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Clinical Study

Cost savings analysis of intrawound vancomycin powder in posterior spinal surgery

Osa Emohare, MBBS, PhD[a,*], Charles G. Ledonio, MD[b], Brian W. Hill, MD[c], Rick A. Davis, MD[d], David W. Polly, Jr., MD[b], Matthew M. Kang, MD[a]

[a]*Department of Neurosurgery, Mail Stop 11503G, Regions Hospital, 640 Jackson Street, Saint Paul, MN, 55101*
[b]*Department of Orthopaedic Surgery, University of Minnesota, 2512 South 7th Street, Suite R200, Minneapolis, MN, 55454*
[c]*Department of Orthopaedic Surgery, Saint Louis University, 3635 Vista at Grand Blvd. St. Louis, Missouri 63104*
[d]*Department of Orthopaedic Surgery, Mail Stop 11503L, Regions Hospital, 640 Jackson Street, Saint Paul, MN 55101*

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Abstract

BACKGROUND CONTEXT: Recent studies have shown that prophylactic use of intrawound vancomycin in posterior instrumented spine surgery substantially decreases the incidence of wound infections requiring repeat surgery. Significant cost savings are thought to be associated with the use of vancomycin in this setting.

PURPOSE: To elucidate cost savings associated with the use of intrawound vancomycin in posterior spinal surgeries using a budget-impact model.

STUDY DESIGN: Retrospective cohort study.

PATIENT SAMPLE: Data from a cohort of 303 patients who underwent spinal surgery (instrumented and noninstrumented) over 2 years were analyzed; 96 of these patients received prophylactic intrawound vancomycin powder in addition to normal intravenous (IV) antibiotic prophylaxis, and 207 received just routine IV antibiotic prophylaxis. Patients requiring repeat surgical procedures for infection were identified, and the costs of these additional procedures were elucidated.

OUTCOME MEASURE: Cost associated with the additional procedure to remediate infection in the absence of vancomycin prophylaxis.

METHODS: We retrospectively reviewed the cost of return procedures for treatment of surgical site infection (SSI). The total reimbursement received by the health care facility was used to model the costs associated with repeat surgery, and this cost was compared with the cost of a single local application of vancomycin costing about $12.

RESULTS: Of the 96 patients in the treatment group, the return-to-surgery rate for SSI was 0. In the group without vancomycin, seven patients required a total of 14 procedures. The mean cost per episode of surgery, based on the reimbursement, the health care facility received was $40,992 (range, $14,459–$114,763). A total of $573,897 was spent on 3% of the 207-patient cohort that did not receive intrawound vancomycin, whereas a total of $1,152 ($12×96 patients) was spent on the cohort treated with vancomycin.

CONCLUSIONS: This study shows a reduction in SSIs requiring a return-to-surgery—with large cost savings—with use of intrawound vancomycin powder. In our study population, the cost savings totaled more than half a million dollars.

Keywords: Local vancomycin powder; Vancomycin; Posterior spine surgery; Posterior spinal fusion; Infection; Cost saving; Economic; Cost-benefit analysis; Comparative effectiveness

FDA device/drug status: Not approved for this indication (vancomycin powder).

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The disclosure key can be found on the Table of Contents and at www.TheSpineJournalOnline.com.

* Corresponding author. Department of Neurosurgery, Mail Stop 11503G, Regions Hospital, 640 Jackson St, Saint Paul, MN 55101, USA. Tel.: (651) 254-3684.

E-mail address: oemohare@umn.edu (O. Emohare)

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Introduction

About 300,000 spinal surgeries are performed each year in the United States [1], with single cases costing, on average, $92,884 according to the *DRG Summary for Medicare Inpatient Prospective Payment Hospitals, FY201* [2].

