WORKSHOP (W9)

BRIDGING THE GAP BETWEEN EFFICACY AND EFFECTIVENESS

USING BOTH REAL-WORLD AND TRIAL-BASED EVIDENCE TO IMPROVE CLINICAL DECISION MAKING

Monday, 10 September 2018
3:45 PM - 4:45 PM

ISPOR Asia Pacific 2018, Tokyo, Japan

Speakers

Dr. Bor-Sheng Ko (Kevin), National Taiwan University Hospital, TW

Dr. Fei-Yuan Hsiao (Sharon), National Taiwan University, TW

Dr. Ming-Hui Tai (Mindy), Amgen Inc, USA

Dr. Han-I Wang (Annie), University of York, UK
Speakers

MSc. Hsin-Yi Tsai (Chris), Amgen Inc, TW

Dr. Fei-Yuan Hsiao (Sharon), National Taiwan University, TW

Dr. Chia-Hui Tan (Elise), Ministry of Health and Welfare, TW

Dr. Han-I Wang (Annie), University of York, UK

Outline

MSc. Hsin-Yi Tsai (Chris), Amgen Inc, TW

Dr. Fei-Yuan Hsiao (Sharon), National Taiwan University, TW

Dr. Chia-Hui Tan (Elise), Ministry of Health and Welfare, TW

Dr. Han-I Wang (Annie), University of York, UK

Q & A
Real-world evidences for Changing Disease Landscape by Novel Therapy

Multiple myeloma as an example

Bor-Sheng Ko, M.D. Ph.D.
Assistant Professor and Attending Physician, NTUH, Taiwan
President, Taiwan Society of Pharmacoeconomics and Outcome Research (TaSPOR)

Hsin-Yi Tsai (Chris), MSc
Head of Value, Access and Policy, Amgen Inc, Taiwan

Live polls

How is the use of RWE in HTA submission?

1%, 5%, 10%, 50%
Types of evidence using RWD in HTA submission

Multiple myeloma:
An old disease with recent therapeutic advances

- First described in 1844, with a lady with multiple fracture
- Abnormal plasma cell proliferation
- A disease in elderly
- Incurable and fatal, within less than 3 years

- More than 8 drugs approved by FDA in the past 10 years
Bone events in myeloma: A common and suffering complication

- Multiple osteolytic lesions, with fractures
- Even not completely recovered after treatment
- Novel drugs developed:
  - Low-potency bisphosphate: clondronate, palmidronate
  - High-potency bisphosphate: zolendronate
  - RANKL inhibitor: denosumab

Study rationales/aims:

- To examine the incidences for myeloma in Taiwan
  - For disease burden

- To describe the survival of myeloma in Taiwan
  - Not clear in East Asia, especially in the era of novel therapy
  - Hardly to analyze the Impacts of single novel drug, because they are usually used in combination and in different lines
  - Improvement in care also contribute for survival

- To describe the incidences of bone events, and also the impacts of drugs in Taiwan Myeloma patients
Study design:

- Link 3 database, with cross validation
- Enroll only adult patients (>18 y/o)
- Bone events within 3 months prior to diagnosis are counted.

N=4660
2914 bone events

The incidence of myeloma is increasing in Taiwan.

- Anyway, the trends is ameliorated by age adjustment.
- Probably due to aging population in Taiwan
The survival for myeloma patients is in improving in Taiwan.

- The cutting points are correlated to novel drug reimbursement:
  - 2007: Bortezomib
  - 2011: Lenalidomide

![Survival curves for myeloma patients](image)

- Median=1.91 yrs
- Median=1.42, 1.77 and 2.44 yrs

Number at risk:
- All Patients: 4660 2261 1165 534 253 118 45 0

Age and gender impact on survival also.

