

# Promoting Appropriate PICC Line Usage through Implementation of an Order Set

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## BACKGROUND

- Peripherally inserted central catheters (PICCs) are relatively easy to place and use but carry a higher risk of line-associated deep vein thrombosis (DVTs) and central line-associated bacterial infections (CLABSI) than other types of venous catheters.
- At our institution prior to 2017, clinicians made decisions about PICC line placement without evidence-based guidance.
- This often results in higher lumen, larger lines than are clinically indicated.

## OBJECTIVE

- Reduce overall PICC line placement by encouraging midline use when appropriate as well as to reduce the unnecessary use of multi-lumen PICC lines at the University of Colorado Hospital.

## SAMPLE

- Study included 6,800 patients with 8,700 total procedures
- Data was collected from University of Colorado Hospital
- Study period was January 2017 to December 2019

	Pre-	Post-
Female	47%	48%
Male	53%	52%
Ave Age	55	56
Ave BMI	30.09	29.48

## METHODS

- Intervention was a new order set for PICC and midline placement to provide clinical guidance to clinicians on appropriate use of midlines and PICC lines.
  - Deployed system-wide on 11/19/2017
- Pre- and post-intervention data were compared in a linear interrupted time series looking at:
  - Midline and PICC line usage as a proportion of all lines
  - CLABSI and DVT rates
  - Single, double, and triple lumen PICCs as proportions of all PICCs
  - Conversion rates from PICCs to midlines and vice versa within the same encounter.

