



**TEXAS**  
Health and Human  
Services

**Texas Department of State  
Health Services**

# Healthcare-associated Infections and Preventable Adverse Events: Learning from COVID-19

Alex Daniels, MPH, CIC

Joy Zimmerman-Bodi, MSN, RN, CPHQ, HACP

# Overview

The National Picture



TEXAS  
Health and Human  
Services

Texas Department of State  
Health Services

# Acronyms

- SIR – Standardized infection ratio
- SUR – Standardized utilization ratio
- CLABSI – Central line associated bloodstream infection
- CAUTI – Catheter associated urinary tract infection
- VAE – Ventilator associated event
- LabID Event – Laboratory identified event
  - MRSA – Methicillin resistant *Staphylococcus aureus*
  - CDI – *Clostridioides difficile* infection
- SSI – Surgical site infection
  - COLO – colon procedure code
  - HYST – abdominal hysterectomy code

# National Picture: Reporting

- Between 86-88% of hospitals that reported in 2019 also reported in 2020
  - CLABSI, CAUTI, MRSA or CDI LabID Events
- 22-25% fewer hospitals reported VAE data in 2020
- 25-36% fewer hospitals reported SSI data in 2020

# National Picture: CLABSI, CAUTI, SSI

- CLABSI: 46-47% increase in Q3 and Q4 of 2020 compared to the same period in 2019
  - Increases in CLABSI SIRs for this period were due to the increase in actual CLABSIs (numerator)
- CAUTI SIRs steadily increased over Q1-Q4 2020
- SSI SIRs remained relatively stable, with some decreases over 2020

# National Picture: All HAI

	2020 Q1	2020 Q2	2020 Q3	2020 Q4
CLABSI	↓ -11.8%	↑ 27.9%	↑ 46.4%	↑ 47.0%
CAUTI	↓ -21.3%	No Change <sup>1</sup>	↑ 12.7%	↑ 18.8%
VAE	↑ 11.3%	↑ 33.7%	↑ 29.0%	↑ 44.8%
SSI: Colon surgery	↓ -9.1%	No Change <sup>1</sup>	↓ -6.9%	↓ -8.3%
SSI: Abdominal hysterectomy	↓ -16.0%	No Change <sup>1</sup>	No Change <sup>1</sup>	↓ -13.1%
Laboratory-identified MRSA bacteremia	↓ -7.2%	↑ 12.2%	↑ 22.5%	↑ 33.8%
Laboratory-identified CDI	↓ -17.5%	↓ -10.3%	↓ -8.8%	↓ -5.5%

**Fig. 1.** Changes in the 2020 national healthcare-associated infection (HAI) standardized infection ratios (SIRs) for acute-care hospitals, compared to respective 2019 quarters. Note. CLABSI, central-line-associated bloodstream infection; CAUTI, catheter-associated urinary tract infection; VAE, ventilator-associated event; SSI, surgical site infection; MRSA, methicillin-resistant *Staphylococcus aureus*; CDI, *Clostridioides difficile* infection. Interpretation: Unless otherwise noted, the results of the significance tests comparing consecutive annual pairs of quarterly SIRs are based on a 2-tailed test  $P \leq .05$ ; however, the directional percentage change is based on the relative change in magnitude. An arrow pointing down, and a negative percentage change value, indicate that the 2020 SIR is lower than the 2019 SIR for the same quarter. An arrow pointing up, and a positive percentage change value, indicate that the 2020 SIR is higher than the 2019 SIR for the same quarter. Note. 1. “No change” signifies that the change in SIR was not statistically significant.



# Texas HAI

CLABSI & CAUTI in Critical Care Units in Texas Acute Care Hospitals  
SSIs associated with COLO and HYST Procedures  
2019-2021





# Texas HAI: Methods

- Standardized Infection Ratio (SIR): Summary measure used to track HAIs at a national, state, or local level over time

$$SIR = \frac{\text{Observed (O) HAIs}}{\text{Predicted (P) HAIs}}$$

SIR < 1: below national baseline  
SIR = 1: same as national baseline  
SIR > 1: above national baseline

- SIR data from Q1 2019 to Q1 2021
  - CLABSI & CAUTI data from critical care units in acute care hospitals
  - SSIs associated with COLO and HYST procedures

# Texas HAI: Methods

- Standardized Utilization Ratio (SUR): Summary measure used to track device use at a national, state, or local level over time





















$$SUR = \frac{\text{Observed (O) device days}}{\text{Predicted (P) device days}}$$

SUR < 1: below national baseline  
SUR = 1: same as national baseline  
SUR > 1: above national baseline

- SUR data from Q1 2019 to Q1 2021
  - CLABSI & CAUTI data from critical care units in acute care hospitals

# Texas HAI: Overview

















Changes in the 2020-2021 Texas healthcare associated infections (HAI) standardized infection ratios (SIR) for acute care hospitals compared to the prior half-year

	2019 H2	2020 H1	2020 H2	2021 H1	2021 H2
<b>CLABSI</b>	 -4%	 6%	 84%	 -20%	 6%
<b>CAUTI*</b>	 -1%	 -4%	 35%	 -9%	 5%
<b>SSI (COLO)*</b>	 2%	 -1%	 -9%	 5%	 1%
<b>SSI (HYST)*</b>	 -11%	 -5%	 15%	 -6%	 5%

\*SIRs for HAIs did not go over 1, indicating fewer infections than expected when compared to the national baseline.

# Texas HAI: Overview

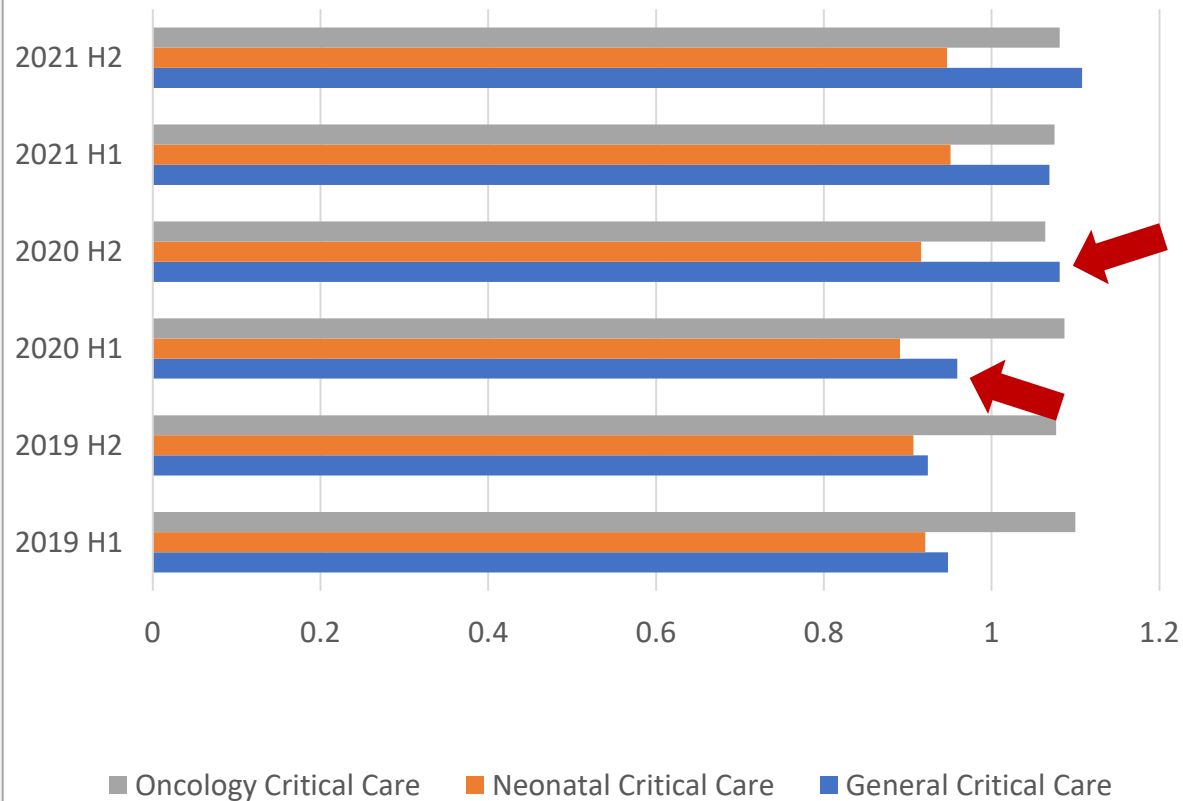
Changes in the 2020-2021 Texas healthcare associated infections (HAI) standardized infection ratios (SIR) for acute care hospitals compared to respective 2019-2020 half-years

