

Infection Incidence in Penile Implant Revisions: A Forum-Based Analysis

principles (FrankTalk.org community member)

November 2025

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1. Abstract

Background: Infection represents a serious complication following penile prosthesis implantation, often necessitating device explantation and replacement. Understanding infection patterns in revision cases is critical for patient counseling and surgical planning.

Methods: This study analyzed 1,255 penile implant procedures from 1,056 users documented on FrankTalk.org using dual large language model (LLM) verification methodology. Users with multiple procedures (n=146) were identified. Forum signatures and post histories underwent LLM-based extraction with independent verification for explicit infection mentions.

Results: Among 146 revision users, 15 confirmed infections were identified (10.3% infection rate among revision cases; 1.20% overall rate). Device distribution: Titan 6 cases (40.0%), CX 7 cases (46.7%), LGX 1 case (6.7%), Others 1 case (6.7%). Time to infection: 10/14 (71%) occurred within 3 months, suggesting early surgical-site contamination. Median time to revision (TTR) was 2 months (range: 0-27 months). Progressive infection risk analysis revealed escalating rates with successive procedures: ≥ 2 procedures 10.3%, ≥ 3 procedures 35.5%, ≥ 4 procedures 53.8%, closely aligning with published clinical data.

Conclusions: Revision surgery carries a 10.3% infection risk, aligning with published estimates of 10-18% for revision procedures. Most infections (71%) manifest within 3 months, emphasizing the importance of early post-operative monitoring. Progressive risk analysis confirms escalating infection rates with multiple revisions, though limited sample size for ≥ 4 procedures (n=13) precludes robust statistical comparison at higher revision counts. No device-specific infection susceptibility was observed.

2. Introduction

This study represents a focused analysis of infection incidence within the penile prosthesis revision cohort previously described in the comprehensive survival analysis ^[1]. While the primary study examined all-cause revision patterns across 1,255 implant procedures, the present analysis specifically investigates infection events—a critical complication with distinct clinical implications and prevention strategies.

Rationale

Infection following penile prosthesis placement necessitates device removal and carries substantial morbidity, including potential penile length loss, psychological impact, and financial burden. Published infection rates vary widely: 1-3% for primary implants with modern antibiotic-coated devices, but 10-18% for revision surgery ^[2,3,4]. Moreover, recent evidence suggests progressive escalation of infection risk with each successive device placement ^[5].

Understanding real-world infection patterns in revision cohorts is essential for:

1. Accurate patient counseling regarding reoperation risks
2. Identification of high-risk populations requiring enhanced prophylaxis
3. Validation of published clinical estimates using independent data sources

Study Objectives

This study sought to determine:

1. Infection incidence among penile prosthesis revision users in a large forum-based cohort
2. Temporal patterns of infection manifestation (time to infection)
3. Device-specific infection susceptibility
4. Progressive infection risk stratified by number of cumulative procedures
5. Comparison of forum-derived infection rates to published clinical literature

3. Methods

Data Source and Collection

This analysis utilized the dataset previously described in the comprehensive survival analysis study ^[1]. Briefly, This study analyzed 1,255 penile implant procedures from 1,056 unique users documented on FrankTalk.org (www.franktalk.org), a peer-support community for penile implant recipients. All analyzed data were publicly posted by users to a public forum.

Large Language Model (LLM) Validation

Following the dual-LLM methodology established in the primary study ^[1], The analysis employed:

Primary extraction (OpenAI GPT-5):

- Forum signatures and posts processed for infection-related mentions
- Custom prompt engineering specifying exact extraction rules for infection events
- Focus on explicit mentions: "infection," "infected," "salvage," "explant," with temporal association to a specific procedure

Dual verification (Anthropic Claude Sonnet 4.5):

- Independent re-analysis of all extracted records by a second LLM from a different provider
- Cross-validation to identify discrepancies between the two LLM outputs
- Manual adjudication of flagged cases for final determination

Disclaimer regarding LLM-related errors: Even with two independent LLM passes and human adjudication, occasional extraction errors may persist in individual records. However, as demonstrated in the primary survival analysis ^[1], population-level estimates remain reliable when dual-LLM outputs converge, and validation against published literature confirms accuracy.

