



# Outcomes in Spinal Cord Injury Patients with Stage 3 and 4 Pressure Injuries at a Veterans Affairs Hospital

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## Background

Pressure injuries (PI) and the complication of PI-related osteomyelitis (PIrOM), are a significant source of morbidity and mortality in spinal cord injury (SCI) patients. This study describes the epidemiology, healthcare utilization, and outcomes of SCI patients with PI at a large Veterans Affairs (VA) hospital.

## Methods

We retrospectively reviewed all SCI patients with stage 3 or 4 PI in the pelvic area admitted to the VA North Texas SCI unit from 1/1/2013 to 12/31/2018. We abstracted demographic, diagnostic testing, treatment, and outcomes data from PI-related admissions for wound care from the electronic medical record. A composite definition categorizing the diagnosis of PIrOM was created (**table 1**). Two-sample t test and Fisher's exact test were used to compare variables between flap patients (FP, those who received at least one flap surgery) and non-flap patients (NFP, those without any flap surgery).

**Table 1. Composite Definition of PIrOM**

Category	Criteria
Definite	<ul style="list-style-type: none"> <li>Bone sample with positive findings on histology and positive cultures*</li> </ul> OR <ul style="list-style-type: none"> <li>Operative findings with "soft, discolored, nonbleeding" bone</li> </ul>
Probable	<ul style="list-style-type: none"> <li>Positive imaging (MRI or SPECT-CT) plus bone sample with positive histology</li> </ul> OR <ul style="list-style-type: none"> <li>Positive imaging (MRI or SPECT-CT) plus bone sample with positive culture</li> </ul>
Possible	One of the following: <ul style="list-style-type: none"> <li>Positive imaging (MRI or SPECT-CT)</li> <li>Bone sample with positive cultures</li> <li>Bone sample with positive histology</li> <li>Visible bone on wound care team exam</li> <li>Consulting infectious diseases team is treating as OM</li> </ul>
None	Does not meet any of the above criteria

\*Positive histology: the presence of inflammatory cells (polymorphonuclear cells in acute inflammation or mononuclear cells in chronic inflammation) in bone marrow tissue

Positive microbiology/cultures: one positive bone culture with non-commensal organism, or at least two bone samples with the same commensal organism.

