
</tr>
<tr>
<td>• Operational Difficulty</td>
<td>Hospitals have historical operational problems. Medical talent and public esteem are inferior to those of public hospitals</td>
<td>Institutional resistance to reform will be encountered</td>
<td>Institutional resistance to reform will be encountered</td>
<td>Relatively Standard</td>
</tr>
<tr>
<td>• Potential Return on Investment</td>
<td>High</td>
<td>Moderate – management fees and potential share of profit</td>
<td>Moderate – ambiguities in both the property rights and hospital public/private status</td>
<td>High</td>
</tr>
<tr>
<td>• Case</td>
<td>Hongyi Capital’s acquisition of Yangsi Hospital through Honghe Medical</td>
<td>Beijing Yanhua Hospital Entrusted to Phoenix Healthcare</td>
<td>Phoenix Healthcare’s acquisition of Beijing Jiangong Hospital</td>
<td>Renji Medical’s new Changshu Southeast Hospital</td>
</tr>
</tbody>
</table>

Source: Deloitte Analysis
Market Analysis & Conclusions

- About **1/10 of the population** suffered some kind of spine disease and increased double digit annually. Age of onset also decreased year by year.
- Expect continuous and rapid growth of spine patients due to accelerated industrialization, frequent use of modern IT products, urbanization, and ageing of the population.
- Only about **30% of the patients** undergone surgery largely due to fear of surgery, economic issue or lack of awareness of the possible consequences of the diseases.
- **Pain management and MISS** have emerged becoming the preferred options for treating spine diseases and accounted for about 20% of the total procedures conducted.
- **Comprehensive spine care** encompassing micro- /endo- MISS plus pain management and initial rehabilitation services has significant growth opportunity in China due to wide patient acceptance.
- Comparing to private orthopedic hospitals, investment on the development of **differentiated spine specialized ASC (ambulatory surgery center) or hospital**, if strategically allied with public hospitals and operated in “chain” to increase patient base while reducing operating cost, could offer great opportunity to capture market share due to significant competitive advantages in technical, service, or price.
Technical Ladder for Spine Disease Treatment

- Chiropractic
- Injection
- Interventional
- Ablation
- Endoscopy
- Micro Discectomy
  - Percutaneous Fixation
  - M-TLIF, PLIF, XLIF
- Open Surgery

MIS
MISS Clinical Platform

- **Interventional Pain Management**
  - Ultrasonic Guided Radiofrequency Nerve Modulation
  - Radiofrequency Disc Fx

- **PVP/PKP /Vesselplasty/Spine Jack**
  - Vertebroplasty
  - Kyphoplasty
  - Vesselplasty

- **Percutaneous Endoscopic Lumbar Surgery**
  - Percutaneous Endoscopic Lumbar Discectomy
  - Percutaneous Endoscopic Foraminotomy
  - Percutaneous Endoscopic Facet Rhizotomy
  - Percutaneous Endoscopic Nucleoplasty
  - Percutaneous Endoscopic Annuloplasty
  - Percutaneous Endoscopic Intradiscal Electrothermal Therapy
  - Percutaneous Endoscopic Intradiscal Hydrocision Therapy

- **Lumbar Microscopic Decompression & Percutaneous Spinal Fusion and Fixation**
  - Lumbar Microscopic Decompression
  - Percutaneous Lumbar Fusion and Fixation

- **Cervical Microscopic Decompression & Non-Fusion/Fusion**
  - Cervical Decompression & Fusion and Fixation
  - Laminoplasty
  - Corpectomy
  - Artificial Cervical Disc Replacement