- The gender effects are not clearly described in literature. Await for further exploration.
Multi-variate analysis confirms the findings.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Total patient years</th>
<th>Number of Deaths</th>
<th>Adjusted HR</th>
<th>P&gt;z</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>6684</td>
<td>2100</td>
<td>1.19</td>
<td>&lt;0.001</td>
<td>1.11</td>
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<td>Female</td>
<td>5699</td>
<td>1464</td>
<td>1.00</td>
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</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Total patient years</th>
<th>Number of Deaths</th>
<th>Adjusted HR</th>
<th>P&gt;z</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;65</td>
<td>6358</td>
<td>1163</td>
<td>1.00</td>
<td></td>
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<tr>
<td>65-74</td>
<td>3592</td>
<td>1110</td>
<td>1.58</td>
<td>&lt;0.001</td>
<td>1.46</td>
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<td>&gt;=75</td>
<td>2433</td>
<td>1291</td>
<td>2.48</td>
<td>&lt;0.001</td>
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<table>
<thead>
<tr>
<th>Diagnosed year</th>
<th>Total patient years</th>
<th>Number of Deaths</th>
<th>Adjusted HR</th>
<th>P&gt;z</th>
<th>95%CI</th>
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</thead>
<tbody>
<tr>
<td>2003-2006</td>
<td>3693</td>
<td>1154</td>
<td>1.00</td>
<td></td>
<td></td>
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<tr>
<td>2007-2010</td>
<td>4507</td>
<td>1309</td>
<td>0.87</td>
<td>0.001</td>
<td>0.81</td>
</tr>
<tr>
<td>2011-2014</td>
<td>4183</td>
<td>1101</td>
<td>0.70</td>
<td>&lt;0.001</td>
<td>0.64</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CCI</th>
<th>Total patient years</th>
<th>Number of Deaths</th>
<th>Adjusted HR</th>
<th>P&gt;z</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCI=0</td>
<td>5765</td>
<td>1279</td>
<td>1.00</td>
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<tr>
<td>CCI=1-2</td>
<td>4950</td>
<td>1515</td>
<td>1.32</td>
<td>&lt;0.001</td>
<td>1.22</td>
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<tr>
<td>CCI&gt;=3</td>
<td>1668</td>
<td>770</td>
<td>1.84</td>
<td>&lt;0.001</td>
<td>1.69</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Geographical areas</th>
<th>Total patient years</th>
<th>Number of Deaths</th>
<th>Adjusted HR</th>
<th>P&gt;z</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taipei &amp; Northern</td>
<td>6192</td>
<td>1673</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central &amp; Southern</td>
<td>5801</td>
<td>1771</td>
<td>1.10</td>
<td>0.007</td>
<td>1.02</td>
</tr>
<tr>
<td>Eastern</td>
<td>390</td>
<td>120</td>
<td>1.12</td>
<td>0.227</td>
<td>0.93</td>
</tr>
</tbody>
</table>

Incidence of bone events:

• 40-50% patients will experience the events, and half of them at diagnosis
• Improving in medical treatment reduce the incidences of bone events
Correlating bone events with bisphosphates:

- Low-potent bisphosphates are marginally correlated with higher rate of bone events.

Sex Differences in Clinical Benefits of Rituximab-Containing Chemotherapy for Diffuse Large B Cell Lymphoma (DLBCL)

Fei-Yuan Hsiao (Sharon), PhD
Associate Professor, National Taiwan University, Taipei, Taiwan
Standing director, Taiwan Society of Pharmacoeconomics and Outcome Research (TaSPOR)

J Womens Health (Larchmt). 2018 Jun 20
### Background

#### Efficacy vs. Effectiveness

<table>
<thead>
<tr>
<th></th>
<th>Clinical trial</th>
<th>RWD in healthcare</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample size</strong></td>
<td>100~10,000</td>
<td>million to billion (rare events)</td>
</tr>
<tr>
<td><strong>Follow-up time</strong></td>
<td>1~5 years</td>
<td>life-long treatment (delayed effect)</td>
</tr>
<tr>
<td><strong>Outcome measurement</strong></td>
<td>Surrogate (mid-term)</td>
<td>Final outcome</td>
</tr>
<tr>
<td><strong>Patient population</strong></td>
<td>Restricted</td>
<td>Diverse</td>
</tr>
<tr>
<td><strong>Comparator selection</strong></td>
<td>Placebo</td>
<td>Current standard (Head-to-head comparison)</td>
</tr>
</tbody>
</table>

### Introduction

**Older men** seem to have poorer responses to rituximab (R)-containing chemotherapy for DLBCL in clinical practice?

**Sex difference** in both rituximab metabolism and clinical outcomes of DLBCL was found in previous studies.

**Limitations** of previous research and knowledge gap

Heterogeneity possibly introduced by post-hoc analysis. Generalizability?

Sex differences in baseline characteristics.