## Results

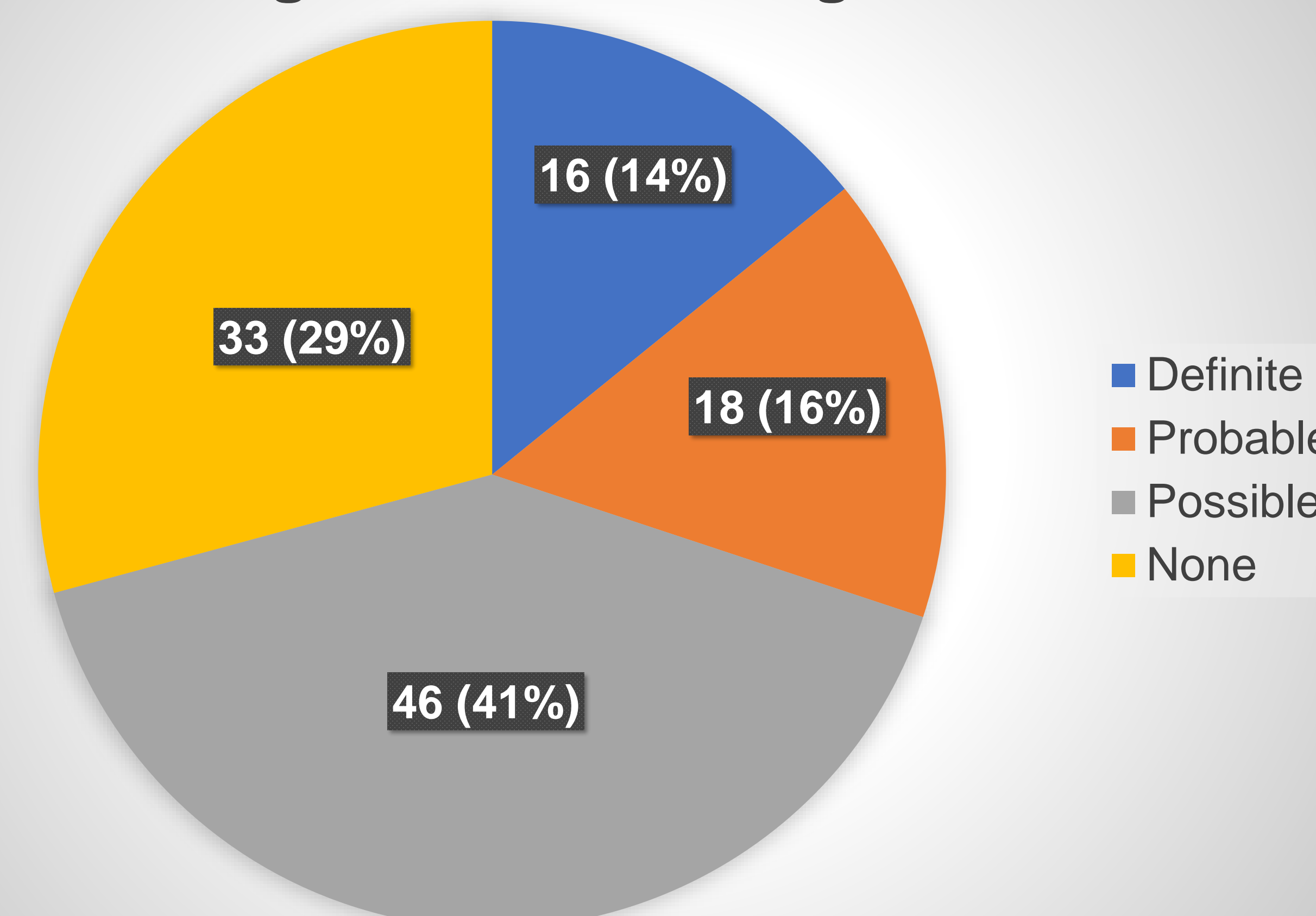
A total of 78 patients, accounting for 113 hospitalizations and 138 unique PI, were identified (**table 2**). Patients had a mean age of 59 years at index admission and male predominance (97%). Of the 138 PI, 49% were ischial and 88% were stage 4. There were 27 FP and 51 NFP. The mean Charlson Comorbidity Index was 4.9 overall and significantly higher in the NFP vs. FP (5.2 vs. 4.3, p=0.05).

**Table 2. Demographics and Comorbidities**

	Non-Flap Patients N = 51	Flap Patients N= 27	Total N= 78 (%)
Age (mean) years	59.5	59.1	59.4 (SD ± 13.54)
Male Gender	49	27	76 (97.4%)
Race			
African American	15	6	21 (26.9%)
Asian	1	0	1 (1.3%)
Caucasian	29	19	48 (61.5%)
Native Hawaiian	0	1	1 (1.3%)
Not reported	6	1	7 (9.0%)
SCI level of injury			
C0-8	24	9	33 (42.3%)
T1-12	22	16	38 (48.7%)
L1-5	5	2	7 (9.0%)
Charlson Comorbidity Index (mean)	5.2	4.3	4.9

Diagnostics included at least one imaging study in 76% (n=86) of hospitalizations and a bone biopsy in 45% (n=51) (**table 3**). A diagnosis of definite, probable, or possible PIrOM was made in 14%, 16%, and 41% of hospitalizations, respectively (**figure 1**).

