

No. 354

## HFMEA-Initiated Safety Improvement in Chemotherapy by Using CPOE System

Pa-Chun Wang MD, MSc., Chia-Hui Cheng MHA, His-Yen Lin MS, Chi-Lan Kao BS, Ching-Shui Huang MD, Chia-Jen Chou PhD  
Cathay General Hospital, Taipei, Taiwan

- Objective:** Use **Healthcare Failure Mode and Effects Analysis (HFMEA)** methodology to investigate chemotherapy risks, report the impacts of **computerized physician order entry (CPOE)** implementation.
- Methods:** A multi-discipline team (including quality manager, pharmacist, nursing staff, oncologist, resident, and hospital information system engineer) was organized to conduct HFMEA for chemotherapy processes. Hazard score (HS) were generated from the likelihood of occurrence (1-4) and the severity of the potential effect for the patient (1-4) of every failure mode. Each potentially hazardous failure mode was put into the decision tree to identify ones in need for immediate improvement actions.

A java-based CPOE system was designed specifically for chemotherapy on a J2EE platform.

Chemotherapy-related medication errors were recorded and analyzed.

## CPOE System and HFMEA

**1. Selection of Protocol**

**HFMEA Score**

| Failure Mode                           | Baseline Hazard Score |
|--|-----------------------|
| Hand writing not eligible              | 12                    |
| No standard protocol                   | 12                    |
| Hard to review past medication history | 12                    |
| Dose miss calculation                  | 12                    |
| Wrong medicine check-out               | 4                     |
| Processes too complicated              | 6                     |

**2. Medication Sheet**

## Outcomes

### Chemotherapy Errors (N=19,431)

|                            | Prescription | Error | Error Rate (%) | 95% CI     |
|----------------------------|--------------|-------|----------------|------------|
| <b>Time Points</b>         |              |       |                |            |
| Before CPOE                | 8415         | 277   | 3.29           | 2.90-3.68  |
| After CPOE                 | 102070       | 34    | 0.03           | 0.028-0.03 |
| Liver/Renal Function Alert | 746          | 0     | 0              |            |
| <b>Division</b>            |              |       |                |            |
| General Surgery            | 3886         | 44    | 1.13           | 0.79-1.47  |
| Hematology                 | 10808        | 83    | 0.77           | 0.76-0.78  |
| Liver Center               | 242          | 11    | 4.55           | 1.88-7.23  |
| Urology                    | 1079         | 8     | 0.74           | 0.71-0.77  |
| OB/GYN                     | 2867         | 127   | 5.25           | 4.44-6.08  |
| Immunology                 | 136          | 6     | 4.41           | 0.89-7.93  |
| <b>Service Department</b>  |              |       |                |            |
| Ambulatory                 | 8030         | 53    | 0.66           | 0.65-0.67  |
| In-hospital                | 11401        | 298   | 2.89           | 1.98-2.53  |

### Comparisons of Chemotherapy Prescription Errors

|                           | Before CPOE  |       |                | After CPOE   |       |                | Liver/Renal Alert System | P Value |
|---------------------------|--------------|-------|----------------|--------------|-------|----------------|--------------------------|---------|
|                           | Prescription | Error | Error Rate (%) | Prescription | Error | Error Rate (%) |                          |         |
| <b>Division</b>           |              |       |                |              |       |                |                          |         |
| General Surgery           | 1752         | 37    | 2.11           | 2029         | 7     | 0.34           | 115                      | 0       |
| Hematology                | 4379         | 69    | 1.58           | 5974         | 14    | 0.23           | 495                      | 0       |
| Liver Center              | 37           | 8     | 21.62          | 199          | 3     | 1.51           | 6                        | 0       |
| Urology                   | 494          | 4     | 0.81           | 552          | 4     | 0.72           | 33                       | 0       |
| OB/GYN                    | 1541         | 151   | 9.80           | 1200         | 6     | 0.45           | 105                      | 0       |
| Immunology                | 66           | 6     | 9.09           | 67           | 0     | 0              | 3                        | 0       |
| <b>Service Department</b> |              |       |                |              |       |                |                          |         |
| Ambulatory                | 3886         | 41    | 1.11           | 4088         | 12    | 0.29           | 256                      | 0       |
| In-hospital               | 4729         | 236   | 4.99           | 6182         | 22    | 0.36           | 490                      | 0       |