---

Introduction

Objective
To investigate the sex differences in terms of DLBCL and its treatments using data from
- Taiwan Cancer Registry Database (TCRD)
- National Health Insurance Research Database (NHIRD)
- National Death Registry (NDR)

Methods
Study design
Retrospective cohort study

TCRD
- DLBCL patients

NHIRD
- Exposure
  - R-CHOP
  - R-containing
  - Baseline condition
  - Treatment failure
  - Relapse
  - Refractory

NDR
- Survival status
Main Results

Patients aged ≥ 20 y/o with newly-diagnosed, pathology-confirmed Non-Hodgkin lymphoma between 2009-2013
N = 10,309

Diffuse large B cell lymphoma between 2009-2013
N = 4,977

Stage unknown (n=143)

Stage I-IV DLBCL patients
N = 4,834

No prescription of chemotherapy (n=344)

Study patients
N = 4,490
Male (n=2,442)
Female (n=2,048)

Overall Survival

Time to treatment failure

FIG. 1. Algorithm of the study cohort selection. DLBCL, diffuse large B cell lymphoma.

4490 pts

2442

2048

Main Results

FIG. 2. Kaplan-Meier plots of OS and TTF. (a) OS and (b) TTF of the patients with DLBCL receiving treatments. OS, overall survival; TTF, time to treatment failure. Color images available online at www.liebertpub.com/jh

P < .0001

P < 0.0182
### Main Results

#### Table 2: Univariate and Multivariate Analysis of Overall Survival and Time to Treatment Failure in Patients with Diffuse Large B-Cell Lymphoma

<table>
<thead>
<tr>
<th>Categories</th>
<th>Overall survival</th>
<th>Time to treatment failure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Univariate</td>
<td>Multivariate</td>
</tr>
<tr>
<td></td>
<td>HR (95% CI)</td>
<td>p-value</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.10 (1.02-1.19)</td>
<td>0.0188</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ann Arbor stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-59 years</td>
<td></td>
<td></td>
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<tr>
<td>Other R-Tx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Induction Chemotherapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>1.18 (1.07-1.29)</td>
<td>0.0005</td>
</tr>
<tr>
<td>Treatment failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All-cause death</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Favor female</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>0.5975</td>
<td>0.0204</td>
<td></td>
</tr>
<tr>
<td>HR (95% CI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.18 (1.06-1.30)</td>
<td>0.0139</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-R Tx</td>
<td>1.11 (0.90-1.36)</td>
<td>0.3533</td>
</tr>
<tr>
<td>Treatment failure</td>
<td></td>
<td></td>
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<td>0.0105</td>
<td></td>
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<tr>
<td>HR (95% CI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rituximab dosing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;=600</td>
<td>1.30 (1.16-1.47)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>&gt;600</td>
<td>0.99 (0.79-1.24)</td>
<td>0.9462</td>
</tr>
<tr>
<td>Treatment failure</td>
<td></td>
<td></td>
</tr>
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<tr>
<td>HR (95% CI)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| HR, hazard ratio; CI, confidence interval.
**Conclusions**

| **1st nationwide and real-world cohort** to discuss the sex difference of the rituximab use and its clinical benefits in DLBCL patients |
| **Sex differences in baseline characteristics** |

**Female sex** is an independent prognostic factor in the DLBCL patients receiving rituximab-containing induction chemotherapies.

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**Impact of Safety-Related Regulations on Codeine Use in Children: A Quasi-Experimental Study Using Taiwan's National Health Insurance Research Database**

*Drug Saf. 2017 Jul;40(7):615-627*

Fei-Yuan Hsiao (Sharon), PhD
Associate Professor, National Taiwan University, Taipei, Taiwan
Standing director, Taiwan Society of Pharmacoeconomics and Outcome Research (TaSPOR)
Background

Efficacy vs. Effectiveness (same in the “Safety”)

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<td>Current standard (Head-to-head comparison)</td>
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Background

Efficacy vs. Effectiveness (same in the “Safety”)

- We know everything about a drug at approval?

- Pre-clinical
  - Basic science
  - Synthesis
  - Animal studies
  - IND (Investigational New Drug)

- Clinical (RCTs)
  - Phase I
  - Phase II
  - Phase III
  - NDA (New drug application)

[Diagram showing Pre-clinical vs. Clinical stages]
Introduction

Use of codeine-containing products in pediatric patients

- The benefit remains unclear
- Severe adverse events: respiratory depression and death
- Safety warnings by professional organizations and regulatory bodies
  - The US FDA, the EMA, Health Canada, the AAP and the ACCP

Are these drug safety communications “effective”?

Efficacy vs Effectiveness of “policy intervention”?