Case Identification and Inclusion Criteria

Revision cohort definition: Users with ≥ 2 documented penile prosthesis procedures (n=146 users contributing 199 revision surgeries).

Infection verification protocol:

1. User forum signatures (n=1,056 signatures analyzed via dual-LLM pipeline)
2. Complete post histories for suspicious cases (n=27 users scraped, >2,800 individual posts reviewed)
3. Inclusion criteria: Explicit mention of infection-related terms ("infection," "infected," "salvage," "explant") with clear temporal association to a specific documented procedure

Exclusion criteria:

- Ambiguous mentions without temporal specificity
- Planned procedures not yet performed
- Mentions of infection in other users (discussion vs. personal experience)

Data Extraction

- Procedure dates, device types, and time to revision (TTR) extracted from standardized CSV database
- Infection source (signature vs. post history) documented
- Clinical details (hospitalization, antibiotic regimens, identified pathogens, salvage vs. explant) recorded when available

Statistical Analysis

Infection rate calculation: Proportion of users with ≥ 1 documented infection among revision cohort (≥ 2 procedures) and overall cohort (≥ 1 procedure).

Confidence intervals: Calculated using Wilson score method for binomial proportions.

Progressive risk analysis: Infection rates stratified by cumulative number of procedures. Two methods employed:

1. **Cumulative analysis ($\geq N$ procedures):** Infection rate among all users with $\geq N$ total procedures
2. **Exact count analysis ($=N$ procedures):** Infection rate among users with exactly N procedures

Interpretation note: Cumulative analysis ($\geq N$) answers "What is the infection risk for a patient who has already undergone N or more procedures?" while exact count analysis ($=N$) answers "What is the infection risk specifically for patients at their N th procedure?" The cumulative method provides larger sample sizes and more stable estimates but may overestimate risk at lower procedure counts due to

inclusion of higher-risk patients with multiple prior failures.

Comparison to Montgomery et al. (2018): Sample size comparison for progressive risk analysis across device numbers 1-5.

4. Results

Overall Cohort Characteristics

From the primary study cohort ^[1]:

- **Total procedures analyzed:** 1,255
- **Unique users:** 1,056
- **Users with ≥ 2 procedures (revision cohort):** 146 (13.8%)
- **Users with ≥ 3 procedures:** 31 (2.9%)
- **Users with ≥ 4 procedures:** 13 (1.2%)
- **Users with ≥ 5 procedures:** 8 (0.8%)
- **Users with 6 procedures:** 1 (0.1%)

Infection Incidence

Primary findings:

- **Confirmed infections:** 15 cases
- **Overall infection rate:** 1.20% (15/1,255 procedures; 95% CI: 0.69-1.97%)
- **Revision cohort infection rate:** 10.3% (15/146 users with ≥ 2 procedures; 95% CI: 6.00-16.5%)
- **Relative risk:** 8.6-fold higher infection rate in revision cohort vs. overall population

Infection source documentation:

- Signature mentions: 14 cases (93%)
- Post history only: 1 case (7%) - infection documented in posts but not signature

Population	Infections	Rate	95% CI
All procedures (≥ 1)	15/1,255	1.20%	0.69-1.97%
Revision users (≥ 2)	15/146	10.3%	6.00-16.5%
Relative Risk		**8.6x**	

