A Paradigm Shift in Surgical Prophylaxis

Moving from a systemic, blunt instrument approach
to one of targeted, surgical precision.

Surgical Site Infections Represent a Staggering Clinical and Financial Burden

$28-45 Billion

Annual direct cost of all HealthcareAssociated Infections (HAIs) in the U.S.

290,000

Estimated number of SSIs annually, the second most frequently reported HAI

$10,443 to $25,546

The additional direct hospital cost for a single SSI

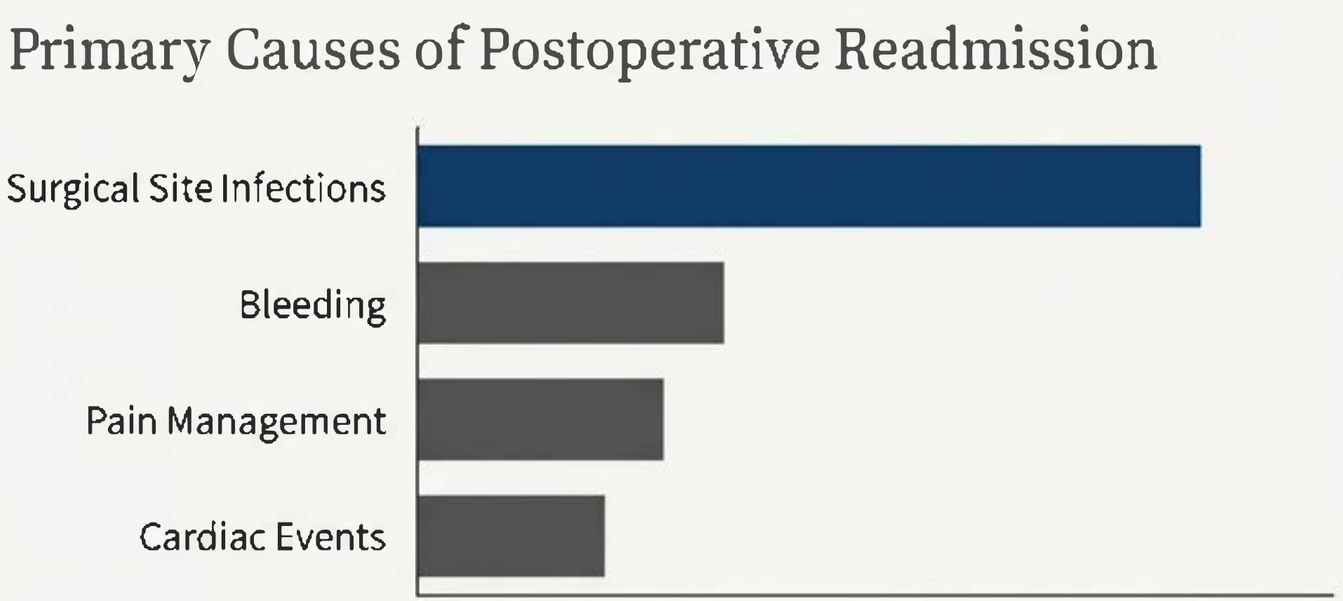
Up to 60%

The proportion of SSIs that are considered potentially preventable

Surgical Site Infections (SSIs) are not a minor complication; they are a leading cause of postoperative morbidity, mortality, and excess healthcare expenditure. Despite advances in surgical technique and sterile practices, SSIs remain a pervasive threat, placing a significant strain on hospital resources and challenging the financial viability of care under new reimbursement models.

Sources: Prevention HAIs.pdf; The Cost of Surgical Site Infections...; Surgical_Precision_Against_Resistance (1).pdf

SSIs Drive Readmissions and Prolong Hospital Stays, Undermining Patient Outcomes



An SSI **prolongs** a patient's hospital stay by a median of **6 days**.

Patients with SSIs experience an average incremental Length of Stay (LOS) of **6.2 to 7.8 days**.

An estimated **8,000 deaths** per year are directly attributed to SSIs.

