

Calculation of Operating Expenses for Conventional Transarterial Chemoembolization in an Academic Medical Center: A Step toward Defining the Value of Transarterial Chemoembolization

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ABSTRACT

Purpose: To determine the “real cost” of conventional transarterial chemoembolization in the treatment of patients with unresectable hepatocellular carcinoma (HCC).

Materials and Methods: Comprehensive cost data for performance of conventional transarterial chemoembolization were calculated from a retrospective review of records of 50 consecutive outpatient transarterial chemoembolization procedures in 36 patients with HCC. Costs included labor, equipment, facility acquisition and maintenance, overhead, and administrative costs in a single academic medical center. Hourly rate operational costs for the angiography suite and recovery area were calculated, to which the consumable supply costs were added. Conventional transarterial chemoembolization was defined as selective intrahepatic administration of chemotherapeutic agents (doxorubicin and mitomycin C) emulsified in ethiodized oil (Lipiodol).

Results: The hourly rate to operate an angiography suite at the institution was calculated to be \$539/h. Recovery time was calculated at \$108/h. Median overall cost of conventional transarterial chemoembolization was \$3,269 (range, \$2,223–\$5,654). This overall cost comprised median room and personnel costs of \$763 (range, \$404–\$1,797), consumable costs of \$1,886 (range, \$1,134–\$4,126), and recovery costs of \$378 (range, \$162–\$864).

Conclusions: The largest contribution (62%) to the real cost of outpatient transarterial chemoembolization comes from the expendable equipment used in the procedure. The angiography suite and personnel costs constitute 25% of the total, and recovery costs constitute 13%. This finding is a change from previous reports in which angiography suite operation was the greatest contributor to cost. Understanding real cost is an essential step in determining the value of the procedure.

ABBREVIATION

HCC = hepatocellular carcinoma

Health care policy makers are increasingly focusing on value to guide resource allocation. Value has been defined as the outcome of any specific treatment divided by the cost required to achieve that outcome (1–4). Value is commonly reported as years of survival per unit

of cost. Outcomes can be adjusted for quality of life after therapy and reported in a standardized format (5).

Traditional medical literature has been built on reporting outcome, and there is an abundance of outcomes data for many conditions. However, data on the cost of therapies or interventions are substantially less available. This lack of data is exacerbated by confusion in the literature between definitions of cost, reimbursement, and charges (6–9). Data on charges and reimbursement are widely available; however, these data often bear little relationship to the actual cost of an intervention. At an individual practitioner level, the ability to determine what a procedure costs is next to impossible. Hospital cost accounting systems are notoriously inaccurate and often built off of erroneous assumptions (10). Cost and cost-effectiveness studies often require extensive assumptions or estimation. Without accurate cost data, value can be neither determined nor compared.

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Locoregional therapy for primary liver malignancy is the prototypic example of therapy that is driven by interventional radiology (IR). The interventionalist assumes increasingly important decision-making responsibility for resource allocation. A large body of data is available regarding the efficacy of various locoregional treatment strategies for primary liver cancer, but data on the costs required to achieve these outcomes are scarce (11–15). The objective of the present study is to determine the actual cost required to perform transarterial chemoembolization in patients with unresectable hepatocellular carcinoma (HCC) at a university medical center. A secondary objective is to establish a methodology that can serve as a reference for future studies.

MATERIALS AND METHODS

This retrospective study was approved by our institutional review board and was performed in a fashion compliant with the Health Insurance Portability and Accountability Act using deidentified procedural and billing records for 36 patients with HCC who underwent 50 consecutive outpatient transarterial chemoembolization procedures between October 2011 and April 2012. All costs were calculated from the perspective of the hospital and college of medicine (5). For purposes of this study, we calculated three distinct costs for each procedure, as follows:

1. The cost of the angiography suite determined by the time in hours the patient spent in the procedure multiplied by the hourly cost to operate the suite. To adjust for the preparation of the room in between cases and to allow for physician reporting and family visits, we added 20 minutes to the procedure time that was recorded on the patient procedure log.

