Direct Cost Comparison of Open Carpal Tunnel Release in Different Venues

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Abstract

Background: The increased efficiency and cost savings have led many surgeons to move their practice away from the traditional operating room (OR) or outpatient surgery center (OSC) and into the clinic setting. With the cost of health care continuing to rise, the venue with the lowest cost should be utilized. We performed a direct cost analysis of a single surgeon performing an open carpal tunnel release in the OR, OSC, and clinic. **Methods:** Four treatment groups were prospectively studied: the hospital OR with monitored anesthesia care (OR-MAC), OSC with MAC (OSC-MAC), OSC with local anesthesia (OSC-local), and clinic with local anesthesia (clinic). To determine direct costs, a detailed inventory was recorded including the weight and disposal of medical waste. Indirect costs were not included. **Results:** Five cases in each treatment group were prospectively recorded. Average direct costs were OR (\$213.75), OSC-MAC (\$102.79), OSC-local (\$55.66), and clinic (\$31.71). The average weight of surgical waste, in descending order, was the OR (4.78 kg), OSC-MAC (2.78 kg), OSC-local (2.6 kg), and the clinic (0.65 kg). Using analysis of variance, the clinic's direct costs and surgical waste were significantly less than any other setting ($P < .005$). **Conclusions:** The direct costs of an open carpal tunnel release were nearly 2 times more expensive in the OSC compared with the clinic and almost 7 times more expensive in the OR. Open carpal tunnel release is more cost-effective and generates less medical waste when performed in the clinic versus all other surgical venues.

Keywords: carpal tunnel release, outpatient hand surgery, cost comparison

Introduction

Rising health care costs have become a major concern for individuals as well as our elected officials. The Affordable Care Act was a federal attempt at limiting the number of dollars spent on health care. Like most issues, local and personal responsibility is also necessary to keep costs under control. Providing services in the least costly manner is one way that we as physicians and surgeons can do our part to keep expenditures as low as possible. Although most carpal tunnel releases have moved out of the hospital to ambulatory or outpatient surgery centers, there are still hand surgeons who perform this operation exclusively in the hospital setting.⁷⁻⁹ In a recent survey, the majority of hand surgeons are still using anesthesia staff with sedation during carpal tunnel surgery, even though the recent trend is to perform less concomitant procedures.^{8,7}

Wide-awake local anesthesia no tourniquet (WALANT) hand surgery is one way to reduce the cost of both excess perioperative personnel and anesthesiology staff.³ Furthermore, the recent development in the use of epinephrine in hand surgery has allowed many procedures to be done in clinic procedure rooms without the equipment or sedation

necessary for a tourniquet.⁴ Although the clinic does not follow the same dress code and sterility of an operating suite, field sterility is just as effective as complete draping.⁵ Our hypothesis is that the cost of doing procedures in the clinic would be significantly less than in the hospital operating room (OR) or free-standing ambulatory outpatient surgery center.

Materials and Methods

Institutional review board (IRB) approval was obtained to prospectively follow consecutive, open carpal tunnel releases performed by a single surgeon as a solitary procedure in each of the possible locations for surgery: the hospital OR, the ambulatory surgery center, and the outpatient clinic. Four groups were identified based on the possible

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Table 1. Disposable Items Used During Open Carpal Tunnel Release.

Disposable items
Hand/foot pack
Scrub brushes
Masks
Gowns
Gloves
Hats
Chlorhexidine preparation
Tourniquet
Electrocautery-pencil
Electrocautery-pad
Marking pen
Syringes 10 mL
Needle 18 g
Needle 25 g
1% lidocaine with epinephrine (20-mL vial)
1% lidocaine (20-mL vial)
0.5% marcaine (30-mL vial)
Nasal cannula
Knife blade
Suture 5-0 nylon
Gauze 4 × 4
Gauze Raytec
Kerlix
Coban
Anesthesia-versed (2-mL vials)
Anesthesia-propofol (20-mL vials)
Anesthesia-fentanyl (2-mL vials)
IV needle (20 gauge)
IV tubing
IV fluid-normal saline
IV fluid-lactated ringers

Note. IV = intravenous.

combinations of surgical venue and type of anesthesia that was provided: hospital OR with monitored anesthesia care (OR), the outpatient surgery center with monitored anesthesia care (OSC-MAC), the outpatient surgery center with local anesthesia (OSC-local), and the clinic procedure room with local anesthesia (clinic).

Our hospital policy requires an anesthesia provider for any patient in the hospital OR, thus prohibiting local-only cases in this venue. As such, all patients in the hospital received MAC, infiltrative local anesthesia by the surgeon, and a tourniquet. In contrast, at the ambulatory surgery center, local anesthesia can be performed without an anesthesia provider while MAC is available if the surgeon or patient prefers sedation. Patients who received sedation were treated similarly to those in the hospital—Sedation was followed by infiltration with local anesthesia, exsanguination, and inflation of an upper arm tourniquet. Local cases were treated with infiltration in the holding area at least 20 minutes prior to arrival in the OR to allow the epinephrine to take full effect. All cases in the hospital and the ambulatory surgery

Figure 1. Average direct cost comparison of open carpal tunnel release in different venues.

