Time Value Analysis of Inpatient Endoscopy Workflow

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Problem Definition

- The endoscopy suite at TJUH is used daily for both inpatient and outpatient procedures. According to annual data from the gastroenterology (GI) department, case volume continues to rise annually. Comparing fiscal year data from Feb 2019 to Feb 2020, there were 1586 inpatient cases up from 1392 cases the year prior. Similarly, there were 8885 outpatient cases up from 8125 cases.

- Comparing turnover times between inpatient and outpatient rooms revealed an average of 16-17 minutes (mins) for outpatient room turnover, and an average of 28 mins for inpatient rooms.

- Given this significant difference and the impact it has on the amount of inpatient cases completed each day, a time value analysis was designed to investigate any points during room turnover where there was an opportunity for improvement.

Aims For Improvement

- Our aim was to evaluate the variables involved in room turnover and identify any delays that lead to the time difference found between inpatient and outpatient rooms.

- We planned to design an intervention to improve efficiency in the endoscopy suite and complete more inpatient cases.

- We predicted that completion of more inpatient cases would subsequently decrease the need for cancellation and rescheduling of medically necessary cases on a daily basis.

Intervention

- A monitoring system was created to follow the workflow between each case in the inpatient procedure room.

- Times were averaged for each step to find the point of most significant delay.

- Parameters measured included: time from scope out to wheels out for prior case, wheels out from prior case to room ready for next case, patient's arrival time to pre-procedure completed, pre-procedure completed to room ready, pre-procedure completed to wheels in, and room ready to wheels in.
    - "Arrival time" indicates the patient's arrival time to the pre-procedure area in the endoscopy suite.
    - "Wheels out" indicates stretcher out of the endoscopy room to the recovery area.
    - "Wheels in" indicates stretcher into the endoscopy room from the pre-procedure area.

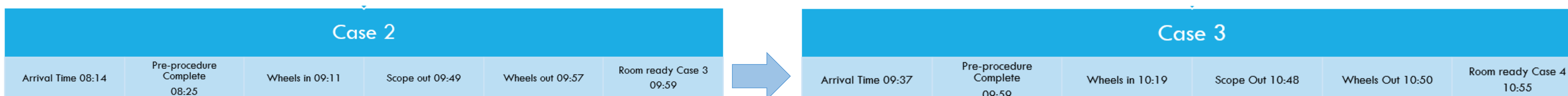- There was also space to record additional transition points not accounted for in the workflow steps above.

Figure 1. Sample Data from Inpatient Case Monitoring

Measurement and Results

- Preliminary data over a 2 day analysis of the inpatient procedure room workflow showed that the largest delay was between "room ready" and "wheels in" which took an average time of 18 mins.

- Five of the six patients over these 2 days were ready before the room was ready, despite the time of room readiness for next case after wheels out from prior case being only 4 mins.

- Other notable parameters: time from scope out to wheels out (3.3 mins), wheels out to room ready (4.3 mins), arrival time to pre-procedure complete (10.6 mins).

Step (min)	Day 1				Day 2				Average
	Case 1	Case 2	Case 3	Case 4	Case 1	Case 2	Case 3	Case 4	
Scope out-wheels out	3	8	2		2	3	2		3.33
Wheels out-room ready	3	2	5		3	6	7		4.33
Arrival time-pre-procedure complete		11	22	6		8	11	6	10.67
Pre-procedure complete-room ready		-28	0	-29		19	-2	-32	-12.00
Pre-procedure complete-wheels in		46	20	19		5	16	39	24.17
Room ready-wheels in		18	20	20		31	14	7	18.33
Arrival time-room-ready		-39	-22	-35		8	-23	-38	-24.83

Table 1. Two Day Inpatient Procedures Turnover Analysis

Next Steps and Lessons Learned

- While further data is pending, our next steps will to identify the factors behind this rate limiting step (room readiness from prior case and wheels in for next case) and to design an intervention to improve efficiency.

- Additionally, the time value analysis showed a second point of significant difference in the time spent on the endoscopy admissions process. An average of 16-20 mins was spent on outpatients versus 10 mins on inpatients.

- This is another transition point that could be similarly investigated to determine how we could improve efficiency in outpatient cases.