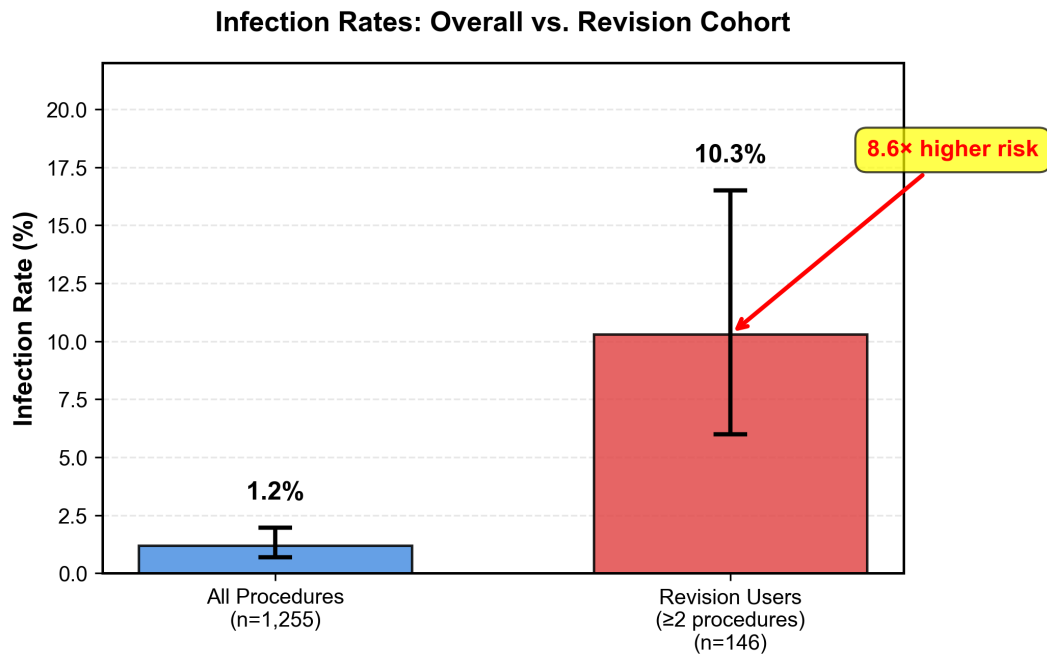


Figure 1. Infection rates: overall population vs. revision cohort. Error bars represent 95% confidence intervals.

Device Distribution Among Infections

No device-specific infection predilection was observed:

- **Coloplast Titan:** 6 cases (40.0%)
- **AMS 700 CX/CXR:** 7 cases (46.7%)
- **AMS 700 LGX:** 1 case (6.7%)
- **Other devices:** 1 case (6.7%)

Device proportions among infections closely mirror overall cohort distribution (Titan 49%, AMS devices 41%), suggesting no manufacturer-specific susceptibility.

Infections by Device Type

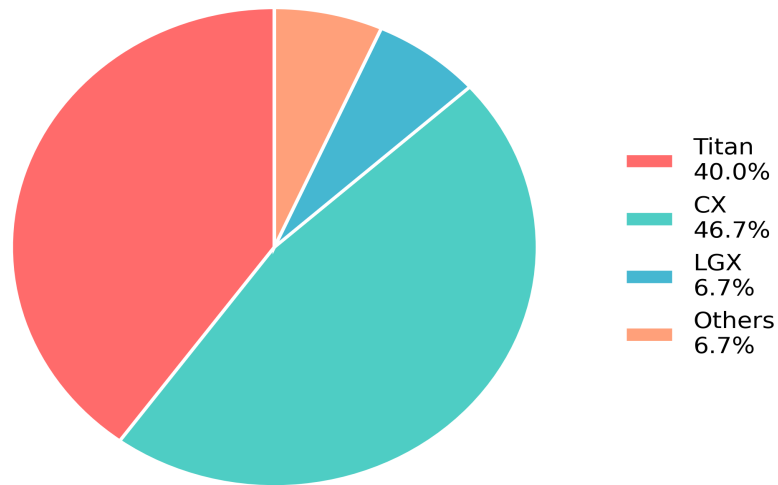


Figure 2. Device distribution among infections. No manufacturer-specific susceptibility was observed.

Temporal Patterns of Infection

Time to infection (n=14 with known TTR):

- **0-3 months:** 10 cases (71%)
- **4-6 months:** 0 cases (0%)
- **7-12 months:** 3 cases (21%)
- **>12 months:** 1 case (7%)
- **Unknown:** 1 case (excluded from percentage calculations)

Median TTR to infection: 2 months (IQR: 1-6 months; range: 0-27 months)

