Development of Medication Barcode System to Ensure Patient Safety in Taiwan

Chairman, Taiwan Healthcare Automation Association
IPP, Taiwan Society of Health-System Pharmacists
Director, Dept. of Pharmacy, Changhua Christian Hospital

Su-Yu Chien, R.Ph., M.S.
Taiwan Country Profile

- Population: 23 million
- Hospital number: 494
- Hospital Accreditation, since 1978
- National Health Insurance, since 1995
  - Coverage rate: 99%
- Life expectancy (2011 est.)
  - Male: 75.98 years old
  - Female: 82.65 years old
Briefings of Changhua Christian Hospital
-- Establish under God’s Love
Dr. Landsborough Flew Overseas to Taiwan in 1895
Pioneer of Taiwan’s Modern Medicine

Founder Dr. Landsborough

Original building of CCH back in 1896
Continuous Growth Since the Establishment in 1896

2-story hospital building built in 1907

Full view of the current CCH building
Patient—Centered Healthcare

Hundred year ago health care

Patient—Centered healthcare
The Only Medical Center with History of 100 Years in Central Taiwan Area
Changhua Christian Hospital Healthcare System

- Hospitals: 10
- Patient beds: 3232
- Staff: 6358
- Pharmacists: 189

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>1 Medical Center</th>
<th>6 District Hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 Regional Hospitals</td>
<td>1 Specialist Hospital</td>
</tr>
</tbody>
</table>
A. Why Develop Medication Barcode System
B. Development of Medication Barcode Standards in Taiwan
C. Standards of Medication Barcode in Taiwan
D. Results of Survey
E. The Future
A. Why Develop Medication Barcode System
Medical Error Annual Reports of IOM

Estimated Deaths Associated with Medical Errors Compared to Leading Causes of Death in the U.S.

- Heart Disease: 727,000
- Cancers: 540,000
- Stroke: 160,000
- Lung Disease: 109,000
- Medical Errors (IOM High Estimate): 98,000
- Accidents: 96,000
- Pneumonia and Flu: 86,000
- Diabetes: 63,000
- Medical Errors (IOM Low Estimate): 44,000
- Suicide: 31,000
- Kidney Disease: 25,000

Adapted from IOM

IOM: Institute of Medicine
Medical Error Reports in Taiwan, 2010

- Medication: 15,569
- Fall: 13,581
- Tubing: 8,099
- Laboratory: 3,323
- Violence/Suicide: 3,159
- Security: 1,862
- Medical practice: 1,543
- Surgery: 636
- Public Accident: 591
- Blood transfusion: 521
- Cardiac arrest: 441
- Anesthesia: 55
- Other: 299

The Number of Incidents
**TSHP 2020 Initiative**

Goal 1  Increase the extent to which pharmacists help individual hospital inpatients achieve the best use of medications

Goal 2  Increase the extent to which pharmacists help individual non-hospitalized patients achieve the best use of medications

Goal 3  Increase the extent to which pharmacists actively apply evidence-based methods to the improvement of medication therapy

Goal 4  Increase the extent to which pharmacists in health systems have a significant role in improving the safety of medication use

Goal 5  Increase the extent to which health systems apply technology effectively to improve the safety of medication use

Goal 6  Increase the extent to which pharmacists engage in public health initiatives on behalf of their communities

Goal 7  Increase the extent to which pharmacists participate in international affairs
More than 50% Medication Error Reduction with Bar-Code Scanning

- **Ordering errors**, 39% of all serious medication errors
  - With CPOE, 55% reduction

- **Dispensing errors**, 11% of all serious medication errors
  - With pharmacy bar-code scanning, 67% reduction

- **Administration errors**, 38% of all serious medication errors
  - With bar-code eMAR, 51% reduction

**Physician**
- Ordering
- **Pharmacist**
  - Dispensing
- **Nurse**
  - Administration

- **Transcription**
  - Transcription errors, 12% of all serious medication errors
    - With eMAR, 100% reduction

**Medication-administration record**

*NEJM 2010; 362; 1698-1707*
B. Development of Medication Barcode Standards in Taiwan

Promote Medication Safety and Efficiency of Medication Management
History of Medication Barcode in Taiwan