Label changes by TFDA

2006.9

Codeine is not recommended for children aged <2 years and should be used with decreased doses in those aged 2-12 years

Reimbursement regulations by NHIA

2007.2

For any physician who prescribes codeine to children aged <2 years, a penalty is exacted that deducts reimbursement for healthcare services

TFDA=Taiwan Food and Drug Administration, NHIA=National Health Insurance Administration
Introduction

Objective
To investigate the impact of the two safety-related regulations in Taiwan on the use of codeine for upper respiratory infection or cough from

National Health Insurance Research Database (NHIRD)

Methods

Collaborative Infrastructure
Retrospective cohort study
Methods

Study design

Before–after design
Interrupted time series design

• Pre-regulation period: 2003 Q1 – 2006 Q2
• Transition period: 2006 Q3 – 2007 Q2
• Post-regulation period: 2007 Q3 – 2010 Q4

Main Results

Use of codeine after the safety regulations

<table>
<thead>
<tr>
<th>Time period</th>
<th>Baseline level</th>
<th>Level change</th>
<th>Baseline trend</th>
<th>Trend change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-regulation</td>
<td>6.10 (5.60 to 6.60)</td>
<td>-4.24 (-4.78 to -3.70)</td>
<td>0.07 (0.01 to 0.12)</td>
<td>0.03 (-0.06 to 0.11)</td>
</tr>
<tr>
<td>Post-regulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Observed rate -- Estimated rate from the segmented regression model -- Predicted rate based on pre-regulation projections
Main Results

Relative change 1 year post-regulation

- Aged 0-1 years: -98.3%
- Aged 2-5 years: -70.3%
- Aged 6-11 years: -45.4%
- Aged 12-18 years: -28.8%

Conclusions

Real-world data to provide valuable information for future policymaking.

The importance of continued assessments to ensure sustained effectiveness of policy interventions.
Proton Pump Inhibitors and Risk of Hepatocellular Carcinoma in Patients with Chronic Hepatitis B or C

Chia-Hui Tan (Elise), PhD
National Research Institute of Chinese Medicine, Ministry of Health and Welfare, Taiwan
Director, Taiwan Society of Pharmacoeconomics and Outcome Research (TaSPOR)
Institute of Health Care Administration, National Yang-Ming University, Taiwan

Background

Proton Pump Inhibitors (PPIs)

- Adverse side effects
  - Bone fracture/Enteric infection/pneumonia/dementia/CKD...

- CVD and CVA
  - Myocardial Infarction
  - Stroke

- Developing cancer
  - Gastric cancer
  - Hepatocellular carcinoma (HCC)

- Liver-related disease (HCV)
  - Cirrhosis/Hepatic decompensation/HCC
Background

- **Objective**
  
  To help elucidate the association between PPI use and the risk of developing HCC among patients with chronic HBV or HCV infections

Methods

- Longitudinal study and Propensity score matching (PSM)
- HBV or HCV cohort from 2003-2013
  - The antiviral therapy for HBV and HCV was reimbursed by Taiwan’s NHI since 2003
Main Results

PPIs use rate
19.8%

HBV Cohort (n=28,335)

PPIs use rate
27.5%

HCV Cohort (n=7,021)

Main Results
Cumulative incidences of HCC after adjusting for competing mortality
### Main Results

**Dose response curve for the hazard 95% CI of HCC**

<table>
<thead>
<tr>
<th>Dose</th>
<th>No PPIs use</th>
<th>PPIs use</th>
<th>cDDD 0-27</th>
<th>cDDD 28-119</th>
<th>cDDD 120-364</th>
<th>≥365</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>5,577</td>
<td>1,915</td>
<td>1,915</td>
<td>562</td>
<td>607</td>
<td>746</td>
</tr>
<tr>
<td>Follow-up time, median (IQR), months</td>
<td>53 (31-78)</td>
<td>51 (30-78)</td>
<td>52 (30-79)</td>
<td>49 (27-74)</td>
<td>46 (26-73)</td>
<td>60 (36-86)</td>
</tr>
<tr>
<td>IR per 1000 Person-months (95% CI)</td>
<td>0.33 (0.27-0.40)</td>
<td>0.91 (0.74-1.11)</td>
<td>0.87 (0.88-1.28)</td>
<td>0.91 (0.74-1.11)</td>
<td>0.76 (0.49-1.13)</td>
<td>0.20 (0.90-1.56)</td>
</tr>
<tr>
<td>IRR (95% CI)</td>
<td>1.30 (1.00-1.68)</td>
<td>1.17 (0.90-1.54)</td>
<td>1.13 (0.78-1.64)</td>
<td>1.00 (0.96-1.90)</td>
<td>0.83 (0.53-1.30)</td>
<td>1.32 (0.95-1.83)</td>
</tr>
</tbody>
</table>

