

Introduction:

Bacterial meningitis can lead to death if there is not a quick response. Molecular techniques have greatly decreased turn-around-time for bacterial meningitis testing, but is still important to quickly report critical values

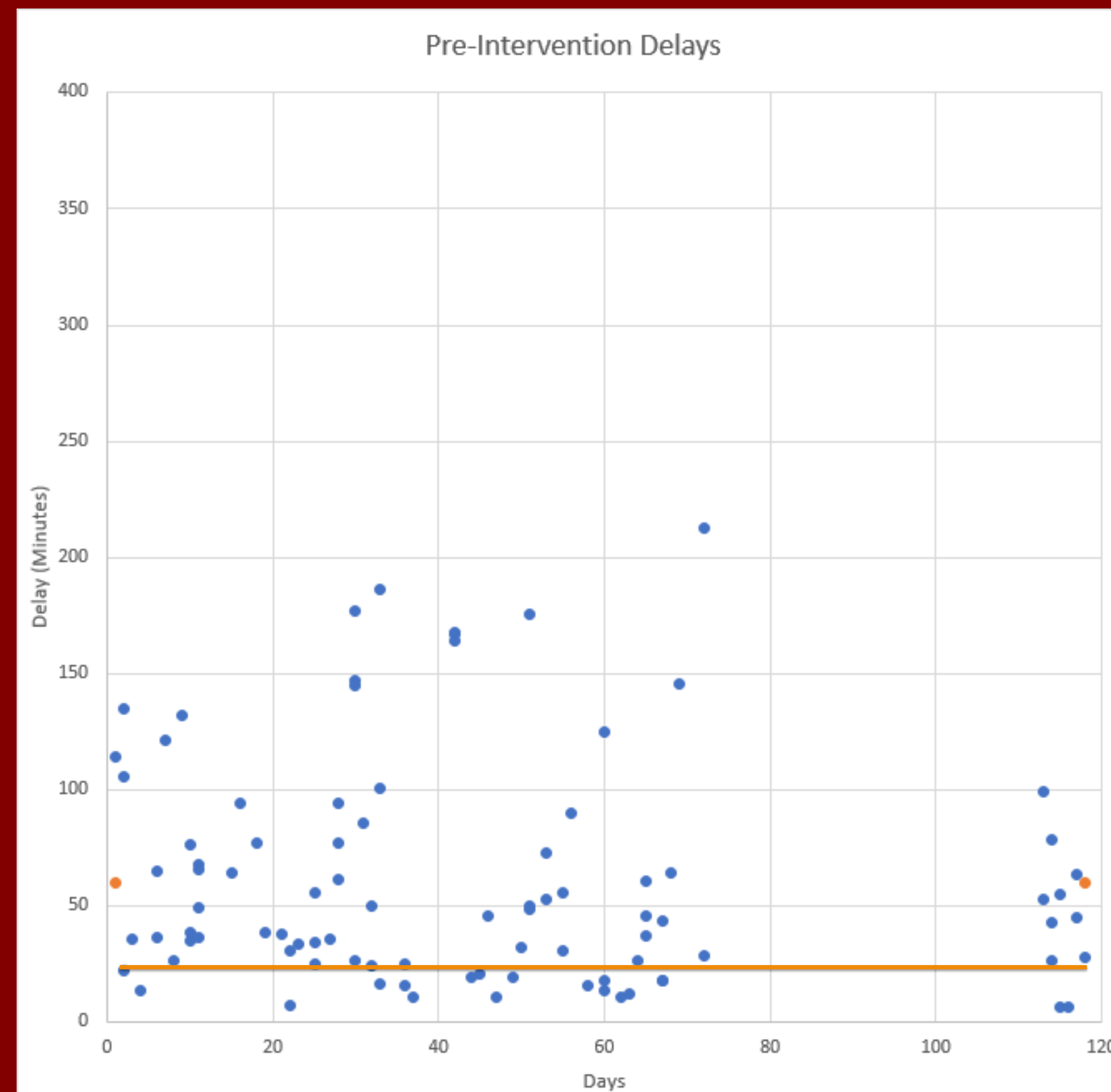
- At a certain location, negative values results are automatically released but positive results, being critical values, need to be manually called to the floor to be released
- The medical instrument for bacterial meningitis is placed in a low foot-traffic area of the laboratory, and there is no visible or audible signal of a positive result. Reporting delays occur if laboratory personnel do not recognize that a positive result is waiting to be released.
 - Nearly 40% of reporting delays (Time between the positive test being finished and results being released) are over one hour
 - Reporting delays range from as little as 7 minutes to over 3 hours
- Testing volume for bacterial meningitis is low-volume, which makes it difficult to evaluate interventions. *Clostridium difficile* testing is performed and reported the same way as bacterial meningitis testing, but at a higher volume, so it was chosen to be monitored as a surrogate for bacterial meningitis reporting delays
- A goal was set to get less than 20% of all reporting delays to be over 60 minutes