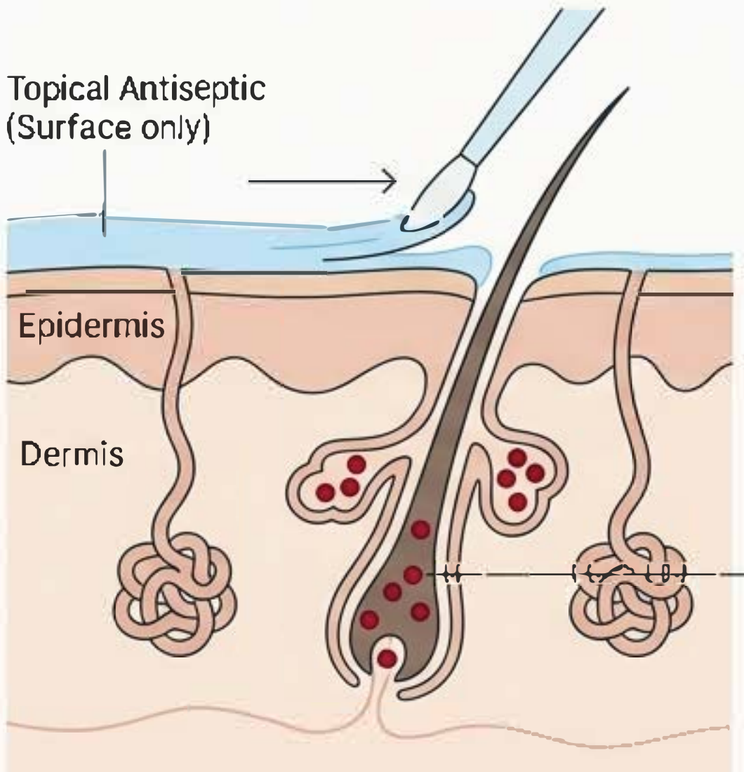
The impact of an SSI extends far beyond the initial hospital admission. These infections are a primary driver of unplanned readmissions, disrupting patient recovery and continuity of care. The prolonged hospitalization required to manage an SSI consumes valuable bed capacity, increases nursing workload, and exposes patients to further risks of hospital-acquired conditions.

Sources: Surgical_Precisi o n_Against_Resistance (1).pdf; Incidence and impact...; Hospital_costs_associated_with_surgical.pdf; Prevention HAIs.pdf

The Standard of Care, Systemic Prophylaxis, is a Flawed Approach

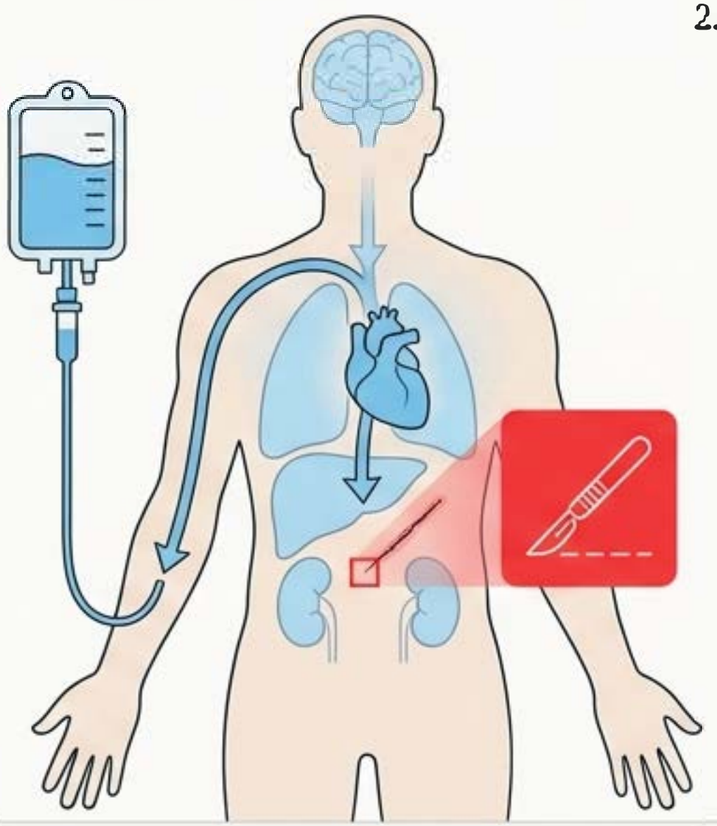
Systemic Prophylaxis: A Blunt Instrument in a Precision Fight

The True Source



1. The patient's own dermal microbiome, specifically bacteria in deep adnexal structures that evade topical antiseptics, is the main source of pathogens causing SSIs.