2. The cost of recovery determined by the time in hours spent in the recovery unit multiplied by the hourly rate to operate the unit.
3. The cost of consumable materials used during the procedure, such as guide wires, catheters, and drugs.

Hourly Cost Calculation Methodology

Classic cost accounting allocates cost to specific cost centers (16–18). Hospital costs are traditionally divided into direct costs and indirect costs. Direct costs are subdivided further into direct fixed costs and direct variable costs. Direct fixed costs include costs directly attributed to the procurement and maintenance of the angiography suite. Direct variable costs include the labor costs associated with operation of the equipment and care of the patients during the intervention and the supplies consumed during the procedure. Indirect costs relate to the various types of overhead and administrative support and include costs related to plant operations, hospital administrative personnel support and salaries, radiology director costs, central services, linen and pharmacy and housekeeping costs, and general facility amortization. In addition, separate costs incurred in our practice include costs allocated to the division in support of the college of medicine and its administrative overhead. Cost allocation for this study is depicted in [Figure 1](#).

Because differing cost centers report costs differently, all angiography suite and recovery costs were standardized to an hourly rate. These hourly rates were multiplied by the time in hours that the patient spent in the angiography suite and recovery area to obtain an overall angiography suite and recovery cost. The overall procedure cost was derived by adding the angiography

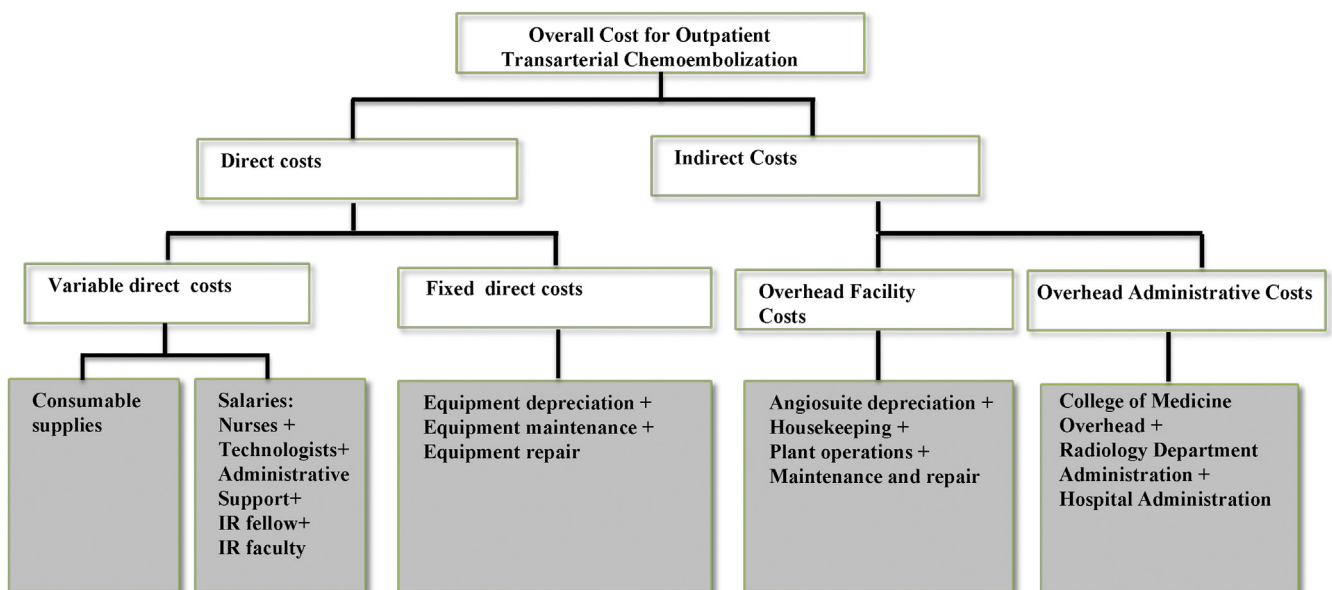


Figure 1. Diagrammatic representation of various cost centers contributing to overall cost of outpatient transarterial chemoembolization in an academic medical center.

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