	2020 H1 vs 2019 H2		2020 H2 vs 2020 H1		2021 H1 vs 2020 H2		2021 H2 vs 2020 H2	
<b>CLABSI</b>		<b>1%</b>		<b>92%</b>		<b>46%</b>		<b>25%</b>
<b>CAUTI*</b>		<b>-4%</b>		<b>29%</b>		<b>22%</b>		<b>5%</b>
<b>SSI (COLO)*</b>		<b>1%</b>		<b>-9%</b>		<b>-4%</b>		<b>6%</b>
<b>SSI (HYST)*</b>		<b>-16%</b>		<b>10%</b>		<b>8%</b>		<b>2%</b>

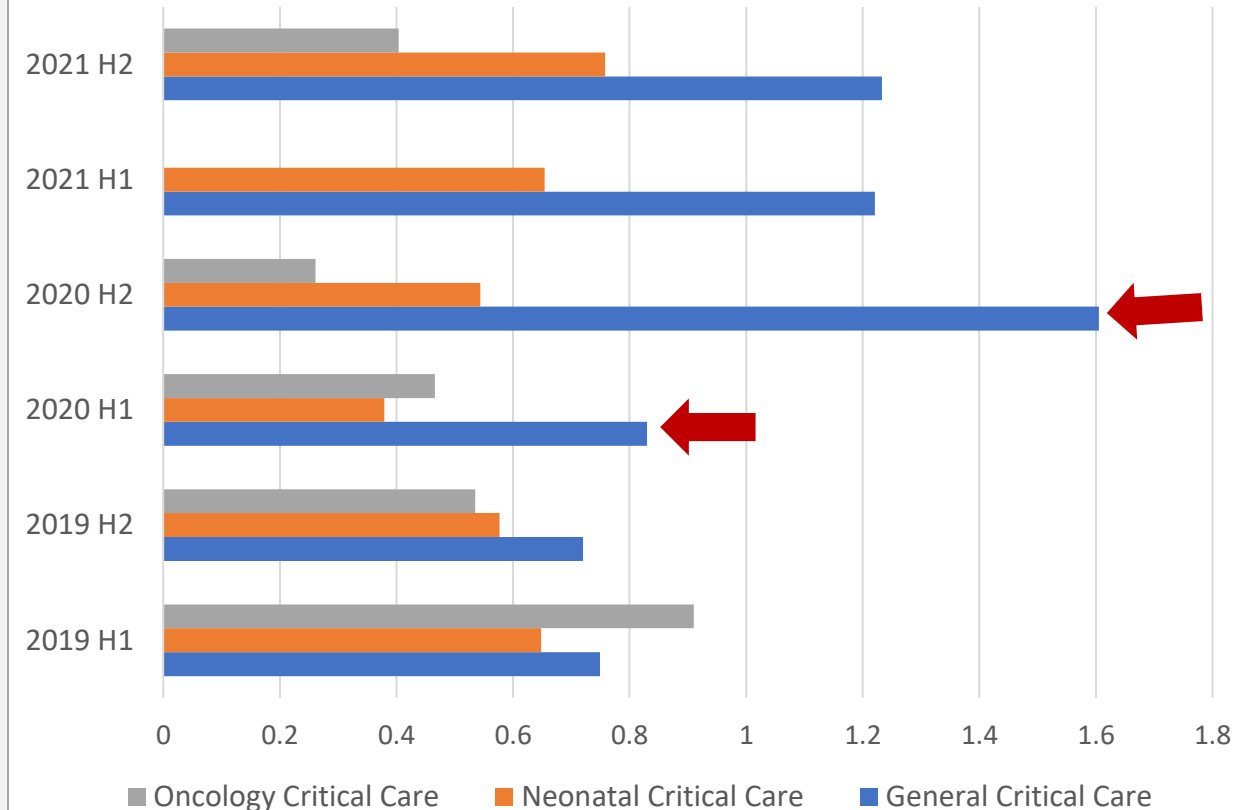
\*SIRs for HAIs did not go over 1, indicating fewer infections than expected when compared to the national baseline.

# Texas HAI: CLABSI SUR & SIR

Figure 2. Standardized Utilization Ratios (SUR) for Central Venous Catheters in Acute Care Hospitals in Texas by Half-Year, 2019-2021

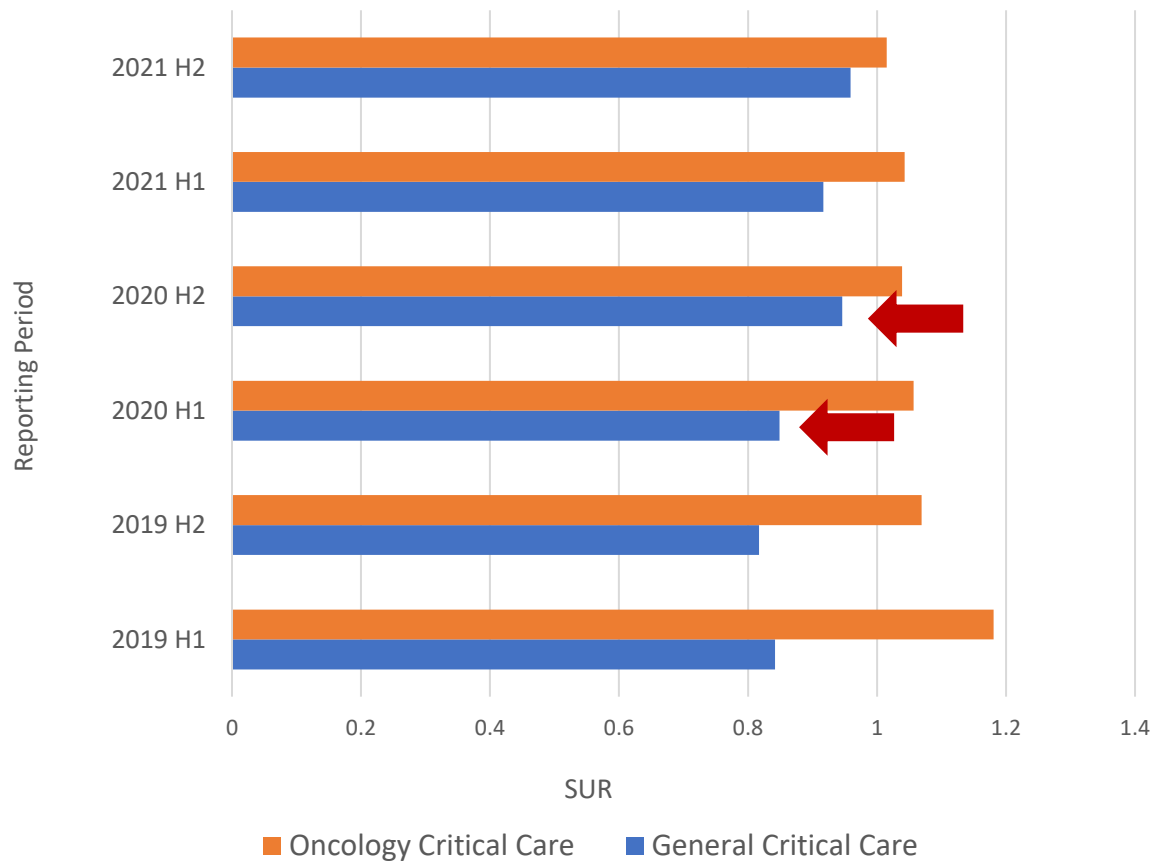


Central Line Associated Bloodstream Infection (CLABSI) Standardized Infection Ratios (SIRs) by Half-Year in Critical Care Units in Acute Care Hospitals, Texas, 2019-2021