**HBV Cohort**

<table>
<thead>
<tr>
<th>Follow-up time, median (IQR), months</th>
<th>IR per 1000 Person-months (95% CI)</th>
<th>IRR (95% CI)</th>
<th>aHR (95% CI) with competing risks</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>No PPIs use</td>
<td>53 (31-78)</td>
<td>0.38 (0.33-0.43)</td>
<td>1.00</td>
<td>0.18</td>
</tr>
<tr>
<td>PPIs use</td>
<td>53 (31-79)</td>
<td>0.42 (0.36-0.50)</td>
<td>1.30 (1.00-1.68)</td>
<td>1.25</td>
</tr>
<tr>
<td>cDDD 0-27</td>
<td>53 (31-79)</td>
<td>0.33 (0.27-0.40)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>28-119</td>
<td>49 (27-76)</td>
<td>0.44 (0.33-0.59)</td>
<td>1.35 (0.96-1.90)</td>
<td>1.28</td>
</tr>
<tr>
<td>120-364</td>
<td>49 (29-74)</td>
<td>0.46 (0.34-0.62)</td>
<td>1.41 (0.99-1.99)</td>
<td>1.34</td>
</tr>
<tr>
<td>≥365</td>
<td>61 (38-85)</td>
<td>0.37 (0.26-0.51)</td>
<td>1.13 (0.78-1.64)</td>
<td>0.77</td>
</tr>
</tbody>
</table>

**HCV cohort**

<table>
<thead>
<tr>
<th>Follow-up time, median (IQR), months</th>
<th>IR per 1000 Person-months (95% CI)</th>
<th>IRR (95% CI)</th>
<th>aHR (95% CI) with competing risks</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>No PPIs use</td>
<td>51 (30-78)</td>
<td>0.91 (0.74-1.11)</td>
<td>1.00</td>
<td>0.25</td>
</tr>
<tr>
<td>PPIs use</td>
<td>52 (30-79)</td>
<td>1.07 (0.88-1.28)</td>
<td>1.17 (0.90-1.54)</td>
<td>1.19</td>
</tr>
<tr>
<td>cDDD 0-27</td>
<td>51 (29-77)</td>
<td>0.91 (0.74-1.11)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>28-119</td>
<td>49 (27-74)</td>
<td>1.20 (0.84-1.66)</td>
<td>1.32 (0.90-1.93)</td>
<td>1.44</td>
</tr>
<tr>
<td>120-364</td>
<td>46 (26-73)</td>
<td>0.76 (0.49-1.13)</td>
<td>0.83 (0.53-1.30)</td>
<td>0.78</td>
</tr>
<tr>
<td>≥365</td>
<td>60 (36-86)</td>
<td>1.20 (0.90-1.56)</td>
<td>1.32 (0.95-1.83)</td>
<td>1.32</td>
</tr>
</tbody>
</table>
Main Results
Subgroup analysis among patients with different baseline characteristics

Conclusions

PPI use is not associated with the risk of developing HCC among patients with chronic HBV or HCV infections

Why

RWD could help to clinical decision making

Standard protocol of RCT vs. real-world practice
Thanks.
Any questions?
You can find me at
elisetam.g@gmail.com

Decision modelling: using trial and real world data (RWD)

A Discrete Event Simulation Model on a UK Population Based Observational Cohort

Han-I Wang, PhD
Health Economist
University of York, UK
Current issues in decision modelling

1. Population

2. Same disease
   - Drug A
   - Drug B
   - Drug C

- 2 60 yrs
- Stage I
- Relapse

Trial data

RWD
Objectives

Trial data only

Drug A
≥ 60 yrs
Trial A
Model A

Drug B
Stage I
Trial B
Model B

Drug C
Relapse
Trial C
Model C

Trial + real world data (RWD)

Drug A
≥ 60 yrs
Drug B
Stage I
Drug C
Relapse

Disease model / policy model

The concept

Step 1
RWD
Base case

Step 2
Trial data
Scenario 1, 2 ...
Follicular lymphoma (FL)