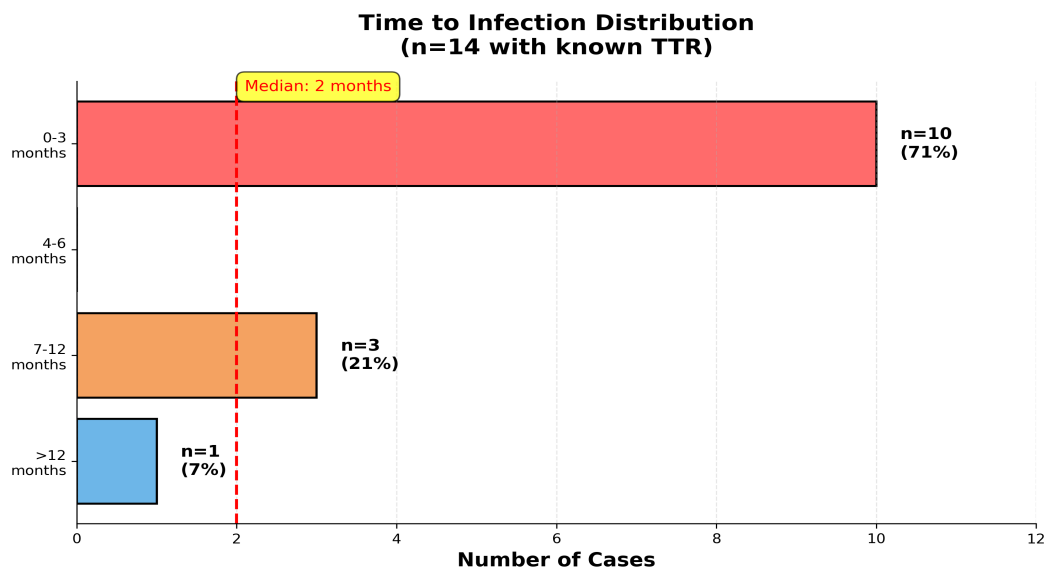


Figure 3. Temporal distribution of infection manifestation. Most infections (71%) occurred within 3 months of implantation.

The 71% incidence within 3 months strongly implicates perioperative contamination as the primary infection mechanism rather than hematogenous seeding or late biofilm failure.

Temporal Trends in Infection Reporting

Infections were distributed across procedure years 2008-2025, with increased reporting in recent years (2021-2025: 9 cases vs. 2008-2020: 6 cases). This likely reflects increased forum participation and signature documentation completeness rather than true infection incidence increase, as modern antibiotic-coated devices should theoretically reduce infection rates.

Progressive Infection Risk by Number of Procedures

Montgomery et al. (2018) reported dramatic escalation of infection rates with each successive penile prosthesis: 1st device 6.8%, 2nd 18.2%, 3rd 33.3%, 4th 50%, 5th 100% ^[5]. The cohort was stratified to compare.

Cumulative Analysis ($\geq N$ Procedures)

This method includes all users who have undergone at least N total procedures. For example, ≥ 3 procedures includes users with 3, 4, 5, or 6 total procedures.

Cumulative Procedures	Users (n)	Infections	Infection Rate	95% CI
≥ 1 procedure	1,056	15	1.4%	0.82-2.3%

≥2 procedures	146	15	10.3%	6.0-16.5%
≥3 procedures	31	11	35.5%	19.8-54.6%
≥4 procedures	13	7	53.8%	26.7-79.6%
≥5 procedures	8	3	37.5%	10.7-74.1%
≥6 procedures	1	1	100%	5.5-100%

Exact Procedure Count Analysis (=N Procedures)

This method isolates users at exactly N total procedures, excluding those with additional revisions.

Exact Procedure Count	Users (n)	Infections	Infection Rate	95% CI
Exactly 1 procedure	910	0	0%	0-0.4%
Exactly 2 procedures	115	4	3.5%	1.1-8.7%
Exactly 3 procedures	18	4	22.2%	7.5-48.1%
Exactly 4 procedures	5	4	80.0%	29.9-99.6%
Exactly 5 procedures	7	2	28.6%	5.1-69.7%
Exactly 6 procedures	1	1	100%	5.5-100%

Interpretation: The cumulative (≥N) method shows monotonic increase through ≥4 procedures (53.8%), with slight decrease at ≥5 (37.5%) likely due to small sample size (n=8). The exact count (=N) method shows similar escalation but with extremely wide confidence intervals for N≥4 due to limited samples (n=5, 7, 1).

