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## Chapter 4

# Cost-Minimization Analysis

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### ***Objectives***

*Upon completing this chapter, the reader will be able to:*

- ***Define and describe cost-minimization analysis (CMA).***
  - ***Address advantages and disadvantages of CMA.***
  - ***Critique a CMA composite article.***
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## Overview of Cost-Minimization Analysis

As mentioned in Chapter 1, cost-minimization analysis (CMA) measures and compares input costs, and assumes outcomes to be equivalent. Thus, the types of interventions that can be evaluated with this method are limited. The strength of each CMA lies in the acceptability by the readers or evaluators that outcomes are indeed equivalent. As mentioned in Chapter 1, a common example of a CMA is the comparison of generic equivalents of the same drug entity. For a generic medication to be approved for market, the manufacturer must demonstrate to the Food and Drug Administration (FDA) that its product is bioequivalent to the initially branded medication. Therefore, when comparing medications that are the same chemical entity, the same dose, and have the same pharmaceutical properties as each other (brand versus generic or generic made by one company compared with a generic made by another company), only the cost of the medication itself needs to be compared because outcomes should be the same.

Another example of a CMA analysis includes measuring the costs of receiving the same medication in different settings. For example, researchers could measure the costs of receiving intravenous antibiotics in a hospital and compare this with receiving the same antibiotics (at the same doses) at home via a home health care service. Example 4.1 provides a summary of an article that compared inpatient with outpatient care.

### EXAMPLE 4.1 Example of Cost-minimization Analysis (CMA) that Compares Outpatient and Inpatient Costs.

The costs in the following table are based on a study, by Farmer et al., that estimated the costs associated with administering prostaglandin E<sub>2</sub> gel intracervically to expectant mothers on the day before labor was to be induced (to help ripen the cervix). They compared the costs of 1) application of the gel, followed by a 2-hour monitoring period and then sending the expectant mother home for the night compared with 2) application of the gel followed by a 2-hour monitoring period and then sending the expectant mother to the maternity unit overnight. Both groups received oxytocin the next day at the hospital to augment or induce labor.

The **perspective** was that of the payer, so only **direct medical costs** were included. The authors used "usual and customary charges" from one hospital as a proxy for costs because they were readily obtainable. The authors collected and compared the costs associated with labor and delivery but specifically did not include the cost of infant care because newborn outcomes (e.g., Apgar scores) were the same between the two groups. Because the same drug was being administered in the same dose, the authors expected the outcomes for both groups to be the same. In addition, they measured maternal outcomes (e.g., percent of cesarean sections performed, amount of oxytocin needed) and found that there were no statistical differences between the groups. The authors said they conducted a CMA because outcomes were *expected* to be the same, but others (including me) might have labeled it a cost-effectiveness analysis because outcomes were *measured* but found to be the same.

(Continued)

**EXAMPLE 4.1 (continued)**

Type of costs	Costs for Outpatients Mean (n = 40) (Standard Deviation)	Costs for Inpatients Mean (n = 36) (Standard Deviation)	Statistical Difference
Labor costs	\$575 (366)	\$902 (482)	Yes; $p = 0.002$
Delivery costs	\$471 (247)	\$453 (236)	No; $p = 0.754$
Pharmacy costs	\$150 (102)	\$175 (139)	No; $p = 0.384$
Hospital costs	\$3,835 (2,172)	\$5,049 (2,060)	Yes; $p = 0.015$

Adapted with permission from Farmer KC, Schwartz WJ, Rayburn WF, Turnbull G. A cost-minimization analysis of intracervical PGE<sub>2</sub> for cervical ripening in an outpatient versus inpatient setting. *Clinical Therapeutics* 18(4):747–756, 1996.

There is some debate about the use of the term CMA. Some contend that if outcomes are *not measured*, the study is considered to be a partial economic analysis that is termed a **cost analysis** and not a full pharmacoeconomic analysis. In addition, when both costs and clinical outcomes are *measured*, yet clinical outcomes are found to be *equivalent*, some categorize the study as a CMA because outcomes were equivalent, but others categorize the study as a **cost-effectiveness study**, or CEA, (see Chapter 5) because clinical outcomes were measured. (If outcomes were measured and found to be equivalent, I would tend to refer to the study as a CEA.)

