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Introduction & Background

In the last 5 years, our program has grown to a current total of 6 MDs, 1 Fellow, 2 RN Coordinators, and 1 Research Coordinator. We have increasingly complex patients, and our involvement with research has grown substantially, along with an increased number of resident trainees. As a group, we have identified that patient flow through our clinic often feels inefficient, leading to wasted time and frustration for care providers (MDs, RNs, rooming staff, etc.) and families. In this project, we are using the %Non-value-added time (NVAT) as an indicator of time that the patient is not interacting with anyone from the health care team during their clinic visit.

Front desk

Rooming staff (RS)

MD

RN

Research coordinator

Check-in

waiting

Call patient from lobby

Room patient

waiting

Send to Front Desk, Lab, etc.

Notify RS

MD visit

Teaching needed?

Yes

Research visit?

No

Labs, AVS, Follow-up

waiting

Notify RN

Teaching

Notify RC

Research Activities

Percent of total NVAT (%)

100

80

60

40

20

0

4

46

50

Check out

In room

Lobby

Fig. 1A. Process map. Patients spend time waiting (NVAT) at many steps during their visit, and standard work is not well-defined in our clinic, particularly at certain steps in the process such as after the MD leaves the room. This results in time wasted looking for staff and communicating and implementing a plan. **1B. What are the major contributors to NVAT?** 50% of the time was in the lobby, 46% of the time was waiting inside the room for the physician, and 4% of the time was checking out.

Aim Statement

To reduce the mean % non-value-added time (NVAT) from a baseline of 29% to 20% by August of 2019.

First Intervention (PDSA #1)

Rooming Staff

□ Labs

□ Throat swab

□ EKG

□ Echocardiogram

□ Influenza immunization

□ After Visit Summary

□ Printed Referrals

□ Printed Materials

Nurse

□ Teaching (Per instructions in AVS)

Child/Family Life

□ Meet with CFL about

Research Coordinator

□ Meet with Research Coordinator

With the implementation of a new check-out sheet, the goal is to **improve communication and standardize the check-out process.** This new process allows the MD to move on to the next patient without interruption, therefore reducing the time the next patient spends waiting in the room.

Results

After PDSA1, there was a non-significant increase in % Non-Value-added time (NVAT)

A

80

70

60

50

40

30

20

10

0

% Non-Value-Added Time

UCL = 72.8

\bar{x} = 30.5

LCL = 0.0

Run number

0

18

36

54

72

90

108

126

144

162

180

Fig. 2. Major outcomes of implementing a check-out sheet. A. Control chart¹, showing on the y-axis the %NVAT, a measure of time patients are waiting, which has been normalized to the visit duration to plot both new and return patients in a single graph. On the x-axis, is a chronological progression of patients seen over time, with each dot representing an individual patient visit. The red line marks the time when PDSA1 was implemented. **B.** Violin plot, showing on the y-axis the time, in minutes, patients are waiting in the room for the MD. The outer shape of the violin plot represents all possible results, with thickness indicating the probability density. **C.** Box plot, showing physician-patient time during clinic visit at baseline and after intervention 1. N = 113 (baseline), 59 (PDSA1). Data shown is mean ± SEM.

Implementation of PDSA1 resulted in 54% reduction of variation in waiting periods in room

B

100

90

80

70

60

50

40

30

20

10

0

Time Spent waiting in room (minutes)

F-test variance

** P = 0.001

Baseline

PDSA1

Balancing measure: There was no decay in physician-patient time

C

70

60

50

40

30

20

10

0

Time physician spent in room with patient (minutes)

n.s.

n.s.

New

Return

Baseline

PDSA1

Methods

Baseline Data Acquisition

During the two-week baseline data acquisition period, a total of 116 patient visits were recorded over the months of February and April 2018 at the University of Minnesota Masonic Children's Hospital in the Department of Pediatrics. A worksheet was used to manually record the time, comments, and satisfaction of the patient's visit duration and flow. A similar procedure was carried out for PDSA1; we collected data two weeks after implementation of intervention to allow for adjustment period in the clinic staff.

Analysis

Statistical analyses were performed with GraphPad Prism (version 7.0d) for student t-tests, one-way ANOVA, Normalization test, and linear regression. R (R foundation for Statistical Computing, 2018) was used to correct for multiple comparisons. *Post hoc* tests were conducted with the Bonferroni-Holm method to control for a family-wise error rate at $\alpha = 0.05$. Error bars represent SEM, and null hypotheses were rejected at or below a p-value of 0.05.

Insights

Patients who arrive later to their appointments wait less

30

20

10

0

-10

-20

-30

-40

-50

-60

-70

-80

-90

-100

-110

-120

-130

-140

-150

-160

-170

-180

-190

-200

-210

-220

Arrival from Appointment Time (minutes)

$y = -0.5676x - 5.706$

P = 0.0021

● Late

■ On-time

% Non-value added time

0

20

40

60

80

N = 16 (late), 95 (On-time)

Future Directions

- Our **next PDSA cycle** will involve creating a standard work protocol for the entire visit, patient check-in through visit completion. Once this protocol is finalized, all staff will be trained.
- Define **what an appointment time means**, which we think may help with the observation we have made that about 20% of patients arrive late.
- We discovered that the **physical space** in our clinic is not ideal². The spaghetti diagram below shows the pathways our rooming staff walk, which is approximately 2.5 miles per week *just to room patients* per person.

Lab

Check-in

Front desk

29

31

33

MAs

work-room

39

41

43

45

47

Stairs

Waiting area

Waiting area

weight height

24

26

28

32

34

40

42

work-room

MDs

Summary & Conclusions

- Barriers to efficiency stem from process issues rather than from problems with individuals involved in the process.
- Although our first PDSA cycle did not reduce the mean %NVAT, it resulted in a significant 54% reduction in variation in the targetted area.
- There is no correlation between age of patient and visit duration as we originally thought that younger patients would require more care than older patients.
- 20% of the patients arrive late and this population, on average, experiences *less* %NVAT than those patients that arrive early.

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