The Systemic Failure



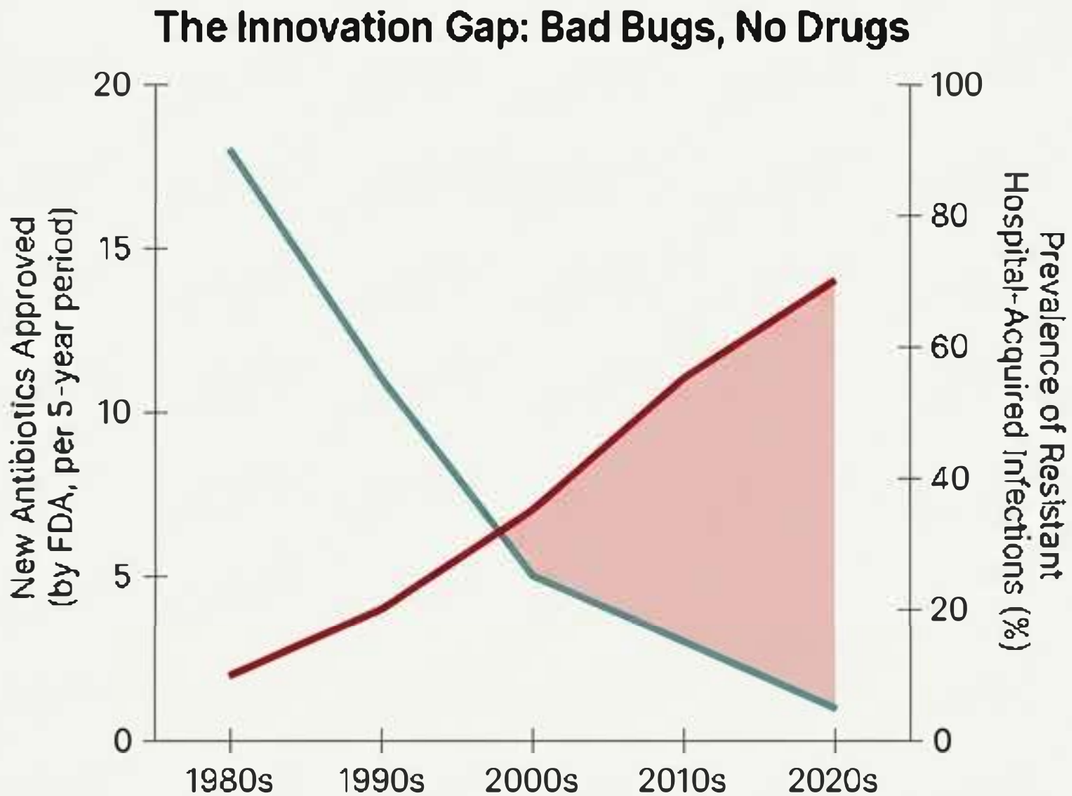
2. Systemic (IV) antibiotics often result in sub-therapeutic levels at the incision site. The medication is diluted throughout the entire body before reaching the avascular dermal tissues where it's most needed.

Sources: innovation and impact section ARPA-H.docx; Surgical_Precision_Against_Resistance (1).pdf

Systemic Prophylaxis Fuels the Global Crisis of Antimicrobial Resistance

>70%

of bacteria causing hospital-acquired infections are resistant to at least one of the drugs commonly used to fight them.