A Generic Model for **Follicular Lymphoma**: Predicting Cost, Life Expectancy, and Quality-Adjusted-Life-Year Using UK Population-Based Observational Data

Hsin-I Wang, PhD,1,*, Eve Roman, PhD,2, Simon Crouch, PhD,3, Elme Aas, PhD,4, Cathy Burton, MD,4, Russell Peimani, MD,2, Alexandra Smith, PhD1

1Epidemiology & Cancer Statistics Group (ECCS), Department of Health Sciences, University of York, York, UK; 2Department of Health Management and Health Economics, University of Oslo, Oslo, Norway; 3Haematological Malignancy Diagnostic Service, St. James’s University Hospital, Leeds, UK; 4Queens Centre for Oncology and Haematology, Castle Hill Hospital, Hull, UK

**ABSTRACT**

Objective: To use real-world data to develop a flexible generic decision model to predict cost, life expectancy, and quality-adjusted life-years (QALYs) for Follicular lymphoma (FL) in the National Health Service budget for haematological cancer as a whole. Assuming that treatment effects reported in trials are applicable to all patient groups, scenario analyses for two recent...
1. Data source

Haematological Malignancy Research Network (HMRN, www.hmrn.org)

Population: 3.6 million
Diagnostic laboratory: 1
Hospitals: 14

Epidemiology & Cancer Statistics Group (ECSG), University of York (www.hmrn.org)

3. Base case results: two types of results

Incidence-based results

Prevalence-based results
### Incidence-based results

#### No. of newly diagnosed FL per year in the UK (n=1860)

*Source: Haematological Malignancy Research Network (HMRN, www.hmrn.org)*

#### Results (5,000 iterations)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Cost (£) Mean (95% CI)</th>
<th>LYs Mean (95% CI)</th>
<th>QALYs Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>1,860</td>
<td>18,705 (18,631-18,781)</td>
<td>9.08 (9.06-9.11)</td>
<td>7.35 (7.34-7.37)</td>
</tr>
<tr>
<td>Observation only</td>
<td>550 (548-551)</td>
<td>5,296 (5,290-5,301)</td>
<td>8.22 (8.20-8.24)</td>
<td>7.40 (7.38-7.41)</td>
</tr>
<tr>
<td>Not Treated</td>
<td>37 (36-38)</td>
<td>6,165 (6,093-6,237)</td>
<td>0.21 (0.20-0.21)</td>
<td>0.12 (0.12-0.12)</td>
</tr>
<tr>
<td>Treated</td>
<td>1,273 (1,271-1,274)</td>
<td>24,872 (24,765-24,979)</td>
<td>9.72 (9.69-9.75)</td>
<td>8.46 (8.43-8.48)</td>
</tr>
<tr>
<td>1st line only</td>
<td>720 (717-722)</td>
<td>13,456 (13,388-13,525)</td>
<td>8.27 (8.24-8.31)</td>
<td>8.07 (8.06-8.14)</td>
</tr>
<tr>
<td>2nd line plus</td>
<td>77 (76-78)</td>
<td>60,261 (59,791-60,730)</td>
<td>15.79 (15.70-15.87)</td>
<td>12.15 (12.09-12.21)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SCT: stem cell transplantation
Prevalence-based results

FL Incidence rate in the UK

Allow burn-in period of 30 years

MODEL

Source: Haematological Malignancy Research Network (HMRN, www.hmrn.org)

Prevalence-based results

Expected annual economic impact in the UK is around £50-60 million (1/10 of total NHS budget each year for haematological malignancies)

Burn-in period of 30 years
4. Scenario analysis

Frontline rituximab

Allow burn-in period of 30 years

MODEL

Time to start of new treatment: HR 0.35 (95% CI: 0.22-0.56)


4. Scenario analysis

£2-3 million

Source: Model showing £2-3 million savings.
5. Decision aid: model front end

https://www.hmrn.org/economics/models

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![Decision aid: model front end](https://www.hmrn.org/economics/models)

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5. Decision aid: model front end

![Decision aid: model front end](https://www.hmrn.org/economics/models)

https://www.hmrn.org/economics/models
5. Decision aid: model front end

Conclusion

- This is the **first study** to model individual FL patients through the entire treatment pathway using both **real-world evidence** and **trial data**.

- The model can predict **costs**, **life-years** and **QALYs** of entire FL treatment pathways.

- Future applications of the developed model could include evaluation of new technologies and interventions to **support healthcare decision-making**, especially in the era of personalised medicine.
Thank you for your attention

Q & A