Value of New Direct Acting Anti-Viral (DAA) to Treat Hepatitis C Infection

ISPOR 7th Asia-Pacific Conference, Singapore
Saturday, 3 September 2016: 5:15PM-6:15PM

Moderator:
Yen-Huei (Tony) Tarn, PhD, Associate Professor, School of Pharmacy, Kaohsiung Medical University, Taiwan

Speaker:
Dan Yock Young, PhD, Associate Professor, University Medicine Cluster, National University Hospital of Singapore, Singapore

Speaker:
Ataru Igarashi, PhD, Associate Professor, Drug Policy & Management, University of Tokyo, Japan
Overview

• HCV disease burden
  – Epidemiology
  – Morbidity and mortality
• HCV treatment landscape
• DAA treatments in Asia
More than 185 million people around the world infected with HCV (WHO, 2014)

South Asia and East Asia have by far the largest number of HCV infections

South Asia
- Estimated Population: > 50 million
- Prevalence: 3.7%

East Asia
- Estimated Population: > 50 million
- Prevalence: 3.4%

North Africa/Middle East
- Estimated Population: > 15 million
- Prevalence: 3.6%

South-East Asia
- Estimated Population: > 11 million
- Prevalence: 2.0%

Western Europe
- Estimated Population: > 10 million
- Prevalence: 2.4%

Top ten countries with the highest new HCV infections in 2015

Incidence is higher in countries without access to new DAAs

HCV disease burden: high-risk population

- HCV has been identified as the most common viral infection affecting People Who Inject Drugs (PWIDs)
- 15~40 times higher prevalence of HCV infection compared with the general population

Table. HCV prevalence (%)

<table>
<thead>
<tr>
<th></th>
<th>General population(^1)</th>
<th>Injection drug users(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1.3</td>
<td>41–60</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>0.9</td>
<td>25</td>
</tr>
<tr>
<td>India</td>
<td>0.9–1.9</td>
<td>92</td>
</tr>
<tr>
<td>Japan</td>
<td>1.0–2.0</td>
<td>55–60</td>
</tr>
<tr>
<td>Pakistan</td>
<td>5</td>
<td>89</td>
</tr>
<tr>
<td>Taiwan</td>
<td>4.4–8.6</td>
<td>67</td>
</tr>
</tbody>
</table>

HCV disease burden: morbidity & mortality

- If left untreated, chronic HCV infection is a major cause of liver cirrhosis and hepatocellular carcinoma (HCC) (WHO 2014)

- Risk of HCC is 17 times higher in HCV-infected patients compared to HCV-negative patients (Donato 2002).

- Hepatocellular carcinoma (HCC) accounts for 85-90% of liver cancer cases, and is the third most common cause of cancer death in the world (Andrade 2009).

HCV treatment landscape

• Landscape of HCV treatment is fast changing
  – From traditional interferon-based therapies
  – To oral interferon-free direct-acting agents (DAAs)

• A great unmet medical needs is now satisfied by newer oral interferon-free Direct Acting Anti-Viral (DAA) drug regimens, which have shorter durations, minimal side effects, and cure rates approaching 90 ~ 100% (Lam 2015)

• Comparator usually is the combined pegylated interferon and ribavirin, and cure rates were averaging between 40 ~ 50%, and were associated with many side effects.

DAA availability in Japan

2001.12: Ribavirin
2003.12: PEG-IFN
2011.11: Telaprevir
2013.11: Simeprevir
2014.11: Vaniprevir
2014.9: Daclatasvir, Asunaprevir
2015.5: Sofosbuvir
2015.8: Sofosbuvir/Ledipasvir
2015.11: Ritonavir/Ombitasvir/Paritaprevir