## RESULTS

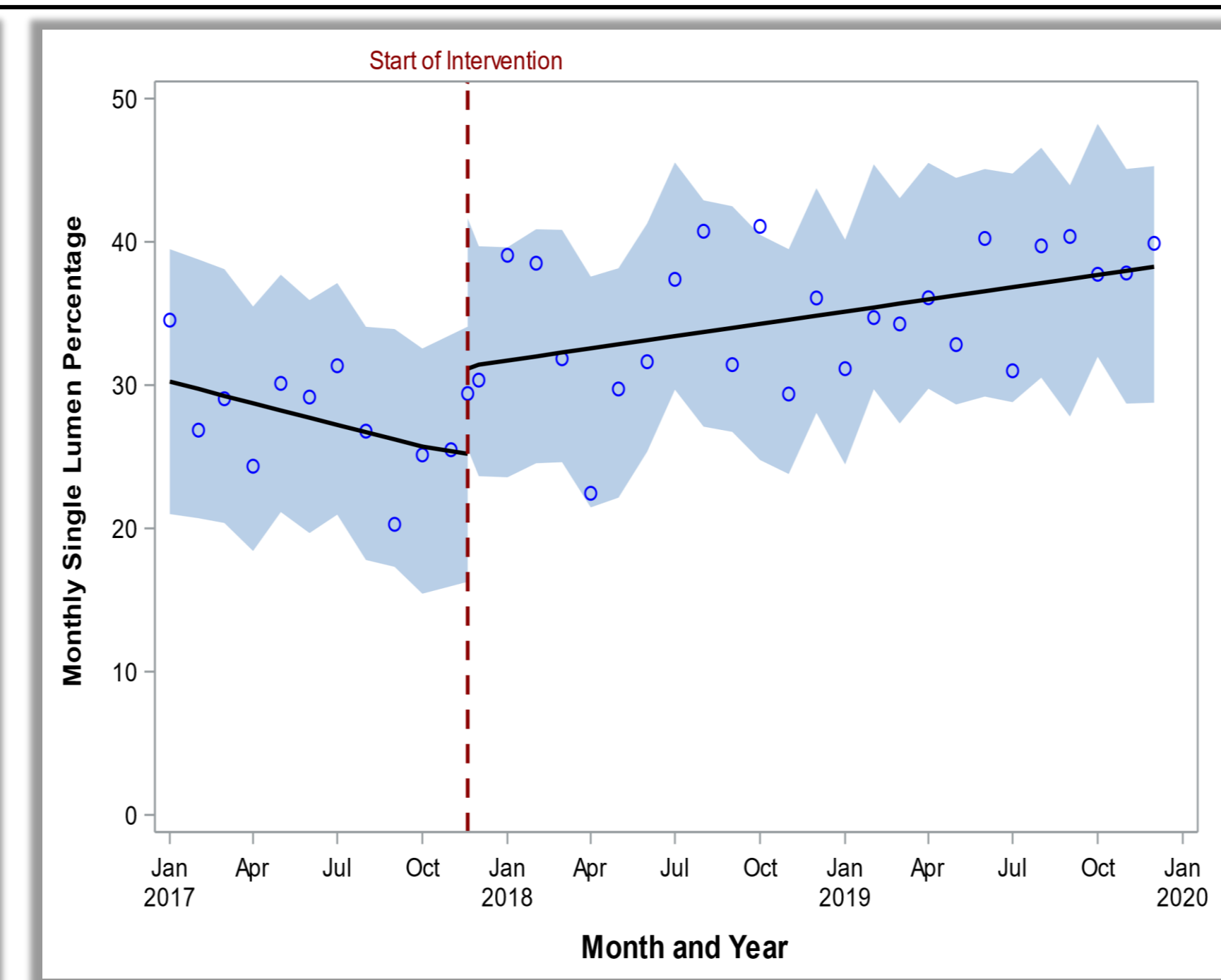
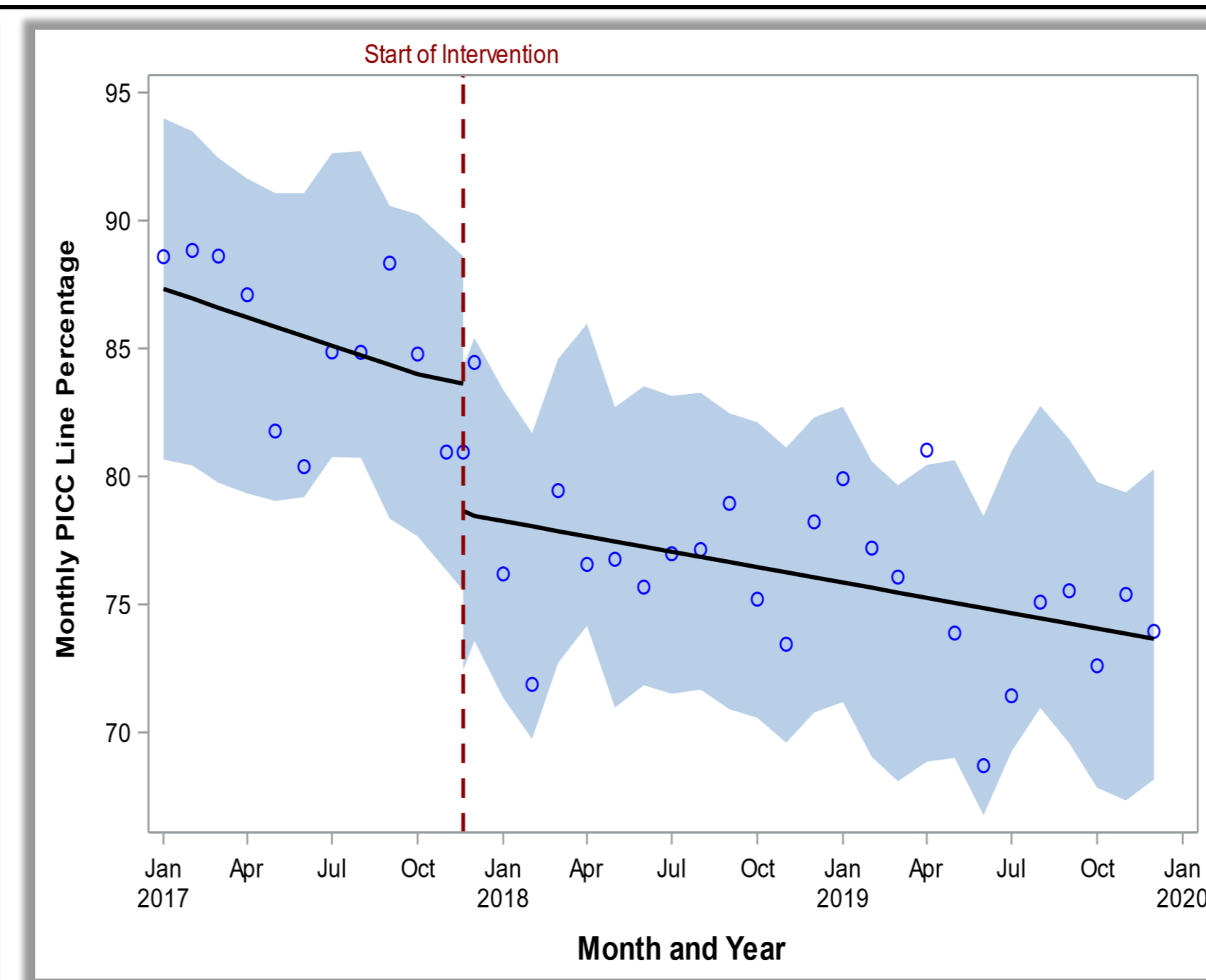
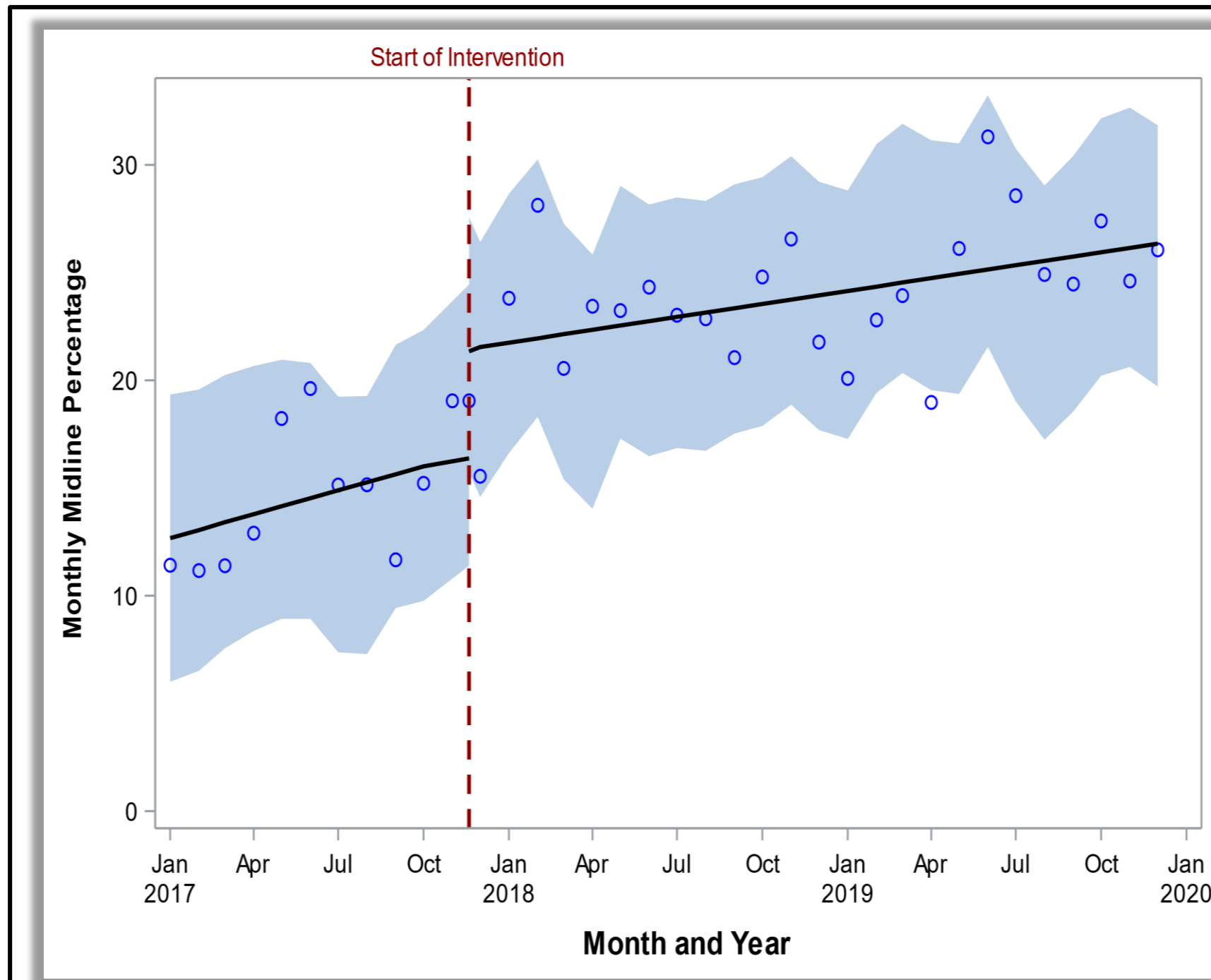


