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Diagnostic Imaging Department

NSHA Diagnostic Imaging

Project Description

The Diagnostic Imaging (DI) department at the Halifax Infirmary is undergoing a massive renovation. This includes the relocation of waiting and changing areas and provides an opportunity to look at appointment scheduling and resource utilization. As a public service, the aim is to optimize hospital care while minimizing resources.

Project Scope

- Analyze scheduling templates for Magnetic Resonance Imaging (MRI), Computed Tomography (CT) and Ultrasound (US)
- Analyze resource utilization in MRI, CT and US such as techs, seats and scanners
- Determine whether MRI patients will change in the CT changing rooms or the X-Ray changing rooms

Scheduling Template Analysis

A comparison of appointment data to appointment scheduling templates for each modality indicated there was room for template improvement in US. The simulation model was used to measure potential changes.

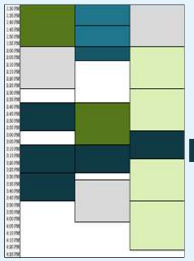

Figure 1. Current US Scheduling Template

Figure 2. US Scheduling Template- 1 Additional Afternoon Slot

Figure 3. US Scheduling Template- 2 Additional Afternoon Slots

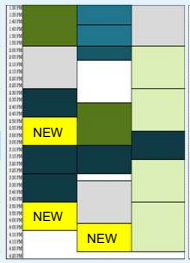

Figure 4. US Scheduling Template- 3 Additional Afternoon Slots

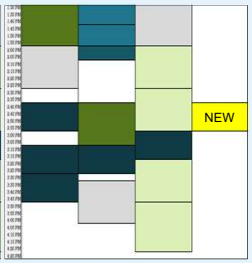

Figure 5. US Scheduling Template- Overbook by 1 Slot

Simulation

Input
- Number of patients arriving according to the scheduling template data
- Number of resources including their capacity and availability (seats, techs, scanners, etc.)

Process
- Patients follow designated route through the department
- Procedures take place once the appropriate resources are available

Output
- Number of patients through
- Utilization of resources
- Overtime required
- Wait times
- Bottlenecks

Flow Analysis

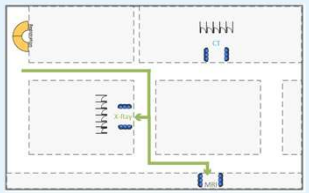

Figure 5. Current MRI Patient Route to Changing Rooms

Currently MRI patients get changed in the X-Ray changing rooms.

Figure 6. Future MRI Patient Routes to Changing Rooms

Option 1: Change in X-Ray

Option 2: Change in CT

Both new options for MRI patients to get changed cause the same hallway congestion. The simulation model was used to make the final decision based on the lowest changing room utilization.

Results

Scheduling Template Analysis

- The simulation results of the template redesigns are detailed in Table 1
- Adding one slot reduces the average procedure wait list to zero in 101 days.
- Adding two afternoon slots proved to be an effective solution that increases capacity without a significant increase in patient wait times

Table 1. US Template Simulation Results

Metric	Current Template	Add 1 Afternoon Slot	Add 2 Afternoon Slots	Add 3 Afternoon Slots	Overbook by 1 Slot
Patient Wait Time (mins.)	14.76	15.97	16.22	16.66	16.14
Tech Utilization	80%	81%	83%	84%	82%
Scanner Utilization	67%	68%	69%	70%	68%
Expected Overtime	No	No	No	Yes	No

Flow Analysis

- The changing room utilization is lower in CT which makes this the better option
- X-Ray changing rooms are not used for X-Ray appointments past 5:00 PM so that remains an option for evening MRI patients

Table 2. Changing Room Utilization

Options	Changing Room Utilization
Option 1: Change in X-Ray	32%
Option 2: Change in CT	13%

Conclusions & Recommendations

- The simulation model proved that there are sufficient resources in the department following the renovations to maintain the same level of patient care
- There are no changes recommended for the MRI and CT scheduling templates
- The recommended improvement to the US scheduling template is to add two appointment slots in the afternoon where there is space in the current schedule
- Following the renovations, MRI patients should get changed in CT during the day and in X-Ray after 5:00 PM