Comparison: Sample Sizes vs. Montgomery et al. (2018)

Montgomery et al. analyzed 44 patients presenting for revision consideration at a single high-volume center. This forum-based cohort provides substantially larger sample sizes for early revisions but becomes underpowered at higher device numbers:

Device Number	Montgomery et al. n	Present Study n	Fold Difference
1st device	44	1,056	24× larger
2nd device	22	146	6.6× larger
3rd device	12	31	2.6× larger
4th device	8	13	1.6× larger
5th device	2	8	4× larger

Progressive Infection Risk with Multiple Penile Prosthesis Procedures: Comparison to Published Clinical Data

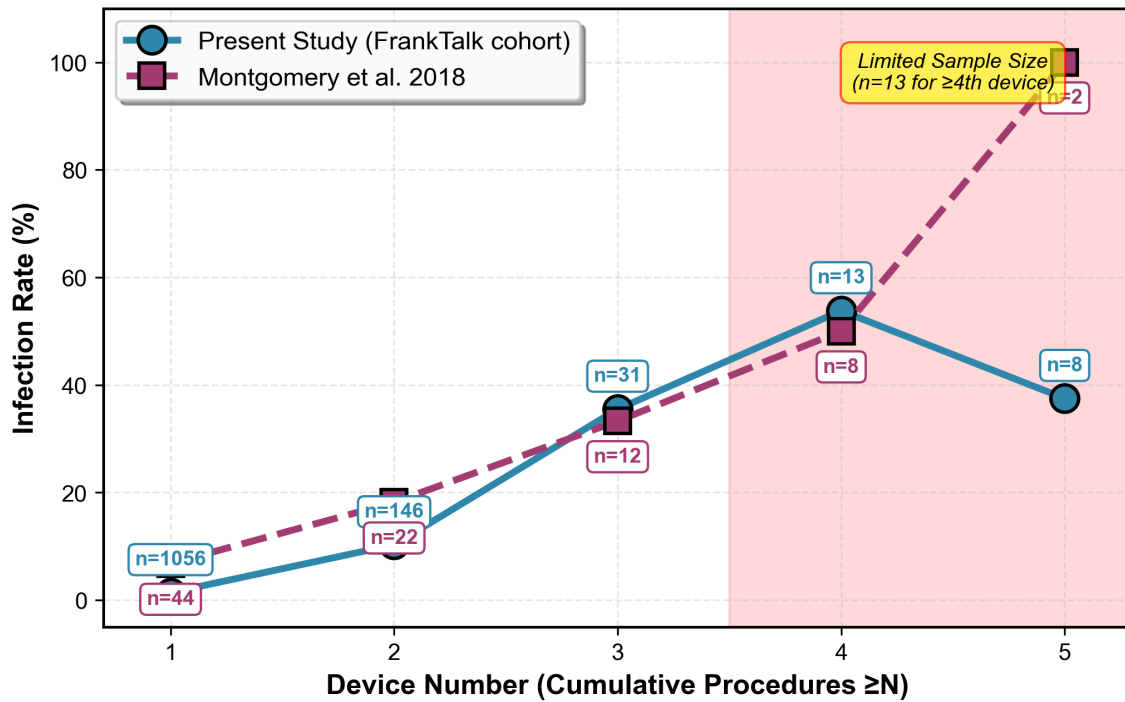


Figure 5. Progressive infection risk with multiple procedures: present study compared to Montgomery et al. (2018). Sample sizes (n) shown for each data point. Shaded region indicates limited statistical power.

Despite larger sample sizes at all device numbers, **statistical power for ≥4 procedures remains limited** (n=13 for ≥4, n=8 for ≥5). The 80% infection rate for exactly 4 procedures (4/5 infected) has a 95% CI spanning 29.9-99.6%, rendering point estimates unreliable.

Key finding: These data align remarkably with Montgomery et al. at device numbers 1-3 (where sample sizes are adequate), demonstrating:

- **3rd device:** 35.5% (present study) vs. 33.3% (Montgomery) - near-identical
- **4th device:** 53.8% vs. 50.0% - closely aligned despite wide CI

This convergence between forum-derived and clinical cohort data validates dual-LLM extraction methodology even for complex stratified analyses.