Figure 1. (left) Interrupted time series of midlines as a proportion of all lines. Binomial linked mixed model with a random intercept for patient MRN. Mixed model to account for patients who had multiple encounters with midline or PICC line procedures performed during the time frame.

Figure 2. (middle) Interrupted time series of PICC lines as a proportion of all lines

Figure 3. (right) Interrupted time series of single lumen PICC lines as a proportion of all PICC lines

- The odds of having a midline were 3.1 times higher after November 19, 2017 as compared to before ( $p = 0.000001$ ).
- Significant reduction in PICC lines as a proportion of all lines after the intervention compared with before (odds ratio: 0.32,  $p$ -value: 0.00000997).
- Significant immediate increase at intervention ( $p$ -value: 0.0184), and the post-intervention slope was significantly greater than the pre-intervention slope ( $p$ -value: 0.0203). There was an estimated immediate one-time increase in the proportion of single lumen PICC line procedures of 5.7% at the time of the intervention.
- No significant change in CLABSI or line-associated DVT rates post-intervention.

## CONCLUSIONS

- Implementation of an order set to guide clinical decision-making alone, is associated with decreased PICC line usage overall, increased midline usage, and decreased number of lumens.
- It is unclear whether this reduction of PICC line usage impacts adverse events that are associated with central lines such as CLABSI or line-associated DVTs. However, literature demonstrates that smaller and fewer lumen lines do reduce adverse events. Likely if our study was repeated with a larger sample size across multiple systems, we would see a reduction.

## LIMITATIONS

- Our study was likely underpowered to determine the true relationship between reduced PICC line usage and increased midlines.
- There were some procedures that involved PICC lines with an unknown number of lumens which could have confounded the PICC line usage as a proportion of all lines.
- While the total number of PICC lines that were placed pre and post intervention did not change, hospital census did which could possibly confound our data.

## FUTURE DIRECTIONS

- Additional, larger studies are necessary to determine the reduction in adverse events with clinical guidance in line selection alone.
- Studies comparing clinical guidance in line selection alone versus other interventions (including staff and provider education) are warranted to determine the best intervention to be deployed across other systems.
- Studies comparing pre and post COVID-19 line usage and associated adverse events.