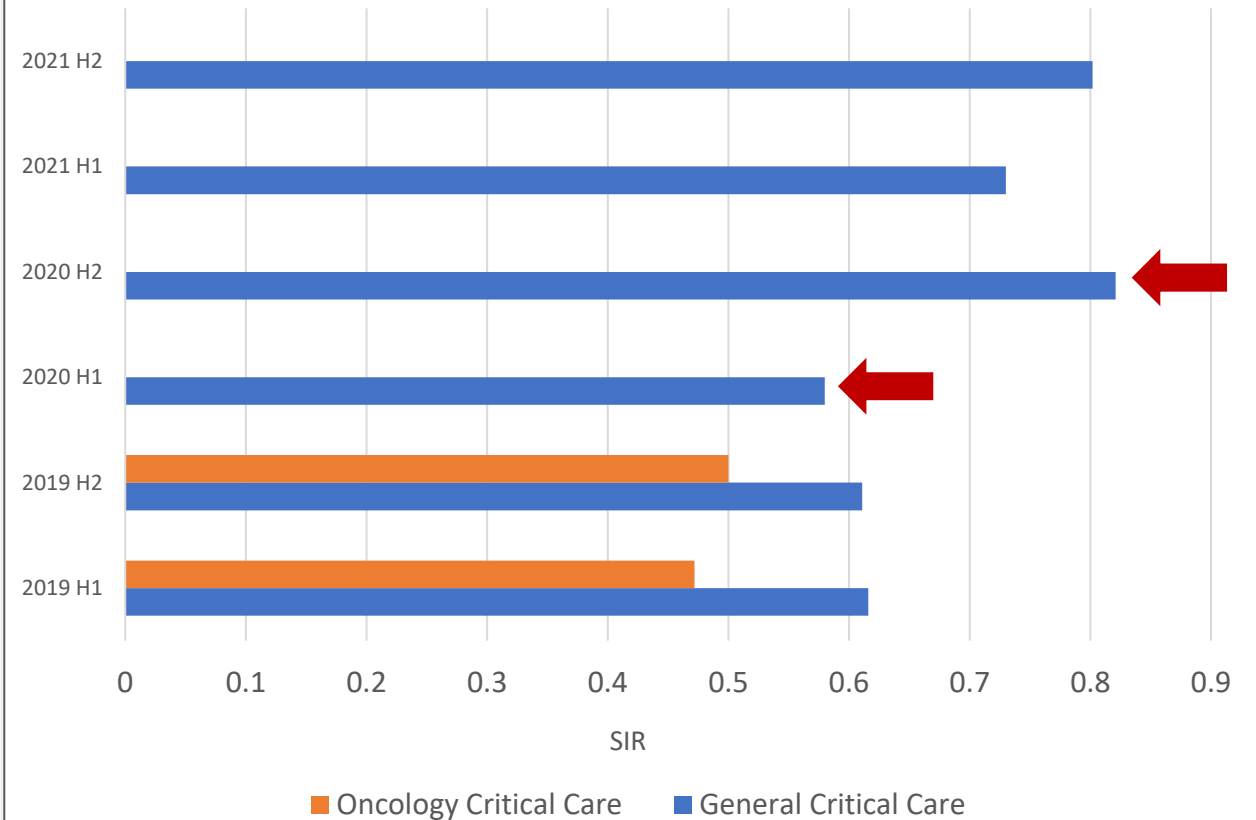


# Texas HAI: CAUTI SUR & SIR

Standardized Utilization Ratios (SURs) for Urinary Catheters in Acute Care Facilities, Texas, 2019-2021



CatheterAssociated Urinary Tract Infection (CAUTI) Standardized Infection Ratios (SIRs) by Half-Year in Critical Care Units in Acute Care Hospitals, Texas, 2019-2021



# Texas HAI: SSI

Colon Procedures (COLO)



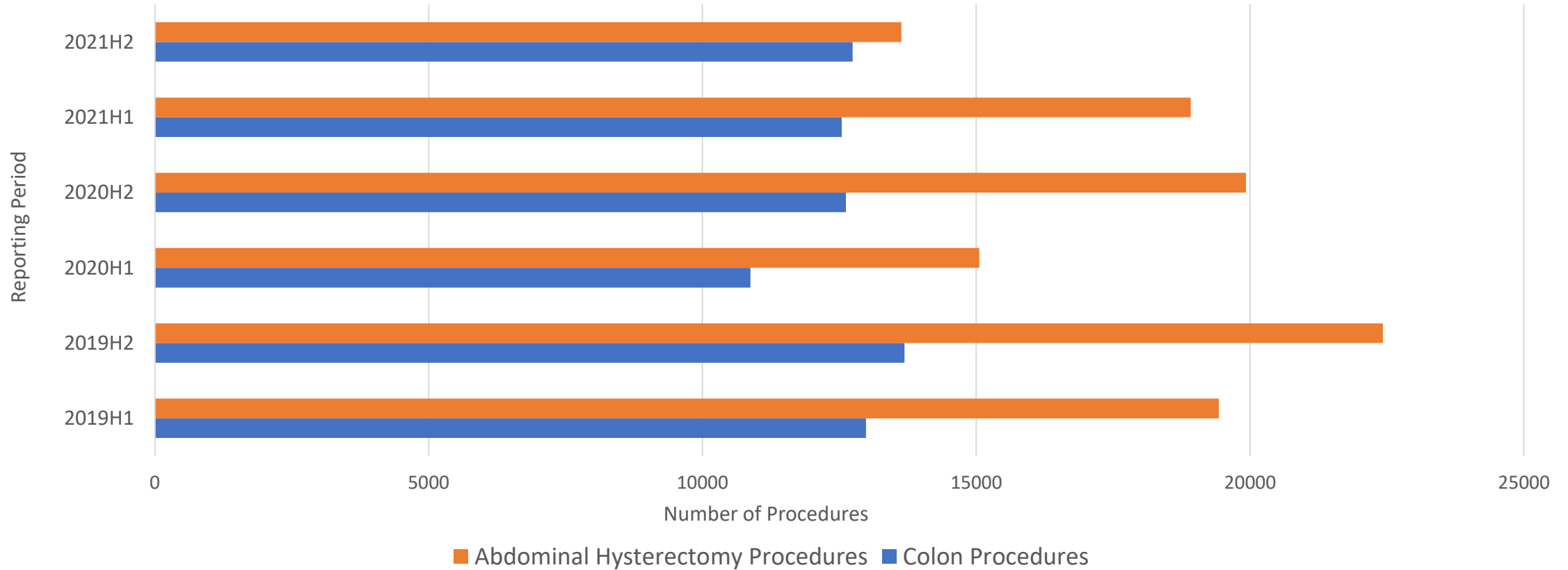
Abdominal Hysterectomy Procedures (HYST)





# Texas HAI: Reported Procedures

Figure 6. Number of Colon and Abdominal Hysterectomy Procedures by Half-Year in Acute Care Hospitals, Texas, 2019-2021



# Texas HAI: SSI

## Colon Procedures (COLO)

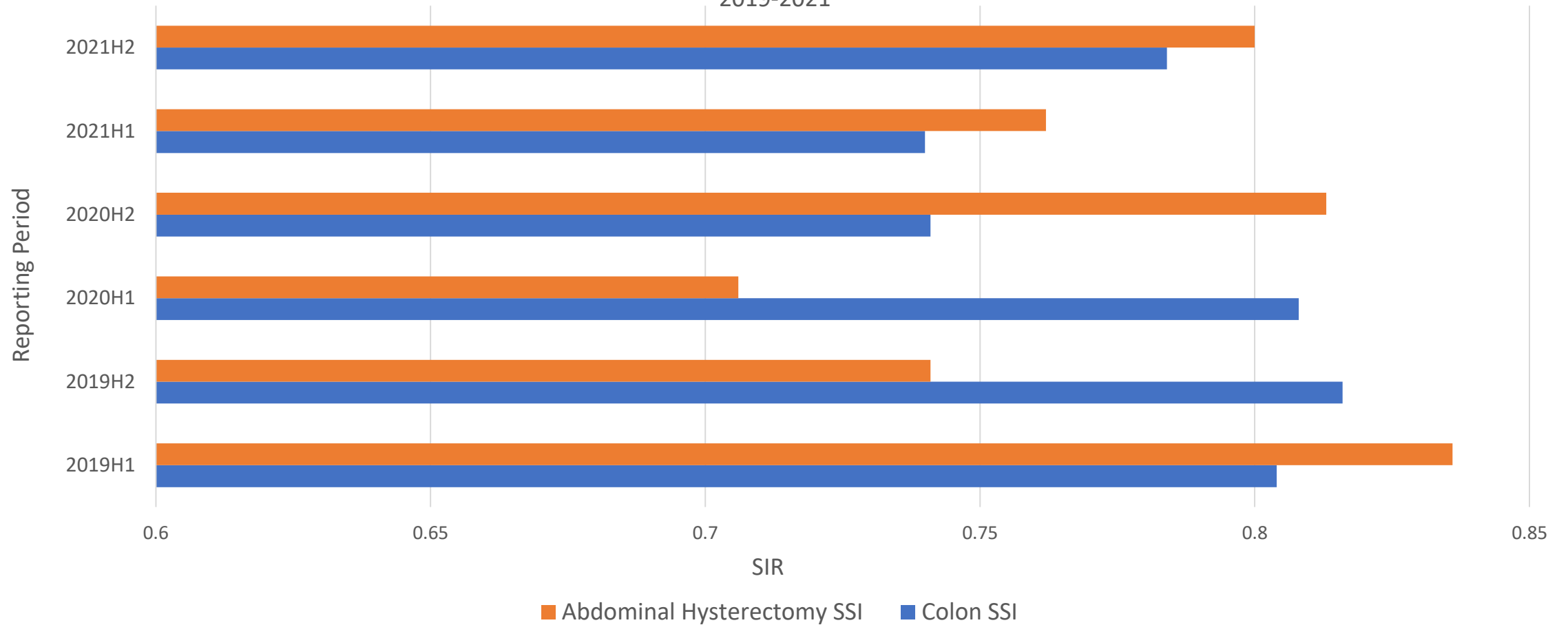
- COLO SSI SIRs relatively stable from H1 2019 to H1 2020
- Non-significant decrease in COLO SSI SIR from H1 2020 to H2 2020
- SIR remained below 1 for entire analysis period