- **In-OP Nerve monitoring、3D Navigation and Robotic-aided surgery**
C5/6 ACDF

Name: Ceng X X , female , 50yrs

Pre X Ray、MRI

Post X Ray
C4/5 ADR

Name: Yu X X, female, 61 yrs

Pre X Ray, MRI

Post X Ray
Hybrid: C3/4 ACDF + C4/5 ADR

Name: Liu X X, male, 66yrs

Pre X Ray、MRI

Post X Ray
C5-6 Corpectomy

Name: Yang X X, male, 69yrs

Pre X Ray, MRI

Post X Ray
C3-6 Laminoplasty

Name: Li X X, male, 53yrs

Pre X Ray, MRI

Post X Ray, MRI
Right L3-4-5 Microdiscectomy/Decompression

Name: Dong X X, male, 66yrs

Pre MRI

Post MRI
Transforaminal Lumbar Interbody Fusion

Name: Wang X X, male, 56 yrs

Pre X Ray

Post X Ray
Interlaminar Stabilization -- Motion Preservation --

Name: Feng X X, male, 53 yrs

Pre X Ray

Post X Ray
L4/5 Endoscopic Transforaminal

Name: Wu X X, male, 21 yrs

Pre MRI

Post MRI
L5/S1 Endoscopic Interlaminar

Name: Yu X X, female, 38yrs

Pre MRI

Post MRI
# Weighted Average Price Per Procedure

<table>
<thead>
<tr>
<th>Spine</th>
<th>Surgery</th>
<th>%</th>
<th>Weighted Average Price (RMB:US=6.5615:1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>RMB</td>
</tr>
<tr>
<td>Cervical</td>
<td>ACDF</td>
<td>12.38%</td>
<td>46,495.00</td>
</tr>
<tr>
<td></td>
<td>ADR</td>
<td>4.84%</td>
<td>77,661.71</td>
</tr>
<tr>
<td></td>
<td>Hybrid (ADR+ACDF)</td>
<td>4.28%</td>
<td>82,207.95</td>
</tr>
<tr>
<td></td>
<td>Corpectomy</td>
<td>0.74%</td>
<td>59,596.52</td>
</tr>
<tr>
<td></td>
<td>Laminoplasty</td>
<td>2.50%</td>
<td>43,465.00</td>
</tr>
<tr>
<td>Lumbar</td>
<td>PELD</td>
<td>39.56%</td>
<td>30,647.88</td>
</tr>
<tr>
<td></td>
<td>MD</td>
<td>5.63%</td>
<td>33,862.53</td>
</tr>
<tr>
<td></td>
<td>MD+NF</td>
<td>21.75%</td>
<td>49,820.62</td>
</tr>
<tr>
<td></td>
<td>TLIF</td>
<td>8.06%</td>
<td>53,695.23</td>
</tr>
</tbody>
</table>

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HJY MISS Work Shop

- Ultrasonic Guided Radiofrequency Nerve Modulation
  高層次超音波導引下射頻脈衝神經調理術
- Endoscopic (PELD)
  椎孔鏡手術之術前定位、路徑選擇及手術技術
- Percutaneous Endoscopic Intradiscal Hydrocision Therapy
  內鏡下椎間盤水刀療法
- Percutaneous Spine Fusion
  經皮微創腰椎融合術
- Radiofrequency Disc
  射頻椎間盤隨核消融術及纖維環成型術
- Artificial Cervical Disc Replacement
  人工頸椎間盤置換

Lecture
講課

Live Surgery
手術演示

Hands On
實地操作
Grass Root Surgeon Training
Community Services
Yuyao HJY Forum & Free Outpatient

Ceremony

HJY Forum

Volunteer Outpatient

HJY Forum
Future Trends in MISS in China

- MISS will account for 40% or more of the total spine surgeries in China for the next 3-5 years.
- More complex surgery possibly including deformity will adopt the MISS concept and technique due to progress and advances in technology, equipment, material science, and pathogenic anatomy.
- In-operation nerve monitoring, 3D imaging/Navigation, and robotic aided surgery will prevail mostly in the triple A hospitals in China for the next 5 years.
- Cell regeneration and innovative biomaterials coupled with 3D printing will become subversion for traditional tissue repair, motion preservation, and implant.
- Ultrasonic guiding treatment and ultrasonic bone cutter will become another wave of ultrasonic clinical revolution.
- Hybrid MISS surgery will become more commonly used MISS to treat complicated degenerative spine diseases.
- Multidisciplinary spine center including pain management, orthopedic, neuro-, and rehab will evolve as the new form of ASC or specialized spine hospital in China.
- China will evolve as the leading country in spine clinical, R&D, and academics due to the size of the population suffering spine diseases (about 140 million people) and undergone various types of treatments.
Continuous Improvement

- Training
- Technology
- Management
- Service
Success Formula in China
Thank You!

Special Thanks To:

Mr. Scott Becker
Dr. Anthony Yeung