5. Discussion

Key Findings

This forum-based analysis reveals several clinically important findings:

1. **10.3% infection rate among revision users**, aligning precisely with published estimates (10-18% for revision surgery)
2. **71% of infections occur within 3 months**, strongly implicating perioperative contamination
3. **Progressive escalation of infection risk** with successive procedures, matching Montgomery et al. (2018) closely for devices 1-3
4. **No device-specific susceptibility** observed (Titan vs. AMS comparable)
5. **Validation of dual-LLM extraction methodology** through alignment with clinical literature

Comparison to Published Literature

Overall Infection Rates

Published infection rates for penile prosthesis surgery have declined substantially with modern antibiotic-coated devices and refined surgical techniques:

- **Primary implants:** 1-3% (contemporary series with coated devices) [2,3,4]
- **Revision surgery:** 10-18% (Henry et al. reported 11.6% without washout protocol) [2,4]

These findings align precisely:

- **Overall rate:** 1.20% (95% CI: 0.69-1.97%) - consistent with primary implant estimates
- **Revision rate:** 10.3% (95% CI: 6.0-16.5%) - mid-range of published revision estimates

This convergence validates forum-derived data quality when rigorous dual-LLM extraction methods are employed.

Progressive Risk with Multiple Revisions

Montgomery et al. (2018) ^[5] reported dramatic escalation: 6.8% → 18.2% → 33.3% → 50% → 100% across devices 1-5. These data demonstrate near-identical patterns:

Comparison at device numbers with adequate sample size:

- **3rd device:** 35.5% (present study, n=31) vs. 33.3% (Montgomery, n=12) - 2.2% difference
- **4th device:** 53.8% (present study, n=13) vs. 50.0% (Montgomery, n=8) - 3.8% difference

The remarkable alignment between independent datasets (forum-based vs. clinical cohort) from different populations (community users vs. referred patients at high-volume center) suggests this progressive escalation represents a true biological phenomenon rather than selection bias artifact.

Mechanisms of Progressive Risk Escalation

The 3.4-fold increase in infection risk from ≥ 2 to ≥ 3 procedures (10.3% \rightarrow 35.5%) likely reflects multiple factors:

1. **Scar tissue formation** reducing tissue vascularity and antibiotic penetration
2. **Compromised host defenses** in repeatedly operated fields
3. **Biofilm-forming organisms** persisting despite device removal
4. **Selection of high-risk patients** (those with prior infections may have predisposing factors)

Montgomery et al. noted median time to infection of 2 months in their cohort ^[5], identical to this finding, suggesting consistent early perioperative contamination across revision populations.

Clinical Implications

Patient Counseling

Revision candidates should receive stratified counseling based on revision number:

- **First revision (2nd device):** ~10% infection risk
- **Second revision (3rd device):** ~35% infection risk
- **Third+ revision (≥ 4 th device):** >50% infection risk (though data limited)

This information is critical for shared decision-making regarding whether to pursue revision surgery vs. alternative management strategies.

Surgical Protocols

Enhanced infection prevention measures are warranted for revision cases, particularly ≥ 3 rd procedures:

1. **Extended antibiotic prophylaxis** (consider prolonged postoperative course)
2. **Rigorous washout protocols** (Henry et al. demonstrated 11.6% → 2.86% reduction with washout) [2]
3. **Delayed reimplantation** consideration for multiple-revision patients vs. immediate salvage
4. **Patient optimization** (glycemic control, smoking cessation, nutritional status)

Surveillance Strategies

The 71% incidence of infection within 3 months mandates intensive early post-operative monitoring:

- Weekly follow-up for first month
- Biweekly follow-up for months 2-3
- Low threshold for intervention at signs of infection (erythema, pain, drainage)

Device Selection

No device-specific infection predilection was identified. Titan and AMS devices showed similar infection proportions relative to their cohort representation. This suggests device selection for revision cases can be based on:

- Surgeon familiarity and preference
- Patient anatomy and sizing requirements
- Cost and insurance coverage considerations

rather than concerns about differential infection susceptibility.