Note. * $P < .005$ versus clinic setting (ANOVA). ANOVA = analysis of variance; OR = operating room; OSC = outpatient surgery center; MAC = monitored anesthesia care.

Figure 2. Average weight of surgical waste produced.

Note. * $P < .005$ versus clinic setting (ANOVA). ANOVA = analysis of variance; OR = operating room; OSC = outpatient surgery center; MAC = monitored anesthesia care.

center received full draping and sterility in accordance with the facility policies. The surgery performed in the clinic procedure rooms was in accordance with guidelines established by Dr Lalonde using WALANT.³ Furthermore, no gowns were used, and only reusable towels were used for draping.

A detailed inventory of every material supplied during each case was tabulated, and the price per unit was recorded. These are direct costs and defined as all expenses required to perform the operation involving all materials used during the procedure that are not reused (Table 1). The weight of medical waste was also recorded for each procedure. Analysis of variance was used to analyze the differences between the groups regarding the direct costs and weight of the trash.

Indirect costs are those that are shared among other procedures and specialties such as support staff salaries, administrative overhead, laundry services, and equipment depreciation, and these were not included in this analysis.

Results

Five cases in each of the 4 groups were prospectively charted, and the average direct costs in descending order were OR (\$213.75), OSC-MAC (\$102.79), OSC-local (\$55.66), and clinic (\$31.71) (Figure 1). The difference in

costs comparing the clinic procedures with the others was statistically significant.

The difference in surgical waste generated per case showed a similar distribution. The average weight in decreasing order was OR (4.78 kg), OSC-MAC (2.78 kg), OSC-local (2.6 kg), and clinic (0.65 kg) (Figure 2). Again the difference between the weights was statistically different when comparing the clinic with the other venues (Figure 2).

Discussion

Small changes in the costs of common procedures can make a large difference because of the number of these cases that are performed. Carpal tunnel release is by far the most common procedure performed by hand surgeons with estimates of more than 500 000 per year in the United States.² If all of the carpal tunnel releases were done in the clinic set-

ting versus the hospital OR, the savings would be more than \$91 million per year considering direct costs alone (difference of \$182 per case). Similar savings per cases have been reported in the military medical system and Canada.^{6,10}

In Canada, a comparison between the hospital OR and the ambulatory setting showed that the OR is 4 times more expensive and is less than half as efficient.⁶ In the United States, the OR was compared with the clinic, and the results mirrored the Canadian results.¹ Although the majority of carpal tunnel releases are performed in the ambulatory setting, there is a paucity of data comparing a free-standing outpatient surgery center with the clinic setting. We found statistically significant savings using the clinic versus the outpatient surgery center.

The cost of draping is a significant charge that can be saved if reusable towels are used instead of complete disposable draping. The amount of medical waste is formida-

Figure 3. Surgical setup and waste produced: (a) Hospital operating room (OR) full draping for sterility, (b) clinic field sterility with reusable sterile towels, (c) OR waste produced, and (d) outpatient surgery center waste produced.

ble.¹¹ Most ORs have found that disposable drapes for shorter cases are more cost-effective. Doing such procedures in the clinic using reusable towels with field sterility not only decreases the amount of waste but also decreases costs substantially because the cost of disposing the waste is almost completely eliminated (Figure 3).

Another advantage not recorded in this study but experienced by the senior author and others is the efficient use of the surgeon's time.⁵ One can easily average 3 procedures per hour in the clinic when using 2 procedure rooms by injecting several patients at the beginning of the block time and then injecting one between each procedure. This has allowed the senior author to perform 12 releases in an afternoon over 4 hours. While doing things faster is not the goal, effective use of time spent operating is important.

While not formally studied, another experience is that the patient's satisfaction is higher with the clinic procedures. Patients are not required to change into gowns, and a tedious check-in and changing process are also avoided. One patient happened to have his first carpal tunnel release done in the outpatient surgery center and the other done later in the clinic. This patient preferred the clinic experience due to the reasons stated above.

We did not try to estimate the indirect costs for this study. However, in the clinic, the only personnel other than the surgeon and resident assistant is a nurse or medical assistant to register the patient and check vital signs on presentation. Another nurse is in the procedure room. We could show considerable savings in personnel comparing the sites as the outpatient surgery center and hospital require a circulating nurse to monitor the patient in the room as well as a surgical technician or nurse to hand instruments to the surgeon. The hospital also requires a nurse anesthetist or anesthesiologist in the room to monitor the patient. As no recovery room is necessary in the clinic, the recovery room nursing salaries, space, and equipment costs can be saved as well. In conclusion, significant cost savings can be achieved by performing carpal tunnel releases in the clinic with local anesthesia.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

Institutional review board approval was obtained, and informed consent was waived as no patient identifiers were recorded.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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