## Abdominal Hysterectomy Procedures (HYST)

- Dramatic decreases in HYST SSI during H1 2019 through H1 2020
- Non-significant increase from H1 2020 to H2 2020
- SIR remained below 1 for entire analysis period

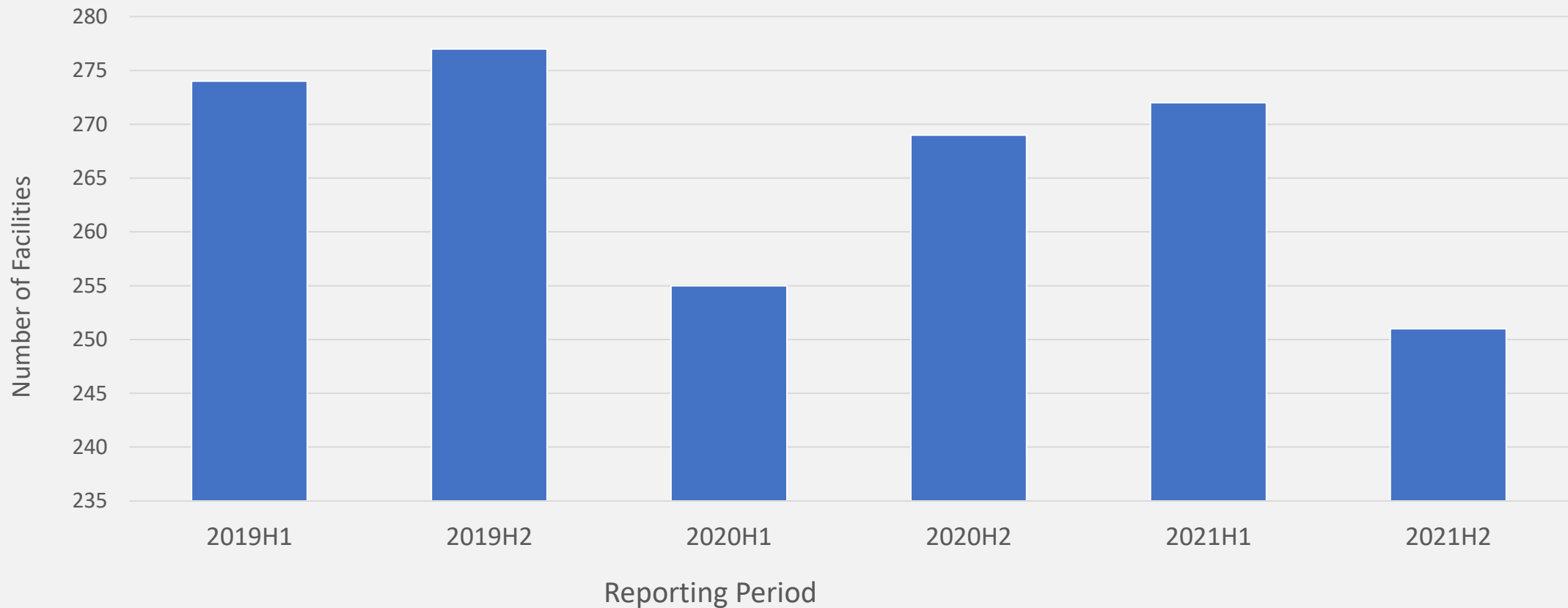
# Texas HAI: SSI

Figure 5. Surgical Site Infection (SSI) Standardized Infection Ratios (SIRs) by Half-Year in Acute Care Hospitals, Texas, 2019-2021



# Texas HAI: Reporting Hospitals (SSI)

Figure 7. General Hospitals Reporting Colon and Abdominal Hysterectomy Procedures, Texas, 2019-2021



# Texas PAE

Preventable Adverse Events

Reported by general hospitals and ambulatory surgery centers

2019-2021



TEXAS  
Health and Human  
Services

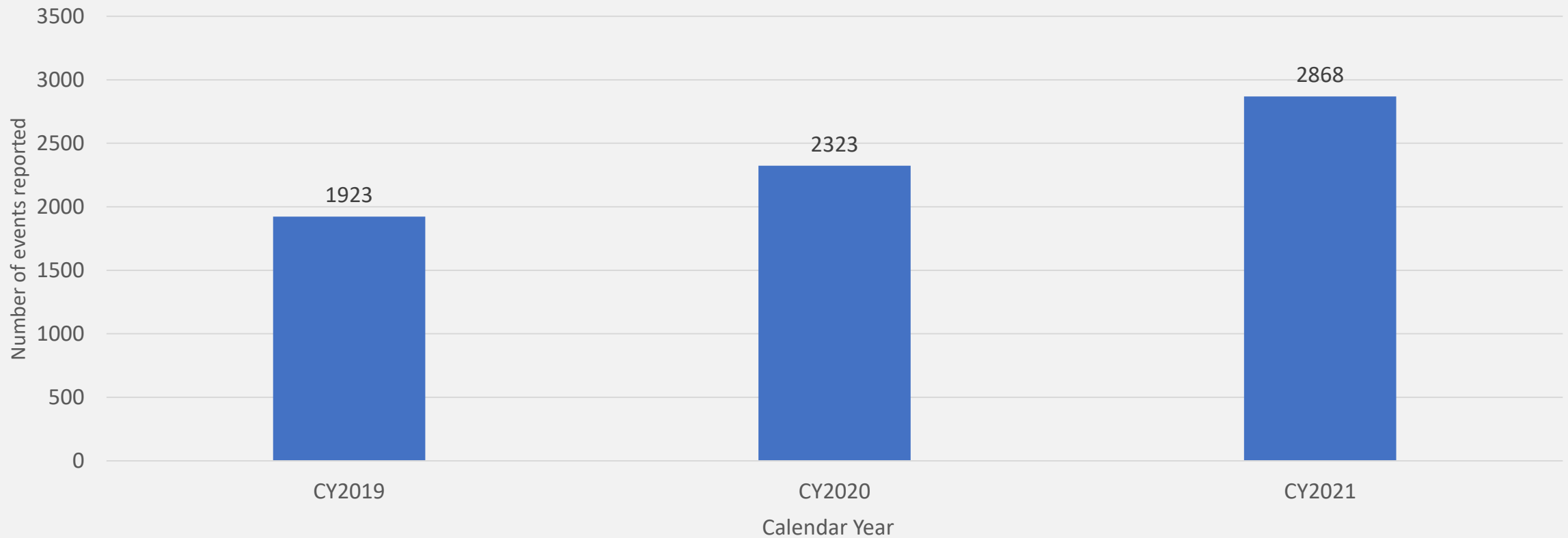
Texas Department of State  
Health Services

# Texas PAE: Methods

- Preventable adverse event data were retrieved from TxHSN in 2021 and 2022 and included events reported as occurring Jan 2019 – December 2021.
- The number of events reported were compared by year and month to determine trends and percent of increase or decrease
- A correlation coefficient was used to measure the strength of a linear association with number of COVID-19 cases and the number of events reported