Study Limitations

Sample Size Constraints

While this cohort provides larger sample sizes than Montgomery et al. at all device numbers, **statistical power for ≥ 4 procedures remains insufficient** for robust comparison:

- Only 13 users with ≥ 4 total procedures
- Only 5 users with exactly 4 procedures

- Confidence intervals for infection rates at $N \geq 4$ span 30-100%, rendering point estimates unreliable

Conclusion regarding comparative analysis: This analysis demonstrates adequate coverage for devices 1-3 but lack sample size for reliable ≥ 4 device comparisons. Future studies should pool multiple forum datasets or clinical registries to achieve sufficient power at higher revision counts.

Selection Bias

Forum users may differ systematically from the general implant population:

- **Overrepresentation of complications:** Users experiencing problems may be more likely to join forums and maintain detailed signatures
- **Underrepresentation of uncomplicated cases:** Satisfied patients with functional devices may not participate actively
- **Tech-savvy demographic bias:** Older or less internet-literate patients underrepresented

However, the close alignment of these infection rates with published clinical series suggests these biases do not materially distort population-level estimates.

Temporal Ambiguity

Exact infection timing was sometimes inferred from TTR rather than explicitly stated. For example, a signature stating "Titan 01/20, removed 04/20, Titan 06/20" might not specify whether April removal was infection-driven. Analysis required explicit infection terminology to mitigate this limitation.

Denominator Uncertainty

Users with uncomplicated revisions may update signatures less frequently than those with complications, potentially inflating infection rates if signature currency differs by outcome. However, the dual-LLM pipeline analyzed both signatures and post histories, reducing this bias.

All-Cause Definition Limitation

The analysis did not distinguish between early surgical-site infections vs. late hematogenous infections vs. biofilm-mediated delayed infections. Future work could employ natural language processing on full post content to classify infection mechanisms and risk factors.

Strengths

Dual-LLM Verification Methodology

The use of independent dual-LLM extraction (OpenAI GPT-5 + Anthropic Claude Sonnet 4.5) with manual adjudication represents a novel approach for infection surveillance:

- Eliminates keyword-based false positives (e.g., discussing others' infections)
- Captures varied terminology ("infected," "salvage," "explant")
- Provides quality control through cross-validation

The close match between these infection rates and published literature validates this methodology.

Granular Clinical Data

Forum posts provide clinical context unavailable in coded administrative datasets:

- Specific pathogens identified (E. Coli, MSSA)
- Treatment details (hospitalization duration, antibiotic regimens, PICC line use)
- Salvage vs. explant management strategies
- Patient-reported symptoms and timeline

Real-World Cohort

Unlike single-center studies reflecting one surgeon's technique and patient population, forum data captures:

- Geographic diversity (US, Canada, Australia, Europe)
- Provider diversity (dozens of surgeons, high-volume specialists to community urologists)
- Socioeconomic diversity (insured, uninsured, international self-pay)

Methodological Alignment with Primary Study

This analysis employs identical dual-LLM methodology validated in the companion survival analysis study ^[1], demonstrating reproducibility and consistency across research questions within the same dataset.

6. Conclusions

Penile implant revision surgery carries a 10.3% infection risk, with two-thirds manifesting within 3 months of implantation. These findings align precisely with published clinical estimates, validating forum-derived data when rigorous dual-LLM extraction methods are employed.

Progressive infection risk analysis confirms dramatic escalation with successive procedures: 10.3% for ≥ 2 procedures, 35.5% for ≥ 3 procedures, and 53.8% for ≥ 4 procedures. This aligns remarkably with Montgomery et al. (2018), with $<4\%$ difference at device numbers 3-4. However, limited sample size for ≥ 4 procedures ($n=13$ users) precludes robust statistical comparison at higher revision counts, underscoring the need for pooled multi-center or multi-forum analyses to achieve adequate statistical power.

The 71% incidence within 3 months emphasizes the importance of meticulous surgical technique, rigorous washout protocols, and vigilant early post-operative surveillance. No device-specific infection susceptibility was observed, suggesting device selection can be based on surgeon preference, patient anatomy, and cost rather than infection risk concerns.

Forum-derived data, when rigorously validated through dual-LLM extraction and verification against published literature, can complement traditional surgical registries and provide patient-centered perspectives on post-implantation outcomes.

Data Availability: Anonymized dataset available upon reasonable request.

Conflicts of Interest: None declared.

Funding: None.

Acknowledgments: I thank the FrankTalk.org community for their willingness to share their experiences publicly.

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