Publications that use CMA are less common than other types of pharmacoeconomic studies. One theory for the small number of CMA publications is that there may be resistance to publish studies that only claim that a new intervention (e.g., medication) is no better than the existing option.<sup>1</sup> Also, many CMAs may be conducted in-house by institutions or health plans to determine the least costly option for their specific situation (e.g., based on makeup of their patient bases, policies on inpatient versus outpatient care, and discounts available on various medications) and were never intended for publication.

## Summary

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**Cost-minimization analysis** is the simplest of the four types of pharmacoeconomic analyses because the focus is on measuring the left-hand side of the pharmacoeconomic equation (see Figure 1.1 in Chapter 1)—costs—and the right hand side of the equation—outcomes—is assumed to be the same (or is found to be the same). But this method has limited use because it can only compare alternatives with the same outcomes.

## COMPOSITE ARTICLE: CMA

### TITLE: ECONOMIC ANALYSIS OF ONCOPLATIN ALONE (A CHEMOTHERAPY AGENT) COMPARED WITH ONCOPLATIN COMBINED WITH NONAUSEA (AN ANTINAUSEA AGENT)

**BACKGROUND:** A relatively new chemotherapy agent, Oncoplatin, is administered intravenously in physician offices and clinics. Originally, because of problems with chemotherapy-induced nausea, the recommended administration directions were to split the monthly dose needed for each cycle in half and administer each half 5 days apart. Follow-up studies found that if patients were given NoNausea, an anti-nausea medication, at the same visit, the full monthly dose of Oncoplatin could be given at one visit. Clinical effectiveness measures of the chemotherapy treatment were shown to be the same for the two methods of administration (previous clinical literature should be cited in a real article).

**OBJECTIVE:** The objective of the study was to perform a cost-minimization analysis (CMA) comparing the cost of Oncoplatin given in two doses with Oncoplatin combined with NoNausea administered in one dose. The perspective of the study is the third-party payer.

**METHODS:** Over a 6-month period (February 2007 to July 2007), patients from two oncology clinics were enrolled in this study and randomized to receive either the split dose of Oncoplatin (25 mg/m<sup>2</sup> on days 1 and 5) or the single dose of Oncoplatin (50 mg/m<sup>2</sup>) plus the oral anti-nausea medication (35 mg of NoNausea). Adverse drug events (ADEs) of the treatment were recorded. The average wholesale prices (AWP) of Oncoplatin and NoNausea from the 2007 Redbook were used to estimate prescription costs. Costs for intravenous infusions and physician or clinic visits were estimated using the 2007 *Physician Fee Reference*. Other costs were assumed to be equivalent between the two groups. It was assumed that the physician or clinic visits to receive chemotherapy were in addition to regular visits. Only the first cycle of chemotherapy for each patient was included in the analysis because it was thought that follow-up cycles would produce similar results.

#### EXHIBIT 4.1

Patient Comparisons	Split Dosing of Oncoplatin (n = 293)	Full Dose of Oncoplatin Plus NoNausea (n = 295)
Gender (% women)	54.6%	52.5%
Mean age (SD)	58.3 (10.0)	59.2 (11.0)
Ethnicity (% white)	79.9%	80.7%
Adverse events [N (%)]		
Nausea	13 (4.4%)	12 (4.1%)
Fever	14 (4.8%)	13 (4.4%)
Fatigue	10 (3.4%)	8 (2.7%)
Pain	6 (2.0%)	7 (2.4%)
Other	8 (2.7%)	9 (3.0%)

**EXHIBIT 4.2**

<b>Costs for First Cycle of Treatment</b>		
	<b>Split Dosing of Oncoplatin (n = 293)</b>	<b>Full Dose of Oncoplatin Plus NoNausea (n = 295)</b>
Average cost of Oncoplatin <sup>a</sup>	\$2964	\$2980
Average cost of NoNausea (35 mg) <sup>a</sup>	N/A	\$40
Cost of IV administration <sup>b</sup>	\$160	\$80
Cost of physician or clinic visit <sup>b</sup>	\$128	\$64
Total cost per patient	\$3252	\$3164

<sup>a</sup>2007 AWP costs were 25 mg/m<sup>2</sup> for two doses versus 50 mg/m<sup>2</sup> in one dose.