- The "flood" of systemic antibiotics creates immense selective pressure throughout the body, promoting the development of resistant strains.
- This approach causes significant collateral damage to the patient's gut microbiome, increasing the risk of secondary infections like *Clostridioides difficile*.
- The pipeline of new antibiotics is drying up, creating a "Bad Bugs, No Drugs" scenario where once-curable infections are becoming untreatable. This makes preserving the efficacy of our existing antibiotics a critical priority.

Sources: Surgical_Precision._Against_Resistance (1).pdf; innovation and impact section ARPA-H.docx

The Solution: Targeted Intradermal Delivery for Maximum Efficacy.

A targeted approach that injects micro-doses of antibiotics directly into the wound edges before incision.

This places the highest concentration of the antibiotic precisely where it is needed, at the moment of bacterial contamination.

Achieves local tissue concentrations up to **40 times higher** than those possible through IV administration.

The principle is familiar and proven: intradermal delivery creates a localized, high-concentration depot of the active agent, ensuring it reaches the target dermal tissue effectively.

Sources: innovation and impact section ARPA-H.docx; File:Mantoux tuberculin skin test.jpg - Wikipedia; Tuberculin Skin Testing | CDC

Decades of Data Point to One Inescapable Conclusion.

The efficacy of localized antibiotic delivery is not a new discovery; it is one of the most consistently validated, yet underutilized, interventions in surgical infection prevention.

