## Introduction

Traditional prescription filling process is manual and labor intensive. Pharmacy automation offers a viable solution to handle high prescription loads safely, in an organized and efficient manner. Since November 2012, full end-to-end automation of the Pharmacy workflow was implemented in the SGH Outpatient Pharmacy, collectively termed as the Automated Pharmacy Dispensing System (APDS). Key features include:

1. **Radio frequency identification (RFID)** technology allowing:
   - Real time tracking of queue status
   - Automatic queue sequencing
2. **Light Emitting Diode (LED)-guided drug picking**
3. **Automated packing** by two Drug Dispensing Systems (DDS)
4. **RFID signals to DDS & picking stations**
5. **Tagging of prescriptions**
6. **Dispensing counters**
7. **Conveyor belt system**
8. **RFID-embedded baskets**
9. **Automatic assembly of packed items via a 110m conveyor system**
10. **Automatic channeling of assembled items to dispensing counters**

Figure 1: Pharmacy layout with key features highlighted

## Aim

Evaluate the impact of the APDS on efficiency and safety of the Pharmacy workflow.

## Methodology

**Primary outcome:** Average patient waiting time.

**Secondary outcome:** Number of staff-reported prevented dispensing errors per month.

## Results and Discussion

Pre-APDS and post-APDS period data were collected from electronic databases, compared and analyzed.

- **Pre-APDS time period:** January - March 2012
- **Post-APDS time period:** January - March 2014

### Average Patient Waiting Time

Significant reduction in average patient waiting time of approximately 6 minutes from 31.2 minutes pre-APDS to 25.3 minutes post-APDS.

![Average Patient Waiting Time Graph](image)

Table 1: Comparison of average patient waiting time between pre-APDS and post-APDS time periods

<table>
<thead>
<tr>
<th>Month</th>
<th>Pre-APDS (Minutes)</th>
<th>Post-APDS (Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>31.2</td>
<td>25.3</td>
</tr>
<tr>
<td>Feb</td>
<td>35.1</td>
<td>29.6</td>
</tr>
<tr>
<td>Mar</td>
<td>38.7</td>
<td>33.2</td>
</tr>
</tbody>
</table>

### Prevented Dispensing Errors

Total prevented dispensing errors were significantly reduced by 47% post-APDS from an average of 895 to 474 per month, with the highest reduction of 71% seen in prevented dispensing incidents involving wrong drug and strength.

![Prevented Dispensing Errors Graph](image)

Table 2: Comparison of prevented dispensing errors between pre-APDS and post-APDS time periods

<table>
<thead>
<tr>
<th>Month</th>
<th>Pre-APDS</th>
<th>Post-APDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>895</td>
<td>474</td>
</tr>
<tr>
<td>Feb</td>
<td>684</td>
<td>474</td>
</tr>
<tr>
<td>Mar</td>
<td>927</td>
<td>474</td>
</tr>
</tbody>
</table>

## Conclusion

- **APDS**
  - *Automate and streamline workflow*
  - *Minimize human errors*
  - Improved efficiency and safety

## References