# Texas PAE:

Preventable Adverse Events: Total Events Reported for 2019 - 2021

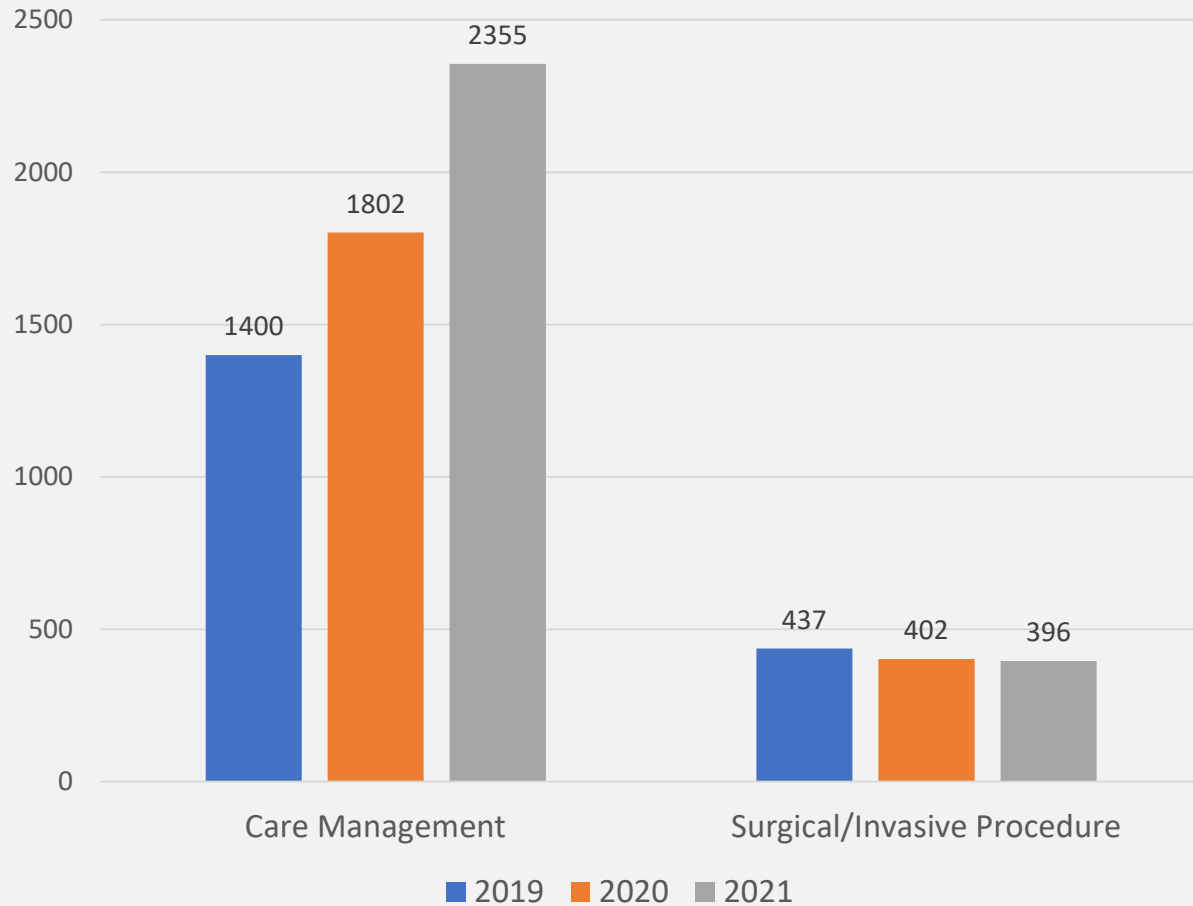


Compared to 2019, the number of events reported increased by 20.8% in 2020 and 49.1% in 2021