Intervention:

- Data Innovations software holds the positive results to be manually released
- Employees were surveyed to determine best course of action for decreasing delays
- The intervention decided upon was to leave the Data Innovations program open on a computer in the setups room with more foot traffic
- This will provide a visual cue, in the form of a red rectangle, when there is a positive result being withheld

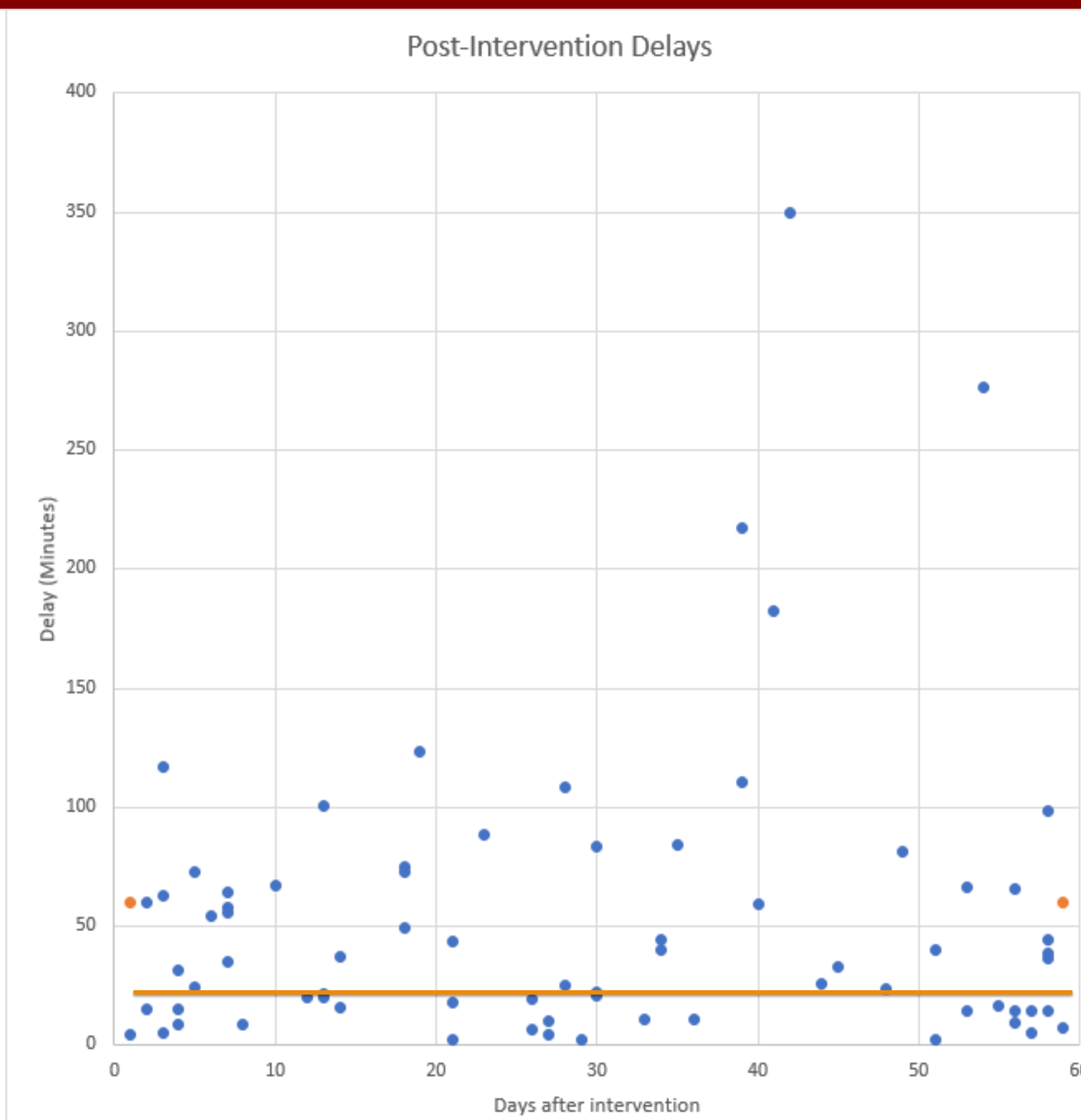
Results

Pre-Intervention



Pre-Intervention	Total	1st Shift	2nd Shift	3rd Shift
Average Delay (Minutes)	61.3	47.5	65.4	65.4
# of datapoints	91	21	28	42
Range (Minutes)	6.2, 212.8	6.8, 134.7	10.9, 185.9	6.2, 212.8
Standard Deviation	48.9	38.6	51.3	51.5
Coefficient of Variation	79.8	81.3	78.4	78.7
Delays over 15 minutes	82	18	26	38
Percent Delays over 15 minutes	90.1	85.7	92.9	90.5
Delays over 30 minutes	63	11	20	32
Percent Delays over 30 minutes	69.2	52.4	71.4	76.2
Delays over 60 minutes	35	7	12	16
Percent Delays over 60 minutes	38.5	33.3	42.9	38.1

Post-Intervention



Post-Intervention	Total	1st Shift	2nd Shift	3rd Shift
Average Delay (Minutes)	51.9	43.5	57.6	48.4
# of datapoints	73	8	32	33
Range (Minutes)	2.2, 349.4	2.2, 182.7	2.2, 349.4	4.2, 216.9
Standard Deviation	60.6	60.1	74.5	45.1
Coefficient of Variation	116.8	138.2	129.3	93.2
Delays over 15 minutes	54	5	25	24
Percent Delays over 15 minutes	74.0	62.5	78.1	72.7
Delays over 30 minutes	39	4	16	19
Percent Delays over 30 minutes	53.4	50.0	50.0	57.6
Delays over 60 minutes	23	2	11	10
Percent Delays over 60 minutes	31.5	25.0	34.4	30.3

- Each point above represents the delay in minutes (y-axis) for a positive result vs. days from the beginning of recording results (left, x-axis) or days from implementation of the intervention (right, x-axis)
- The orange lines indicate a delay of 60 minutes, with the goal being to have greater than 80% of points being under the orange line
- Average delay before intervention was 61 minutes and after intervention was 52 minutes