2000-2004

Suppliers
• Promote the efficiency of supply chain

2008-2009

Advocate Period
• Enhance safe medication usage

2011

Establish Standard Mode
• Elevate safe and efficiency of medication usage

DOH Project

GS1

TSHP

TSHP
Establishment and Nationwide Promotion

1. Standardize the medication barcode content
   - Establish user guidelines of medication barcode application
   - Hold medication barcode application orientation

2. Survey of Medication barcode application penetration

3. Establish the mode of barcode application on medication management system

4. Recommendations for increasing health insurance payment price

5. Establish the information platform of medication barcode
C. Standards of Medication Barcode in Taiwan

- The package of drug should label generic name, brand name, dosage form, potency, lot number, expiration date.
- Every package layer should have printed or patched GS1 barcode.
- The primary layer adopts DataMatrix as a data carrier.
- The second layer adopt DataMatrix or GS1-128 as a data carrier.
- The third layer adopts GS1-128 as a data carrier.
## C. Standards of Medication Barcode in Taiwan (Cont.)

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
<th>Blister</th>
<th>Tablet</th>
<th>Injectable/External usage</th>
<th>Data Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st layer</td>
<td>The most inner package level</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td>DataMatrix</td>
</tr>
<tr>
<td>2nd layer</td>
<td>Sale box level</td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
<td>DataMatrix or GS1-128</td>
</tr>
<tr>
<td>3rd layer</td>
<td>Shipping Box</td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
<td>GS1-128</td>
</tr>
</tbody>
</table>
Samples

- Script information: generic name, Chinese/English brand name, and potency
- Barcode information: GTIN, lot number, expiration date

DataMatrix size: 5.7*5.7mm
GTIN: (01) 04711916011641
Expiry: (17) 131201
Batch: (10) 1BD0772
## D. Results of Survey (1)

### Prescription Drug

<table>
<thead>
<tr>
<th>Category</th>
<th>Domestic investment manufacturer (n=59)</th>
<th>Foreign investment manufacturer (18)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blister</td>
<td>Externa l usage</td>
</tr>
<tr>
<td>Shipping Box</td>
<td>18%</td>
<td>20%</td>
</tr>
<tr>
<td>Sale box</td>
<td>40%</td>
<td>45%</td>
</tr>
<tr>
<td>The inner most package</td>
<td>6%</td>
<td>15%</td>
</tr>
</tbody>
</table>
## Results of Survey (2)

### Strategies to promote pharmaceutical manufacturers using medication barcode

<table>
<thead>
<tr>
<th>Items</th>
<th>Domestic manufacturer</th>
<th>Foreign manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Develop national standards</td>
<td>52</td>
<td>88.1</td>
</tr>
<tr>
<td>Announce mandate</td>
<td>36</td>
<td>62.1</td>
</tr>
<tr>
<td>Priority purchase</td>
<td>39</td>
<td>66.1</td>
</tr>
<tr>
<td><strong>Barcode tech. assistance</strong></td>
<td>52</td>
<td>88.2</td>
</tr>
<tr>
<td><strong>Increase health insurance payment</strong></td>
<td>52</td>
<td>92.9</td>
</tr>
</tbody>
</table>
## Main Implementation difficulties and Solutions

<table>
<thead>
<tr>
<th>No</th>
<th>Difficulties</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Small size of Unit-dose package</td>
<td>Technology assistance</td>
</tr>
<tr>
<td>2</td>
<td>Difficult to print barcode on blister</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Small market demand in Taiwan</td>
<td>Give priority purchase -- products with DataMatrix printed</td>
</tr>
<tr>
<td>4</td>
<td>Increase operating time and cost (Material cost: 0.05 NT/Tab.)</td>
<td>Strive for reasonable payment</td>
</tr>
</tbody>
</table>
E. The Future

- Need government support
  - Announce the timeline

- Develop complementary strategy
  - Technical assistance
  - Reasonable payment
  - Priority purchase
I Hope, ... ??? To --

- Improve the patient safety
- Enhance professional role
- Reduce hospital management cost
- Promote government efficiency in medication management and vigilance
Taiwan (Formosa) - Beautiful Island

Thank You for Your Attention
Establish the Barcode Consultation Team

**Purpose:** providing technique tutoring and Consultation to help reduce implementation barriers

### Consultant services

| Consultation | Individualized tutoring and application plan | Problem solving | 2D Barcode examination service |

### Contact barcode technique consultation center

- Hospitals
- Pharmaceutical manufacturers
- SW/HW companies
- Printing Factory
- GS1 Taiwan
- Academics