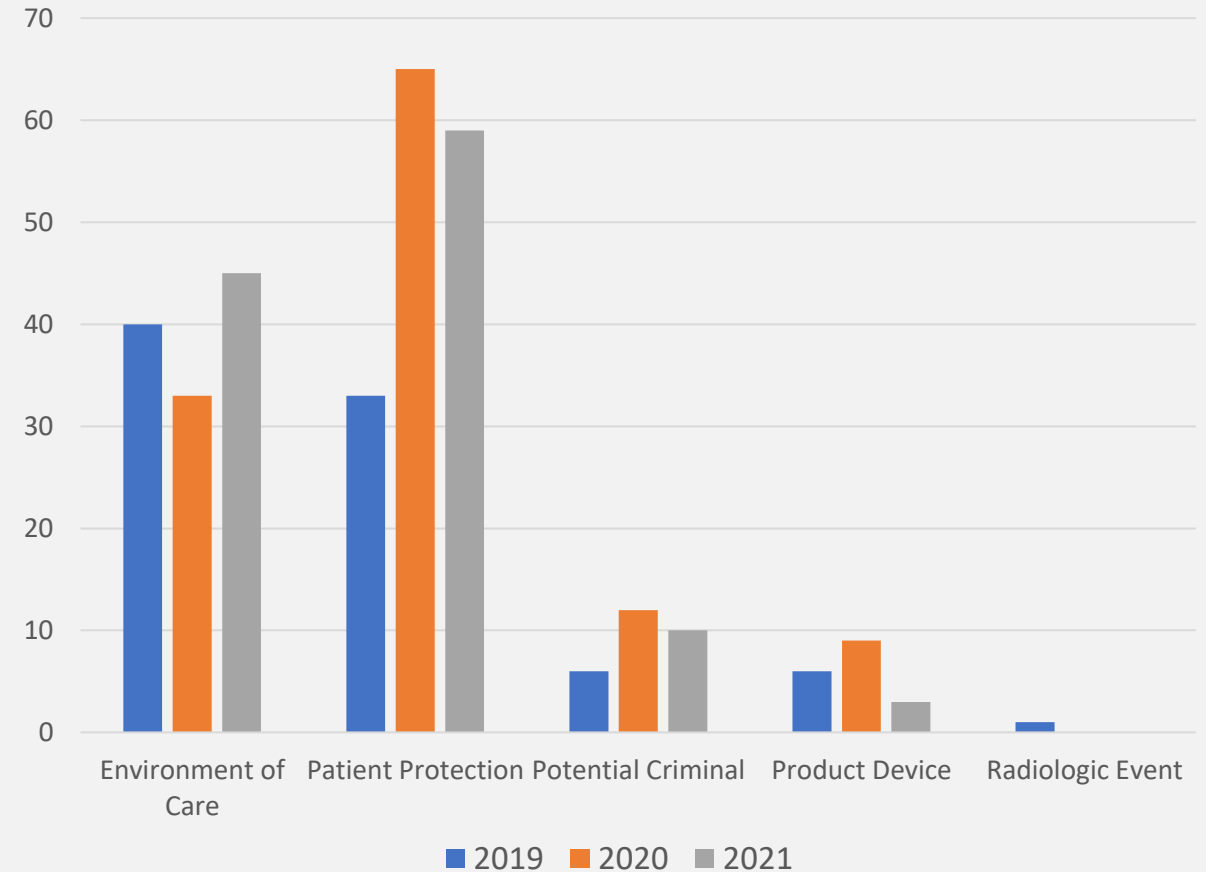


# Texas PAE

### Top Categories with Most Reported Events

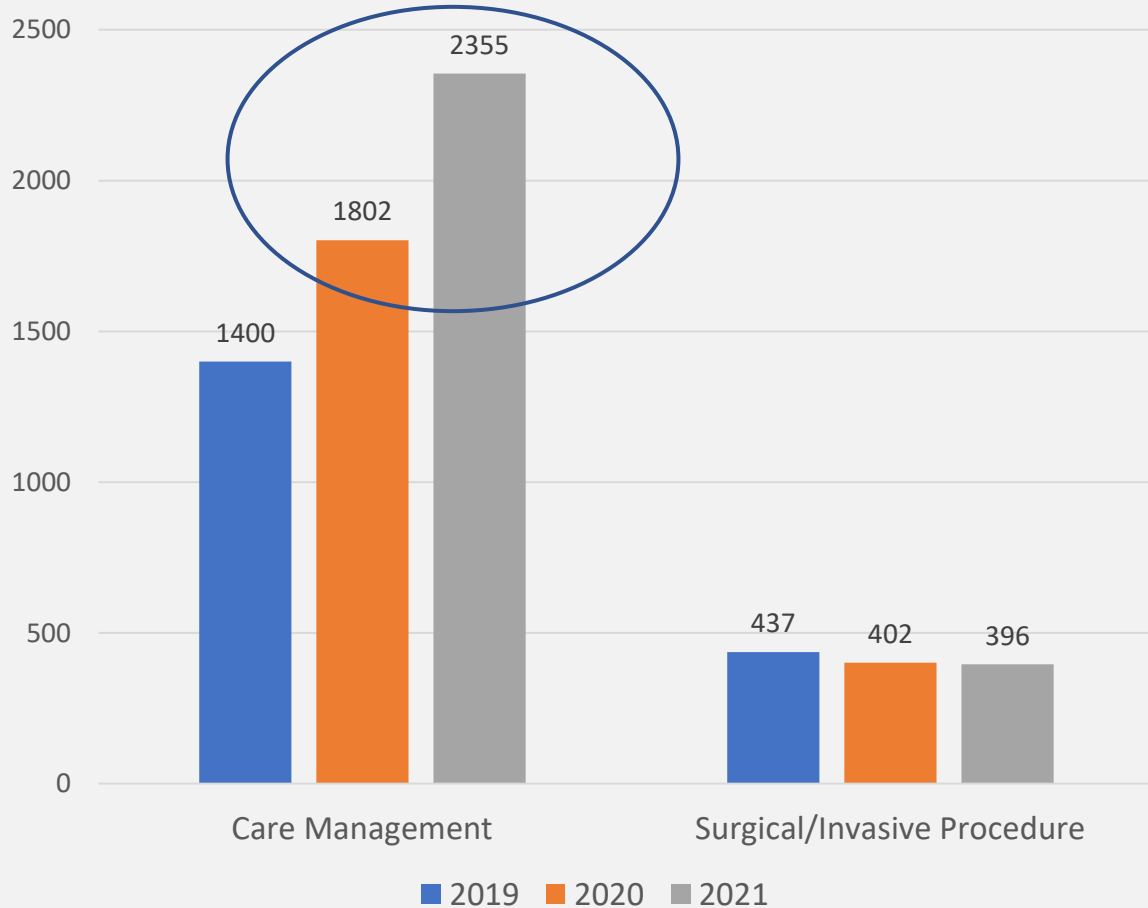


### Five Categories with Less Reported Events

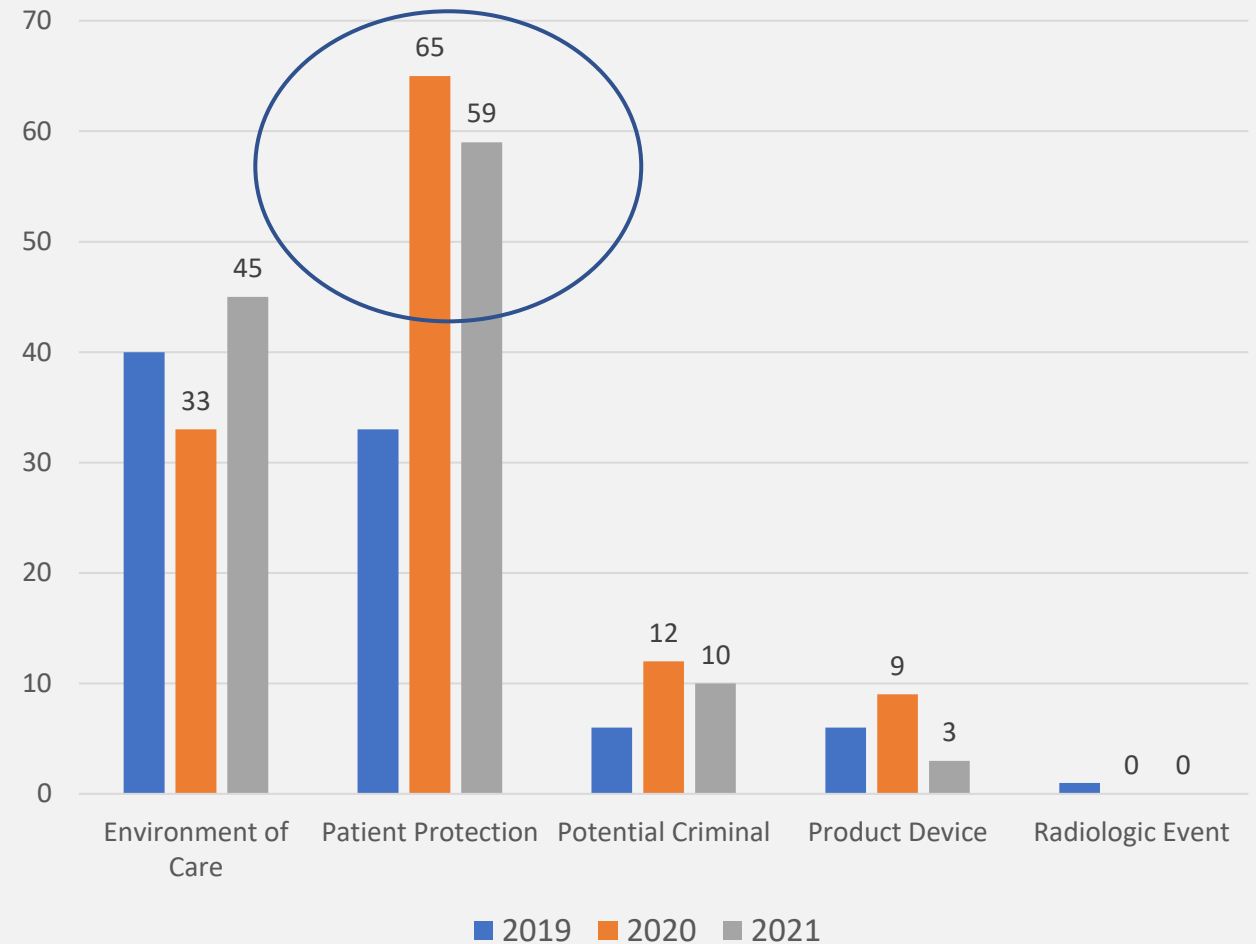


# Texas PAE

### Top Categories with Most Reported Events

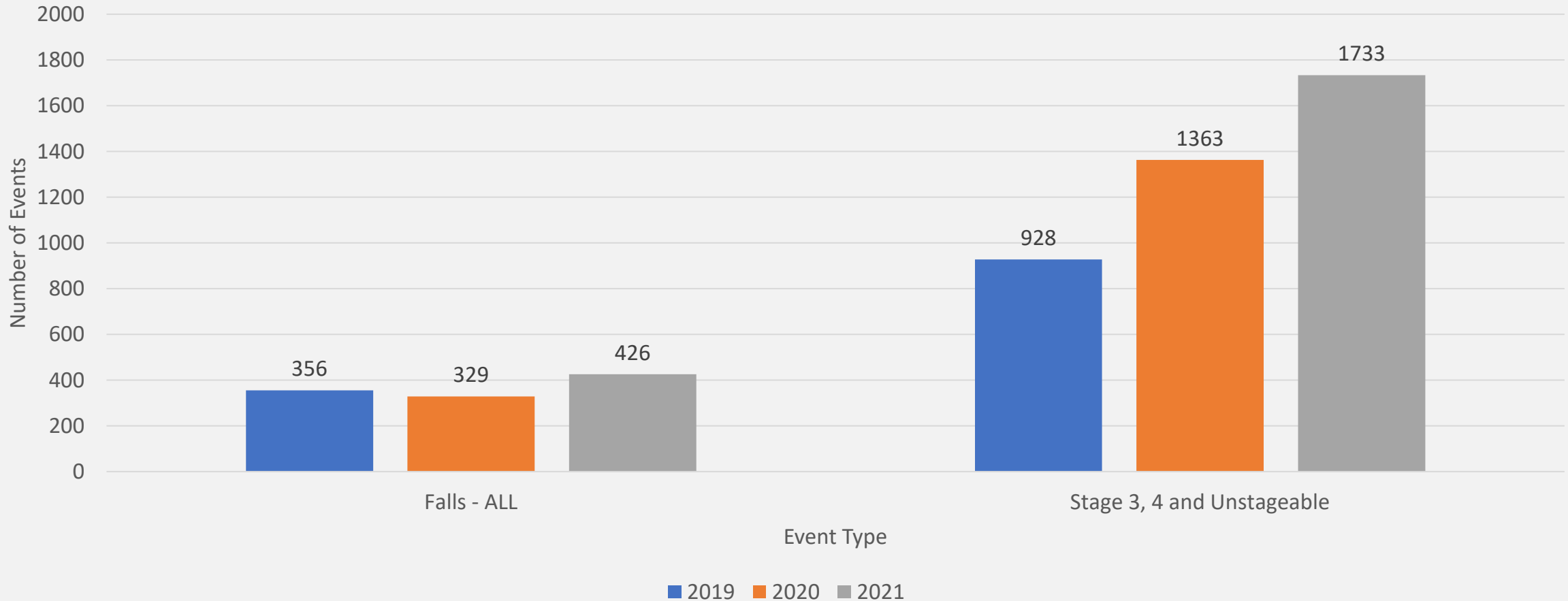


### Five Categories with Less Reported Events



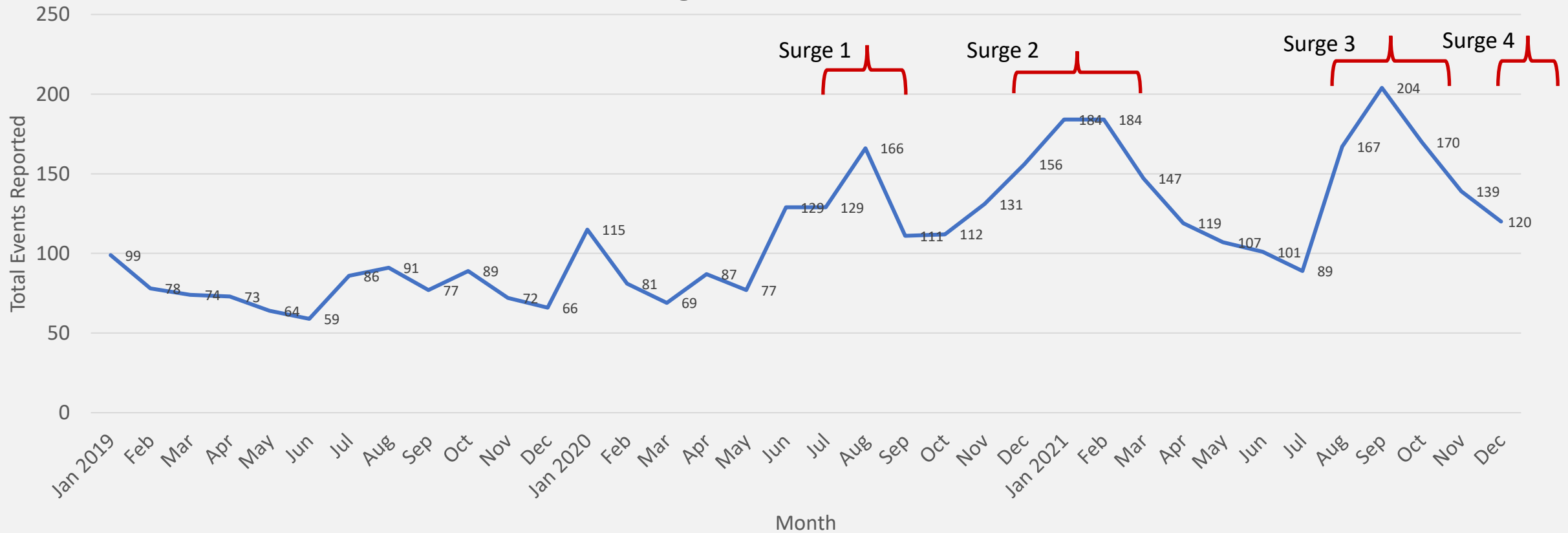
# Texas PAE

## Top Reported PAEs in Care Management Category



# Texas PAE

Stage 3, Stage 4, Unstageable Hospital-acquired Pressure Injuries  
Correlation to Surges in Positive COVID-19 Cases