A major complication of spine surgery is postoperative surgical site infection (SSI) that can be devastating. Although the reported frequency and severity of these infections vary widely, with reported rates of 0.7% to 15% [3–13], the use of antibiotic prophylaxis is well established. The incidence of SSI has been noted to vary, depending on the procedure, with rates in short lumbar instrumentation as low as 2% to 4% [14–16] and as high as 8% to 15% in special situations, such as in trauma patients or those with cerebral palsy [13,14]. Not only does SSI cause additional morbidity and mortality, but health care resources must be expended to manage it [15,16].

Most SSIs after spine surgery are caused by Gram-positive organisms [17]. As a result, the use of intrawound vancomycin to prevent this complication is becoming more common. Recent publications have demonstrated a reduction in SSI with the use of intrawound vancomycin in posterior spine surgery, both in trauma patients [18,19] and in patients undergoing elective procedures [19,20]. The use of intrawound vancomycin in this setting achieves a high but well-localized tissue concentration of antibiotic and, given the size of the vancomycin molecule, there is very minimal ingress into the systemic circulation.

Although increased costs are known to be associated with SSI after spine surgery, and intrawound vancomycin is known to reduce the frequency of SSI, the potential budgetary impact of this reduction in SSI has yet to be elucidated. This study was designed to analyze the cost savings associated with the use of prophylactic intrawound vancomycin in posterior spine surgery.

Methods

After institutional review board approval, we enrolled consecutive patients between July 2010 and December 2012. Two surgeons participated in this study, each with a parallel group; patient allocation to a group was done simply on the basis of which patients were referred to a specific surgeon or on the basis of on-call admissions.

Over the recruitment period, one surgeon administered 1 g vancomycin powder (McKesson, San Francisco, USA) into the wounds of consecutive patients undergoing posterior spine surgery in addition to normal intravenous (IV) antibiotic prophylaxis that comprised IV cefazolin, in the case of a penicillin-allergic patient, vancomycin. The second surgeon continued the routine administration of prophylactic IV antibiotics without the instillation of vancomycin powder in the wounds. Vancomycin powder was instilled into all layers of the wound at the end of the procedure when the surgeon was ready to begin closing the incision. Although drains were routinely inserted, drained fluid was not examined for the presence or concentration of vancomycin. Timing of the drain removal was dictated by clinical imperative.

Most procedures consisted of fusions, discectomies, and lateral lumbar decompression. Procedures involving the thoracic, thoracolumbar, and lumbar spine were included, whereas the cervical spine was excluded. Also excluded were microdiscectomies and laminectomies (Table 1).

A multivariate analysis was performed to compare various parameters in the two parallel patient groups. The

EVIDENCE & METHODS

Context
Over the last few years, the utilization of vancomycin powder in surgical wounds has gained popularity as an added means of prophylaxis against post-operative infection. The authors sought to assess outcomes and costs associated with this technique in a series of 303 patients.

Contribution
The authors report that of the 96 patients in the cohort treated with vancomycin powder, there were no infections that required return to the operating room. Over $1 million in expenditures were generated by seven patients in the control arm who required surgical intervention for the treatment of post-operative infection.

Implications
The present study adds additional information to the growing literature regarding use of intrawound vancomycin powder. There are limitations to the widespread translation of this study's findings, however, and these should be appreciated. The authors highlight some of these in the limitation section of their discussion. Also important is the fact that the two groups differed significantly on a number of vital parameters, including patient age, the presence of diabetes and the type of surgery performed. This clearly confounds the capacity to attribute the study's results, in their entirety, to the use of vancomycin powder. Moreover, the intent of an analysis of this kind is, ideally, to draw a sample population is representative of the larger demographic. In this instance, to be considered as such, the reader must accept that surgical site infections requiring operative intervention would never occur in the setting of intrawound vancomycin application. Other available literature contests this fact and this represents another, quite substantive, limitation of the current work. While this effort, combined with other studies, lays the groundwork for future analyses on this issue, higher quality, scientifically rigorous, investigations are certainly necessary.

—The Editors