# Innovation and Research Week
# שבוע חדשנות ומחקר

## Beating the clock: reduced time to first antibiotic dose administration following an audit-and-feedback intervention

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## Background

Quality improvement intervention and policy revisions have been shown to improve clinical practice and patient outcomes. Among indicators of a successful intervention is its sustainability over time. Studies suggest that timely administration of the first antibiotic dose is associated with reduced mortality, thus making it an important quality measure. We evaluate an intervention aimed to shorten the time from the first antibiotic dose ordering to its administration.

## Methods

An intervention consisting of a weekly email to nurse and physician leaders of different departments was introduced. The feedback included the percentage of patients that received their first antibiotic dose within three hours and details of those that did not. We compared the delay between the order and administration of antibiotics in different wards (surgical to medical) and different shifts; day-time (A), evening(B), and night (C) using interrupted time series analysis. .

## Results

The total number of orders pre-intervention was 58,320 and post-intervention was 52,127. The longest delays were observed during shift A in the surgical and medical wards (161 and 100 minutes, respectively). Comparing the pre- to post-intervention time to the first antibiotic dose (TTFAD):  a reduction in Shift A was noted both in the surgical wards (87 minutes, 55%) and medical wards (37 minutes, 37%) and with a preserved trend (p<0.001). A significant reduction in TTFAD was shown in shifts B and C as well. Comparing weekdays to weekends did not demonstrate any difference. The slope's angle before and after the intervention was not affected (Figure 1).

## Discussion and Conclusions

Using an e-mail-based automatic weekly alert significantly reduced TTFAD in hospitalized patients. Moreover, our intervention proved to be cost-effective and sustainable over time.
The longest delay shown in shift A pre-intervention may be attributable to the overload of tasks making antibiotic administration of lower priority. Raising staff awareness of current medical care practices appears to be an effective way to improve performance

Table 1. Monthly medians of time to antibiotic administration in minutes comparing surgical wards, Internal medicine wards, and the emergency departments in different shifts, prior to and following intervention

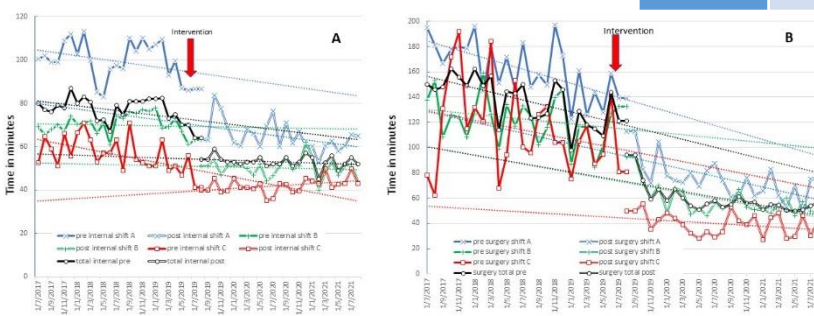| Variable | | | Pre-intervention (n=58320) | Post-intervention (n=52127) | P value |
|---|---|---|---|---|---|
| Time to AB administration, minutes (Median, IQR) | Surgical wards | Total | 144.5, 122-150 (n=11014) | 56, 53.5-60.5 (n=12062) | <0.001 |
| | | Shift A | 161, 145.5-180 (n=4026) | 74, 64-82.5 (n=4480) | <0.001 |
| | | Shift B | 125, 108-133.5 (n=4690) | 55, 49.2-66.5 (n=4990) | <0.001 |
| | | Shift C | 105, 90.5-132.2 (n=2298) | 42, 31-47 (n=2592) | <0.001 |
| | | Weekdays | 146, 123.2-155.5 (n=8513) | 57, 52.7-61.5 (n=9250) | <0.001 |
| | | Weekends | 130, 105.5-145.3 (n=2501) | 54, 50.5-65.7 (n=2812) | <0.001 |
| | Internal medicine wards | Total | 79, 72.7-81 (n=25538) | 53, 52-55 (n=22534) | <0.001 |
| | | shift A | 100, 94.5-108 (n=9746) | 63, 60.2-69.2 (n=9014) | <0.001 |
| | | shift B | 70.5, 67-74 (n=10540) | 51, 47-52 (n=9086) | <0.001 |
| | | shift C | 55.5, 51-63 (n=5252) | 42.5,39.7-44.5 (n=4434) | <0.001 |
| | | Weekdays | 81, 74.7-84.5 (n=19313) | 55, 53-57.5 (n=17037) | <0.001 |
| | | Weekends | 70, 66-75.5 (n=6225) | 48, 46-51.2 (n=5497) | <0.001 |
| | Emergency room | Total | 22, 21-23 (n=21768) | 22, 21-24 (n=1753) | 0.714 |
| | | shift A | 22, 20-24 (n=7017) | 21, 19-22 (n=5455) | 0.099 |
| | | shift B | 23, 21.5-23.5 (n=9545) | 23, 22.5-26 (n=7840) | 0.059 |
| | | shift C | 20, 19-21.8 (n=5206) | 20, 18-22 (n=4236) | 0.612 |
| | | Weekdays | 23, 21-23.7 (n=16166) | 22, 21.5-23.5 (n=13032) | 0.914 |
| | | Weekends | 20, 19-21 (n=5602) | 21.5, 20-22.7 (n=4499) | 0.028 |



Figure 1. Interrupted time series analysis showing the change in slope in TTFAD post-intervention in the medical wards (A) and surgical wards (B) in different shifts of the day.

| Variable | | Pre-intervention slope | | | Post-intervention slope | | | Change in slope (gradual effect) | | | Change in Intercept (immediate effect) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B | SE | P value | B | SE | P value | B | SE | P value | B | SE | P value |
| A Internal medicine | Total | -0.36 | 0.16 | 0.029 | -0.15 | 0.08 | 0.071 | 0.14 | 0.22 | 0.524 | -16.01 | 3.20 | <0.001 |
| | shift A | -0.41 | 0.29 | 0.158 | -0.50 | 0.17 | 0.007 | -0.13 | 0.42 | 0.765 | -21.88 | 5.58 | <0.001 |
| | shift B | -0.01 | 0.16 | 0.963 | -0.05 | 0.12 | 0.706 | -0.08 | 0.23 | 0.741 | -18.85 | 3.27 | <0.001 |
| | shift C | -0.50 | 0.12 | <0.001 | 0.14 | 0.10 | 0.150 | 0.66 | 0.17 | <0.001 | -10.16 | 2.49 | <0.001 |
| B Surgery | Total | -1.60 | 0.34 | <0.001 | -1.10 | 0.24 | <0.001 | 0.49 | 0.49 | 0.319 | -43.41 | 7.01 | <0.001 |
| | shiftA | -1.83 | 0.32 | <0.001 | -1.28 | 0.32 | 0.001 | 0.53 | 0.44 | 0.239 | -47.89 | 6.50 | <0.001 |
| | shift B | -0.83 | 0.48 | 0.090 | -1.27 | 0.32 | 0.001 | -0.46 | 0.68 | 0.504 | -36.42 | 9.73 | 0.001 |
| | shift C | -1.08 | 0.74 | 0.150 | -0.50 | 0.26 | 0.063 | 0.57 | 1.05 | 0.589 | -53.76 | 15.08 | 0.001 |