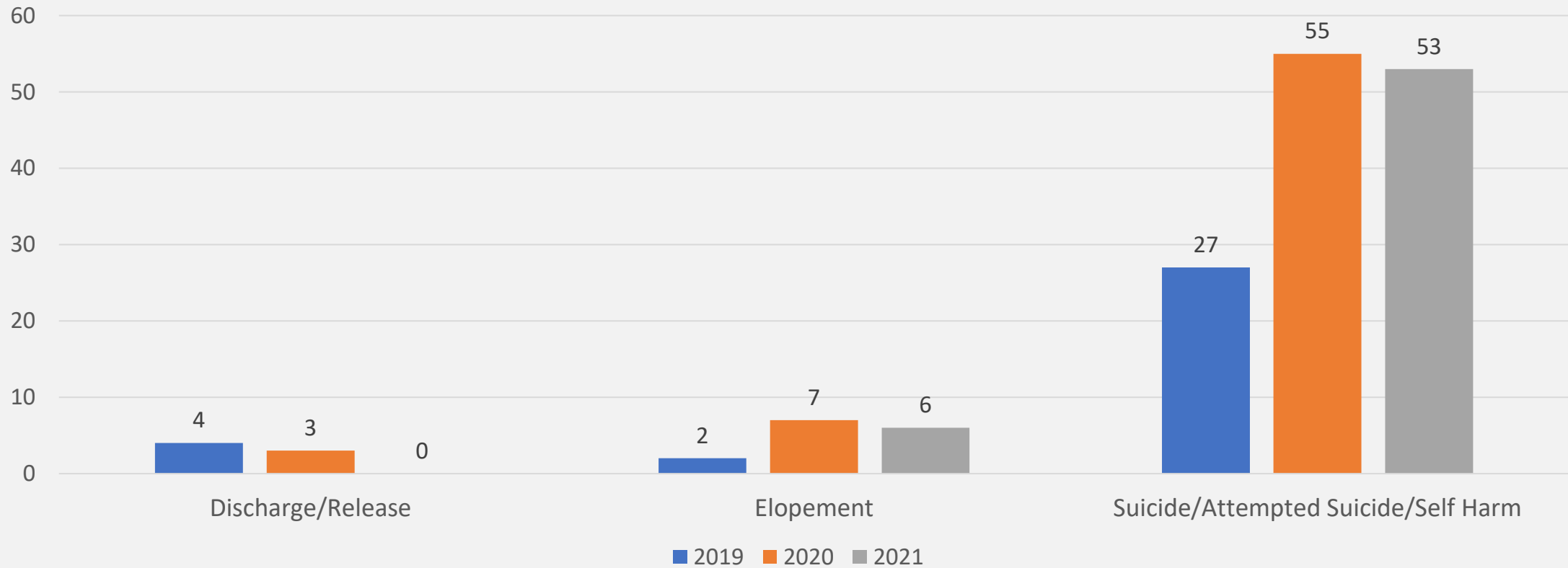


2020: R value is 0.8251 (strong positive correlation)

2021: R value is 0.7236 (moderate positive correlation)

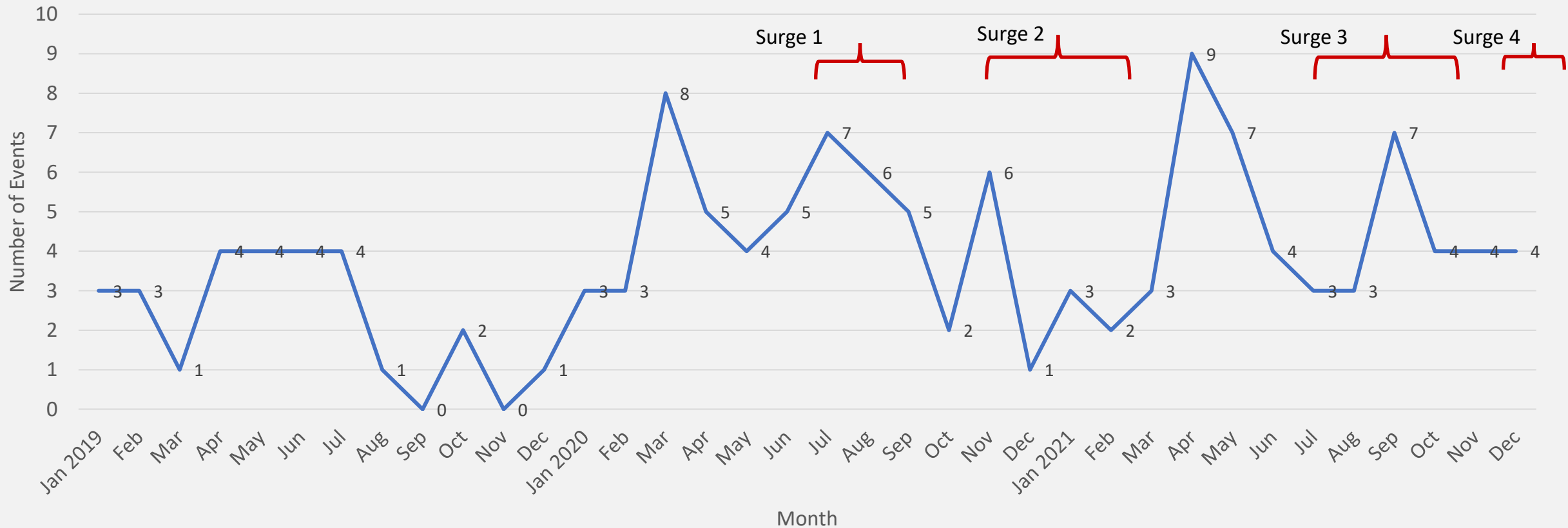
# Texas PAE

Category: Patient Protection Events



# Texas PAE

Suicide/Attempted Suicide/Self Harm  
Correlation to Surges in Positive COVID-19 Cases