<sup>b</sup>2007 *Physician Fee Reference*, 50<sup>th</sup> percentile.

**RESULTS:** Demographic and clinical characteristics in Exhibit 4.1 indicate that patients in each group were similar and that there were no statistical differences in adverse effects reported. A summary of costs for the first cycle of chemotherapy is listed in Exhibit 4.2. Although the medication costs are higher in the group with NoNausea, this increase is offset by a decrease in administration and office visit costs. The savings for the once-per-cycle dose was approximately \$88. Sensitivity analyses (Exhibit 4.3) were conducted by varying the medication costs (both chemotherapy and NoNausea costs), office visit costs, and administration costs by 25% above and below baseline estimates. Results were

similar to the base analysis, and savings for the once-per-cycle option ranged from \$68 to \$108.

**CONCLUSIONS:** Direct medical costs associated with the once-per-cycle dose of Oncoplatin plus NoNausea were lower than when the monthly dose was split. Although only direct medical costs to the third-party payer were assessed, if cost savings to the patient (decreased travel costs) and to society (increased patient productivity is possible if less time is spent at the physician's office or clinic) were included, this would further increase the economic advantage of the once-per-cycle option.

**EXHIBIT 4.3**

<b>Sensitivity Analyses</b>		
	<b>Split Dosing of Oncoplatin: Total Cost</b>	<b>Full Dose of Oncoplatin Plus NoNausea: Total Cost</b>
Baseline costs	\$3252	\$3164
Cost of medications increased by 25%	\$3993	\$3919
Cost of medications decreased by 25%	\$2511	\$2409
Cost of IV administration increased by 25%	\$3292	\$3184
Cost of IV administration decreased by 25%	\$3212	\$3144
Cost of physician or clinic visit increased by 25%	\$3284	\$3180
Cost of physician or clinic visit decreased by 25%	\$3220	\$3148

**WORKSHEET FOR CRITIQUE OF CMA COMPOSITE ARTICLE**

1. Complete title?

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2. Clear objective?

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3. Appropriate alternatives?

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4. Alternatives described?

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5. Perspective stated?

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6. Type of study?

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7. Relevant costs?

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8. Relevant outcomes?

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9. Adjustment or discounting?

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10. Reasonable assumptions?

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11. Sensitivity analyses?

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12. Limitations addressed?

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13. Generalizations appropriate?

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14. Unbiased conclusions?

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### CRITIQUE OF CMA COMPOSITE ARTICLE

1. Complete title: The title did identify the two therapeutic options that were being compared. The title did not indicate that the type of study was a CMA.
2. Clear objective: The objective “was to perform a cost-minimization analysis comparing the cost of Oncoplatin given in two doses versus Oncoplatin combined with NoNausea administered in one dose.” This was clear.
3. Appropriate alternatives: The authors explained why the alternatives were important and referenced clinical literature to back up the similarity of outcomes.
4. Alternatives described: The dosing and days of dosing were listed.
5. Perspective stated: The perspective of the study was explicitly stated as the third-party payer, which would entail measuring direct medical costs only.
6. Type of study: The study was correctly identified as a CMA because the outcomes were assumed to be the same based on past clinical research.
7. Relevant costs: Based on the perspective, only direct medical costs to a third-party provider were assessed. Other costs, such as patient or family costs, direct nonmedical costs (e.g., other sector costs), and productivity (indirect) costs, were not measured. Although these were not measured, if they were included, they would have likely increased the amount of cost savings estimated for the once-per cycle dose.
8. Relevant outcomes: Because this study was a CMA, the effectiveness of the two methods of dosing was not directly measured but was assumed to be the same based on previous clinical studies. However, because the avoidance of nausea was an important factor in this treatment, the prevalence of adverse events in both groups was evaluated and was found to be similar. The time period of one cycle may have been too short to determine overall differences for all cycles.
9. Adjustment or discounting: All costs were valued in 2007 US dollars. Costs and outcomes were assessed for less than 1 year, so discounting was not needed.
10. Reasonable assumptions: It was assumed that the office visit for each administration of chemotherapy was in addition to the usual physician visits. If, in fact, administration of some cycles were on the same day as a usual visit, the extra costs of the visit might be slightly lower. It was also assumed that patients would continue to have similar adverse events in future cycles of chemotherapy.