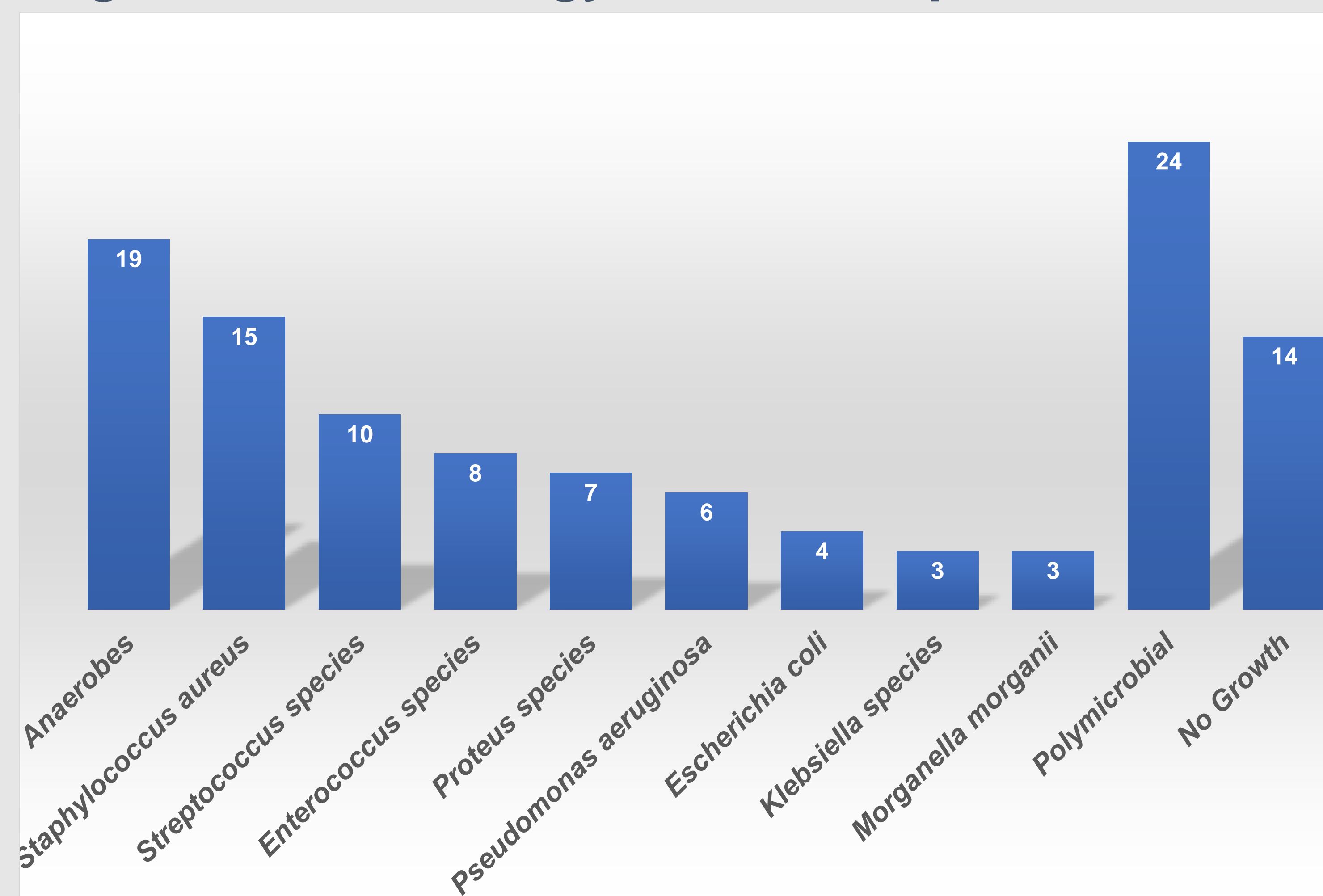
**Figure 1. PIrOM Diagnosis**



**Table 3. Work up of PIrOM**

	Non-flap hospitalizations N= 81	Flap hospitalizations N= 32	Total Hospitalizations N = 113 (%)
ID consult	65	26	91 (80.5%)
Imaging performed#	61	25	86 (76.1%)
MRI	37	14	51
SPECT-CT	16	7	23
CT	27	12	39
Plain films	7	2	9
Bone biopsy	26	25	51 (45.1%)
Deep tissue	25	27	52 (46%)

**Figure 2. Microbiology of Bone Biopsies**



Healthcare utilization was high, with a mean length of antibiotic therapy of 54 days (50.2 days in NFP and 64 days in FP) and mean length of stay of 122 days (113 days in NFP and 144 in FP) per hospitalization. The rates of healed PI overall at discharge were 68% in the FP, and 12% in the NFP group. The 1-year mortality for NFP was 22%, while all FP were alive at one year.

**Table 4. Healthcare Utilization and Rates of healing**

	Non-flap Hospitalizations N=81	Flap Hospitalizations N=32	Total hospitalizations
Length of Stay Mean # of days	113	144	122 (SD±95.2)
Length of Therapy Mean # of days	50.2	64	54.1 (SD± 42.1)
Healed PI at discharge (out of 138 PI)	12/101 (11.9%)	25/37 (67.6%)	
Mortality at 1 year (out of 78 patients)	11/51 (21.6%)	0/27 (0%)	

## Conclusions

Despite significantly high healthcare utilization, VA SCI patients with stage 3 and 4 PI had very poor wound outcomes and high mortality, particularly in NFP. Evidence-based, high value care paradigms are needed for this population and disease state.

## References

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