



## Brief Communication

# Empiric treatment is less costly than *Staphylococcus aureus* screening and decolonization in total joint arthroplasty patients

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## ABSTRACT

The aim of our study was to compare the cost of preoperative empiric mupirocin treatment of all total joint arthroplasty patients with a standard *Staphylococcus aureus* screening and decolonization protocol. The cost of empiric mupirocin treatment is \$24.65 per patient, whereas the cost of a standard *S. aureus* screening and decolonization protocol is \$60.32 per patient. Given that more than 1,051,000 total joint arthroplasties are performed annually, the cost savings with empiric treatment is nearly \$40 million per year. Empiric treatment allows for more efficient workflow, minimizes potential for clerical error, eliminates risk of undertreatment, and has not been shown to increase antibiotic resistance.

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## Introduction

Kalmeijer et al. [1] reported a 9-fold higher risk of *Staphylococcus aureus* prosthetic joint infection (PJI) after total joint arthroplasty (TJA) with *S. aureus* nasal colonization. Nearly 85% of *S. aureus* PJIs are caused by bacterial strains found in the patient's nares [2]. The efficacy of *S. aureus* screening and decolonization programs in preventing PJI and decreasing associated costs is well established [2].

Screening involves culturing swabs of the anterior nares of both nostrils. Decolonization is achieved by administering 2% mupirocin ointment intranasally twice daily for 5 days to all patients with nasal cultures positive for methicillin-sensitive *S. aureus* and methicillin-resistant *S. aureus*. Screening and decolonization protocols suffer from a false-negative *S. aureus* detection rate as high as 8% [3], clerical error in culture interpretation or selection of

patients for decolonization, and added cost. There is a need for more accurate, efficient, and cost-effective *S. aureus* decolonization of TJA patients. Recently, universal *S. aureus* decolonization of TJA patients, regardless of *S. aureus* carrier status, has been shown to decrease the rate of PJI [4].

The aim of our study was to compare the cost of preoperative empiric mupirocin treatment of all TJA patients with a standard *S. aureus* screening and decolonization protocol.

## Material and methods

We calculated the costs of a 5-day course of 2% mupirocin topical ointment (Perrigo; Dublin, Ireland) applied intranasally twice daily to all TJA patients preoperatively (empiric treatment) and preoperative nasal swab of all TJA patients sent for *S. aureus* culture, review of culture results, and selective decolonization with mupirocin (screening and decolonization).

We made the following assumptions in our calculations. Based on a study of 912 patients by Hacek et al. [5], 24% of all patients are nasal culture positive for *S. aureus*. Based on 2011 Medical Group Management Association data, the average TJA surgeon's yearly salary is \$589,267. With 4 weeks of vacation a year and a 60 hour work week, a TJA surgeon's wage is \$204.61 per hour. Using our institutional average, a medical assistant's wage is \$15.92 per hour.

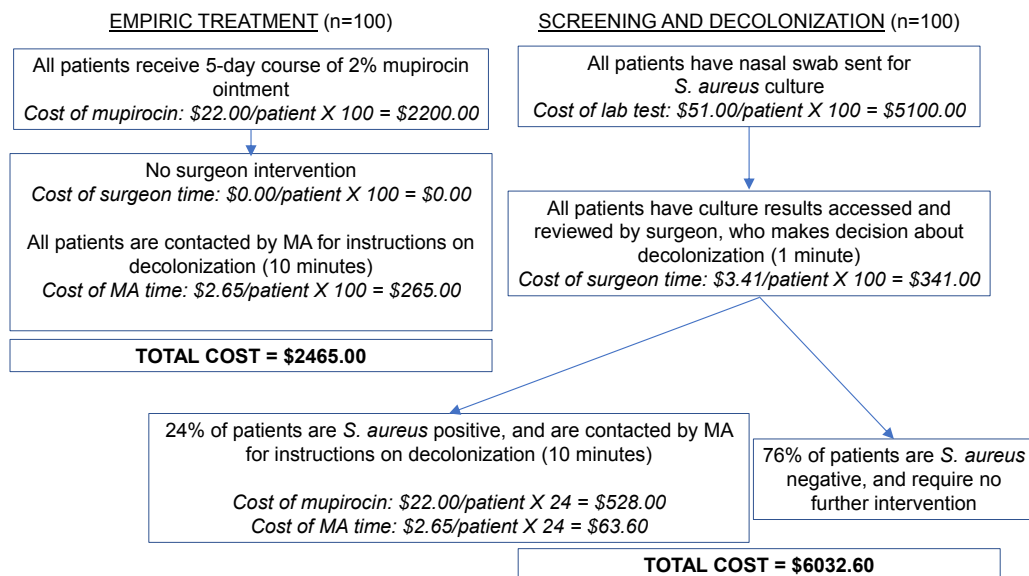
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**Figure 1.** Workflow and cost calculation for empiric mupirocin treatment versus screening and decolonization in 100 TJA patients.

We used the costs of medications and laboratory tests at our institution in our calculations.

Workflow and cost for empiric treatment versus screening and decolonization of 100 TJA patients are illustrated in [Figure 1](#). Costs common to both treatment protocols, such as chlorhexidine washes/showers, were not included in the cost analysis.

## Results

Over 1,051,000 TJAs are performed annually according to the Centers for Disease Control. As a result, the cost savings to our health-care system with empiric treatment over screening and decolonization is at least \$37,489,170.00 per year, as follows:

Standard *S. aureus* screening and decolonization \$60.32/patient × 1,051,000 = \$63,396,320

Empiric mupirocin treatment \$24.65/patient × 1,051,000 = \$25,907,150

Cost difference \$63,396,320 – \$25,907,150 = \$37,489,170

## Discussion

Mupirocin application is extremely safe, with a potential for reaction only in those patients hypersensitive to the drug class. In a multicenter study of 14,316 patients, there were no adverse events associated with mupirocin treatment [6]. The use of povidone-iodine (PI), instead of mupirocin, for nasal *S. aureus* decolonization has recently been investigated. PI (\$27.21) is not only more expensive than mupirocin (\$22.00), but also less efficacious [7]. *S. aureus* culture remains positive in 21% of PI-treated patients but only 2.8% of mupirocin-treated patients [8,9].

There may be concern for increased mupirocin resistance with empiric treatment. However, to our knowledge, increased mupirocin resistance as a result of preoperative *S. aureus* decolonization has not been reported. In a study of approximately 7000 patients followed for 4 years after receiving a 5-day course of nasal mupirocin, there was no evidence of increased mupirocin resistance [10]. These findings were recapitulated by others who found no increase in low-level mupirocin resistance and no high-level mupirocin resistance after a 5-day course of nasal mupirocin [4].

## Conclusions

Our results demonstrate that preoperative empiric mupirocin treatment of all TJA patients is approximately one-third the cost of *S. aureus* screening and decolonization. This amounts to savings of nearly \$40 million annually. In addition, empiric treatment allows for more efficient workflow, minimizes potential for clerical error, eliminates risk of undertreatment due to false-negative screening results, has not been shown to increase antibiotic resistance, and may decrease the rate of PJI. Future work may examine the development or discovery of agents both less expensive and more efficacious than mupirocin for *S. aureus* eradication.

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