Treatment with IFN
IFN-free all-oral Treatment

Source: PMDA https://www.pmda.go.jp/
## DAA treatments in Asia

<table>
<thead>
<tr>
<th>Country</th>
<th>Sofosbuvir</th>
<th>Sofosbuvir/ledispavir</th>
<th>Ombitasvir/paritaprevir/ritonovir/dasabuvir</th>
<th>Asunaprevir/daclatasvir</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Approved</td>
<td>2H 2015</td>
<td>2H 2016</td>
<td>2H 2015</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>No filing</td>
<td>No filing</td>
<td>No filing</td>
<td>NA</td>
</tr>
<tr>
<td>China</td>
<td>2Q 2018</td>
<td>2Q 2019</td>
<td>2H 2018</td>
<td>Registration trial completing 2017</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Approved</td>
<td>3Q 2016</td>
<td>2H 2015</td>
<td>2H 2015</td>
</tr>
<tr>
<td>India</td>
<td>Approved</td>
<td>SH 2016</td>
<td>No filing</td>
<td>NA</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3Q 2016</td>
<td>4Q 2016/1Q 2017</td>
<td>No filing</td>
<td>NA</td>
</tr>
<tr>
<td>Japan</td>
<td>Approved</td>
<td>2H 2015</td>
<td>2H 2016</td>
<td>2014 approved</td>
</tr>
<tr>
<td>Macau</td>
<td>Approved</td>
<td>Approved</td>
<td>Available since 2015</td>
<td>2H 2015</td>
</tr>
<tr>
<td>Malaysia</td>
<td>2Q 2016</td>
<td>1Q 2017</td>
<td>2H 2015</td>
<td>2016/2017</td>
</tr>
<tr>
<td>Myanmar</td>
<td>2Q 2018</td>
<td>2Q 2018</td>
<td>No filing</td>
<td>NA</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Approved</td>
<td>Approved</td>
<td>2H 2016</td>
<td>2H 2015</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Approved</td>
<td>2H 2016</td>
<td>No filing</td>
<td>NA</td>
</tr>
<tr>
<td>Philippines</td>
<td>3Q 2015</td>
<td>2Q 2018</td>
<td>No filing</td>
<td>2016/2017</td>
</tr>
<tr>
<td>Singapore</td>
<td>Approved</td>
<td>3Q 2016</td>
<td>1H 2016</td>
<td>July 2015</td>
</tr>
<tr>
<td>South Korea</td>
<td>4Q 2015</td>
<td>4Q 2015</td>
<td>2H 2016</td>
<td>May 2015 approved</td>
</tr>
<tr>
<td>Taiwan</td>
<td>3Q 2015</td>
<td>3Q 2016</td>
<td>2H 2016</td>
<td>2H 2015</td>
</tr>
<tr>
<td>Thailand</td>
<td>2H 2015</td>
<td>2H 2016</td>
<td>No filing</td>
<td>2016</td>
</tr>
<tr>
<td>Vietnam</td>
<td>2017</td>
<td>NA</td>
<td>No filing</td>
<td>NA</td>
</tr>
<tr>
<td>Mongolia</td>
<td>Approved</td>
<td>2H 2015</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Adapted from pharmaceutical sources (personal communication). Q, quarter; H, half; NA, not available.

DAA treatments in Asia (cont’d)

- Availability of DAAs in Asia is lagging behind Western countries.
- DAA pricing in Asia will vary widely given the diversity in epidemiology, economic priorities, and reimbursement policies (Lim 2015).
- Choice between new DAAs (more expensive and more efficacious) vs interferon-containing regimes (less expensive and less efficacious) is not difficult.
- However
  - Budget impact to the payer?
  - Choice among DAAs?

DAA reimbursement decision in Taiwan (Four brands on the market)

<table>
<thead>
<tr>
<th></th>
<th>Harvoni ® Tab (90mg ledipasvir, 400mg sofosbuvir)</th>
<th>Viekirax ® Tab (12.5mg ombitasvir, 75mg paritaprevir, 50mg ritonavir)</th>
<th>Daklinza ® 60mg Daclatasvir</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily dose</td>
<td>#1 QD</td>
<td>#2 QD + #1 BID</td>
<td>#1QD + #1 BID</td>
</tr>
<tr>
<td>Duration</td>
<td>3 months</td>
<td>3 months</td>
<td>6 months</td>
</tr>
<tr>
<td>Cure rate</td>
<td>94~99%</td>
<td>91%~100%</td>
<td>82~92%</td>
</tr>
<tr>
<td>Self pay cost/course</td>
<td>~NT$1,250,000 (~US$39,062)</td>
<td>~NT$1,490,000 (+Exviera: Dasabuvir)</td>
<td>~NT$330,000 (+Sunvepra: Asunaprevir)</td>
</tr>
</tbody>
</table>

NHIA will negotiate drug cost/course, plans to have an independent budget for this category of drug treatment for ten years. Treat 10,000 patients/year, budget: US$ 80 million. (1US$=32NT$)
What we will learn from this symposium

Part 1
Cost-effectiveness of Hepatitis C Treatment in Asia

Dr. Dan Yock Young,
Associate Professor, University Medicine Cluster, National University Hospital of Singapore, Singapore
What we will learn from this symposium

Part 2
Use of DAAs in treating Hepatitis C in the context of the Japanese Health technology assessment (HTA) system

Dr. Ataru Igarashi, Associate Professor, Drug Policy & Management, University of Tokyo, Japan