- A single-factor ANOVA did not find a statistically significant difference in before and after intervention delays
- A single-factor ANOVA did not find a statistically significant difference between delays for the different shifts
- Percentage of delays over 60 minutes went from 38% to 31.5%
- It is not clear if the intervention had any effect

Discussion

The procedure for positive critical values at this location are:

1. The critical value is withheld in Data Innovations
 2. The laboratory scientist calls the floor and asks for the patient's nurse
 3. The laboratory scientist informs the nurse of the critical value
 4. The nurse's identifying number and the time are recorded in the laboratory information system software
- The delay being addressed by this intervention is after step 1
 - The intervention provided a visual cue to higher foot-traffic areas
 - Audio cues (Setting a timer each time a test was set up) were also discussed but it was decided that they would interfere with other testing being performed too much
 - The majority of test results for *C. difficile* are negative
 - The goal was set to 20% of delays under 60 minutes because a study found a relative increase of 30% for the mortality rate with each hour delay in administering antibiotics for bacterial meningitis
 - Achieving the goal could make a difference in clinical outcomes for a significant amount of patients

Conclusion

- The goal was not met
- This intervention likely did not result in improvements for patient outcomes
- More serious interventions are necessary
- The next intervention could be that positive critical values, including bacterial meningitis, trigger an alarm that is audible to anyone in the setups area (The location of the laboratory scientists responsible for releasing the results)
- The next intervention should also utilize a visual cue, such as causing the screen in the front of the room to flash when a positive critical value is being withheld