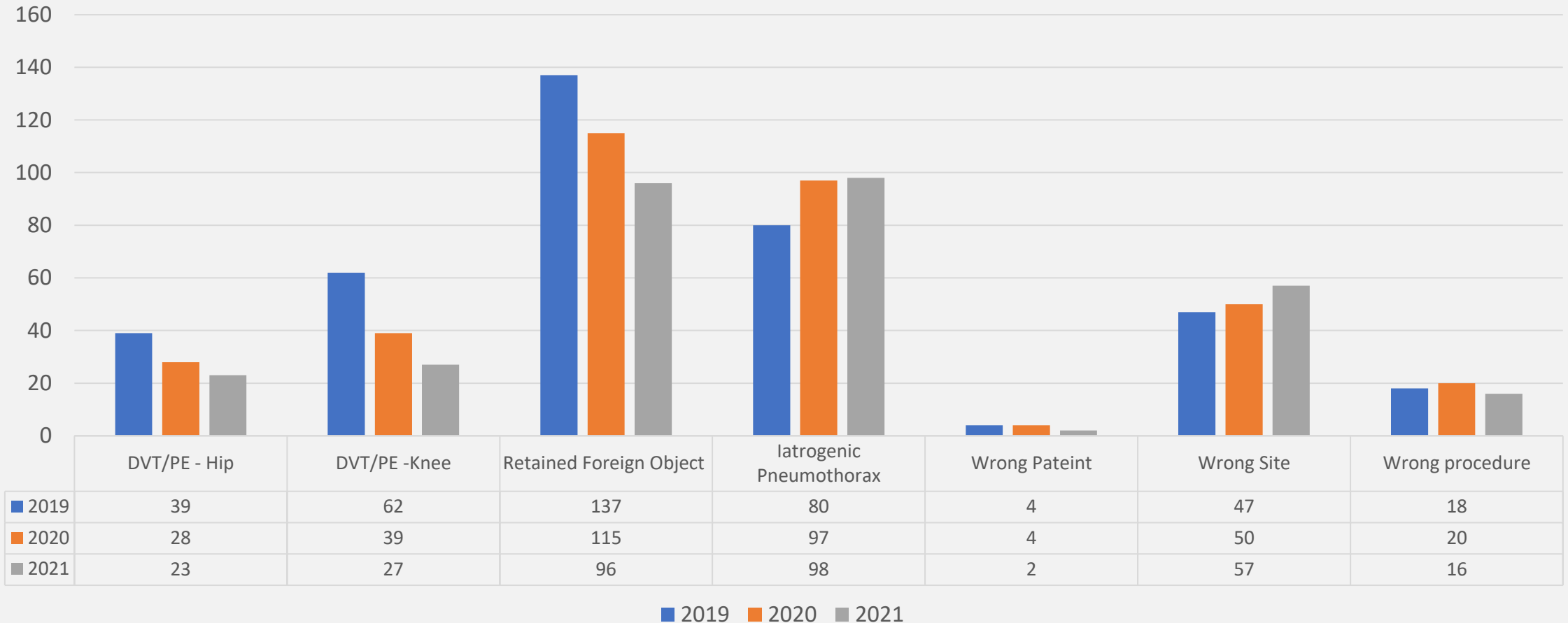


2020: R value is -0.243 (weak negative correlation)

2021: R value is -0.245 (weak negative correlation)

# Texas PAE

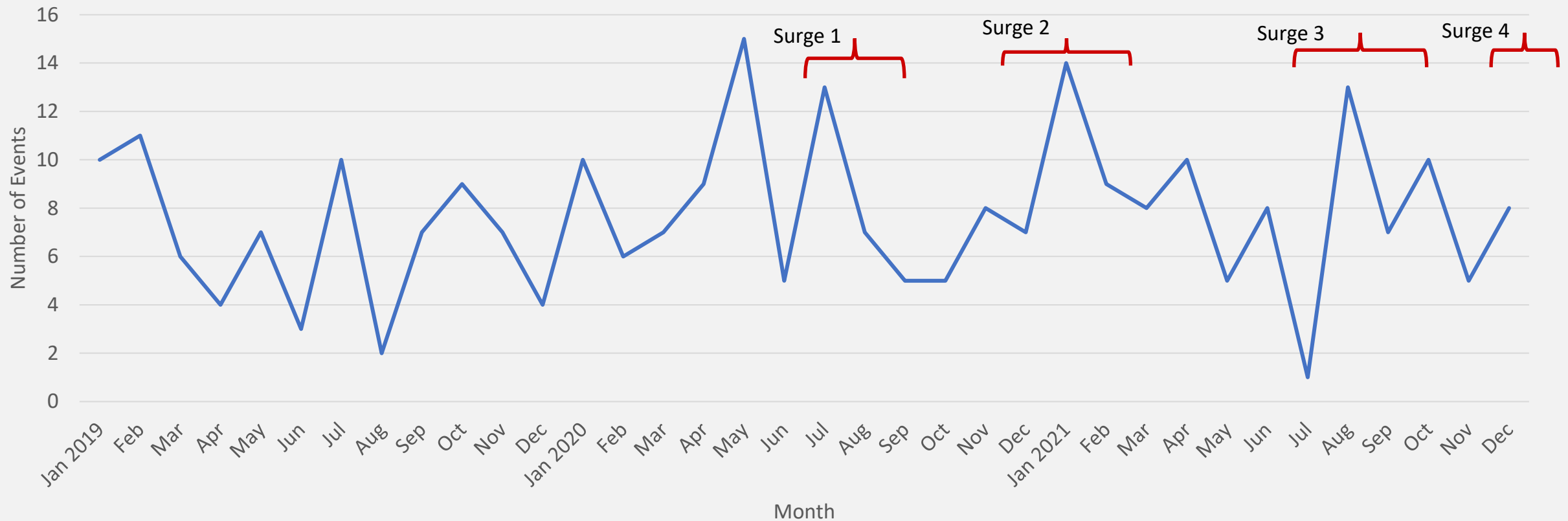
Category: Surgical/Invasive Procedure Events





# Texas PAE

Iatrogenic Pneumothorax with Venous Catheterization  
Correlation with Surges in Positive COVID-19 Cases

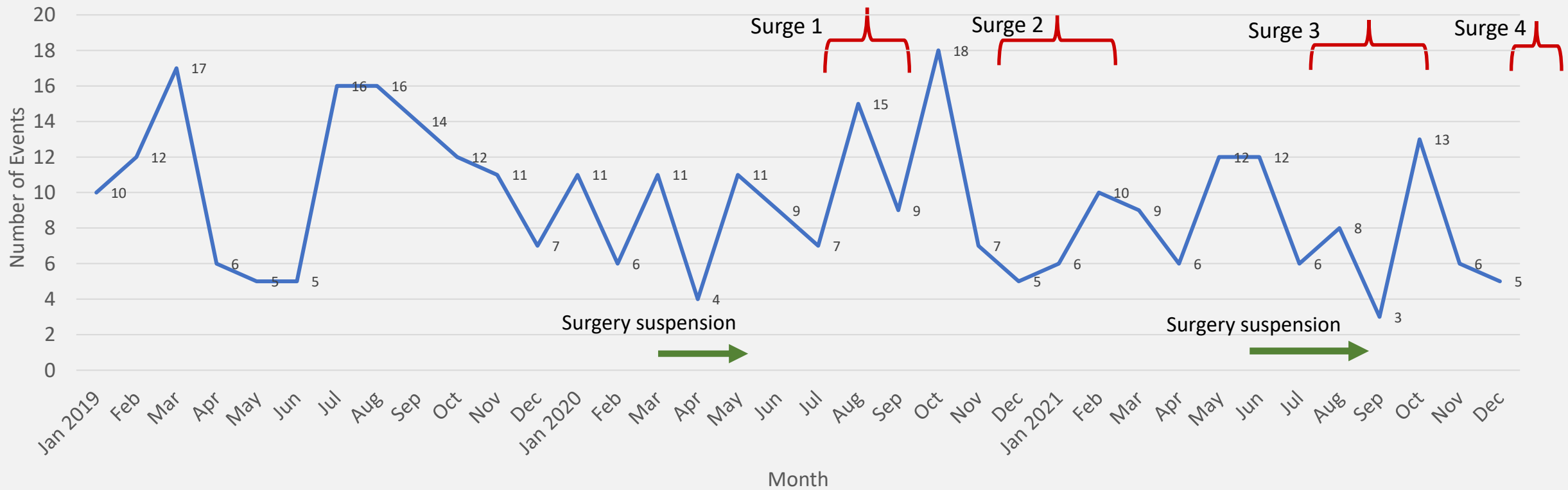


2020: R value is -0.1748 (weak negative correlation)

2021: R value is 0.6203 (moderate positive correlation)

# Texas PAE

Foreign Object Retained After Surgery  
Correlation with Surges in Positive COVID-19 Cases



2020: R value is -0.1893 (weak negative correlation)

2021: R value is -0.4651 (weak negative correlation)

# Discussion

- Limitations with data
- No national database for comparison
- Voluntary reporting for 12 months



# References

Dalgleish, L., Campbell, J., Finlayson, K., & Coyer, F. (2020). Acute skin failure in the critically ill adult population: A systematic review. *Advances in Skin & Wound Care*, 33(2), p 76-83  
doi:10.1097/01.ASW.0000617844.69248.92

Mental health effects of COVID-19 (2020). *American Journal of Nursing*, 120(11), 15. doi:  
10.1097/01.NAJ.0000721880.79285.04

Panchal, N., Kamal, R., Cox, C., & Garfield, R. (2021). The implications of COVID-19 on mental health and substance abuse. *The Kaiser Family Foundation*. Retrieved from  
<https://www.kff.org/coronavirus-covid-19/issue-brief/the-implications-of-covid-19-for-mental-health-and-substance-use/>

Team, V., Team, L., Jones, A., Teede, H., & Weller, C. D. (2021). Pressure injury prevention in COVID-19 patients with acute respiratory distress syndrome. *Frontiers in Medicine*, 7(558696). doi:10.3389/fmed.2020.558696

Texas Department of State Health Services. (2021). *Texas Executive Orders and public health disaster declarations*. Retrieved from  
<https://www.dshs.texas.gov/coronavirus/execorders.aspx>



# Thank you!

DSHS Healthcare Safety Unit

[HAITexas@dshs.texas.gov](mailto:HAITexas@dshs.texas.gov) or [PAETexas@dshs.texas.gov](mailto:PAETexas@dshs.texas.gov)