Source: Surgical_Precision_Against_Resistance (1).pdf

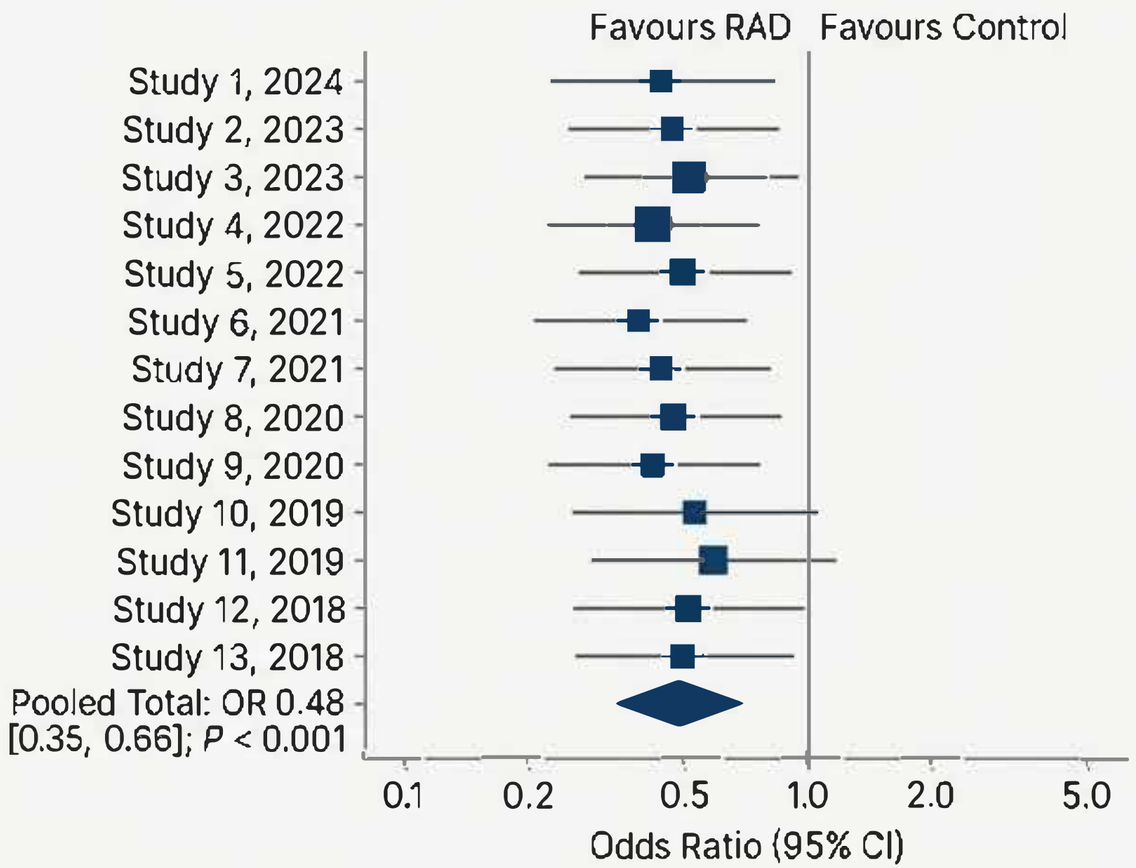
Clinical Editorial

The 2024 Meta-Analysis Provides Overwhelming Proof of Efficacy

>50% REDUCTION IN SSI ODDS

- **Data Synthesis:** Meta-analysis of 13 randomized controlled trials including 7,719 patients.
- **Primary Outcome:** Regional Antibiotic Delivery (RAD) demonstrated a statistically significant reduction in the odds of developing an SSI.
- **The Numbers:** Odds Ratio 0.48; 95% Confidence Interval [0.35, 0.66]; P < 0.001.
- **Consistency:** The benefit is consistent across different antibiotics (vancomycin and gentamicin) and high-risk patient populations, including those with diabetes.

Forest Plot: Efficacy of Regional Antibiotic Delivery (RAD) on Surgical Site Infection (SSI) Odds



Source for Visual and Data: Surgical_Precision_Against_Resistance (1).pdf

A Dual Victory: Superior Prophylaxis and Responsible Antimicrobial Stewardship.

Enhanced Efficacy

- Delivers a bactericidal concentration of antibiotic directly to the at-risk tissue.
- Overcomes the limitations of systemic delivery in avascular or poorly perfused tissue.
- Eliminates pathogens, including resistant bacteria like *Staphylococcus aureus*, at the source.

Antimicrobial Stewardship

- Fights AMR by using less antibiotic, more effectively.
- Results in minimal systemic absorption, preserving the patient's microbiome.
- Greatly lowers the selective pressure that promotes resistance and avoids adverse effects like *C. difficile* infections.

Sources: innovation and impact section ARPA-H.docx; Surgical_Precision_Against_Resistance (1).pdf

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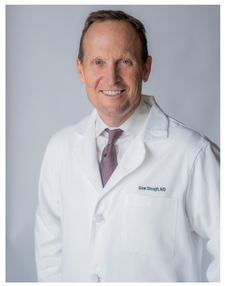

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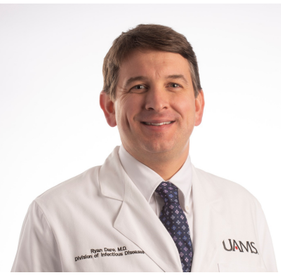

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Michele Simkin

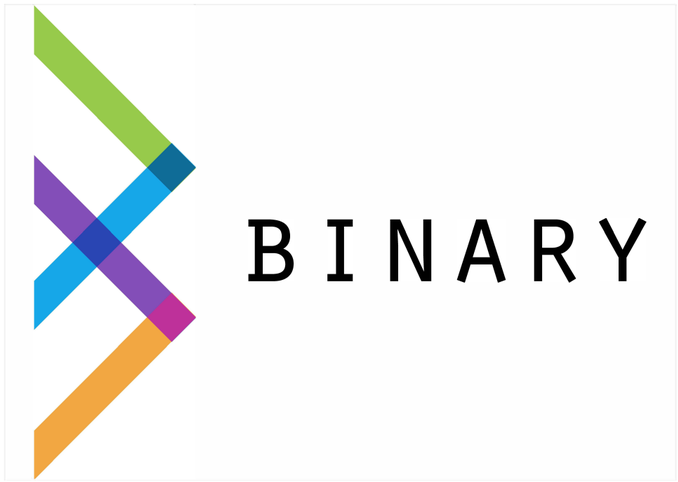
The Evidence is Conclusive. The Path Forward is Clear.

Targeted intradermal antibiotic delivery is not merely an alternative to systemic prophylaxis; it is its logical and necessary successor.

It offers superior protection for the patient.

It provides a powerful tool in the global fight against antimicrobial resistance.

It represents a paradigm shift toward precision, efficacy, and stewardship in surgical care.



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