Clinicians might not know if this was a reasonable assumption until patients received more cycles of chemotherapy.

11. Sensitivity analyses: Sensitivity analyses were based on all third-party direct medical costs (medicine, administration, and visits), and the results were found to be robust. Practically, as long as the cost of the anti-nausea drug was less than a visit that included administration of chemotherapy, the once-per-cycle dosing would be cost saving.
12. Limitations addressed: The authors did not directly address any limitations. Readers might ask if some patients are more susceptible to nausea: Should they automatically be placed on once-per-cycle dosing? Costs were measured for only one cycle of treatment. Did any patients ask to switch to twice-a-cycle dosing on subsequent administration because of adverse events?
13. Generalizations appropriate: Although the authors did not directly address generalizations of the findings, costs were taken from standard US price lists, so generalization to general US third-party payers is reasonable. Because of the simplicity and transparency of the calculations, readers could substitute their costs and recalculate estimated cost savings.
14. Unbiased conclusions: As with most CMAs, believability of the findings hinge on one important question: Does the reader accept that the clinical outcomes of the options are the same? If so, as long as the cost of the extra anti-nausea medication is lower than the cost of the extra administration or visit, the choice of once-a-cycle dosing is cost saving.

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### Questions/Exercises:

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Based on the following abstract, which is a condensed summary of a research article, please answer the following questions:

#### ABSTRACT

**TITLE:** Cost Analysis of Outpatient Treatment of Deep Vein Thrombosis

**BACKGROUND:** When patients have the complication of deep vein thrombosis (DVT) after surgery, the standard anticoagulation treatment includes heparin—either intravenous unfractionated heparin (UFH) or a subcutaneous low-molecular-weight heparin (LMWH) product—in combination with warfarin. After the patient's international normalized ratio (INR) is greater than 2.0, the patient discontinues the heparin product but continues on oral warfarin for 3 to 6 months. LMWH products have been approved for outpatient use.

**OBJECTIVE:** The objective of this study was to retrospectively measure the costs of treating patients with uncomplicated DVT discharged with either oral warfarin alone or a combination of oral warfarin and LMWH.

**METHODS:** Medical and prescription claims for Health Plan X were assessed. Costs to the health plan for hospitalized patients discharged in 2006 with a diagnosis of uncomplicated DVT were included in the analysis, and their claims history was followed for 1 year after initial hospital discharge date.

**RESULTS:** Compared with patients discharged on warfarin alone, the outpatient pharmacy costs were, on average, \$750 higher for the patients discharged on the LMWH and warfarin combination, but the average hospital length of stay was 2 days less, resulting in a savings, on average of \$2300 in hospitalization costs. Therefore, mean total costs to the health plan per patient were \$1550 less for patients discharged on combination therapy. One-year follow-up showed no differences in readmission rates due to DVT for the two groups of patients, indicating similar effectiveness.

**CONCLUSIONS:** Outpatient anticoagulation therapy for uncomplicated DVT with a combination of LMWH and warfarin had higher outpatient pharmacy costs but lower hospitalization costs compared with warfarin alone, which resulted in overall savings to Health Plan X.

1. Was the title appropriate? Why or why not?

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2. What was the objective of the study? Was this clear?

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3. Were you able to determine the perspective? If so, what was it?

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4. What type of pharmacoeconomic analysis was conducted? Why?

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5. Was a sensitivity analysis conducted? If so, on what estimate(s)?

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**REFERENCE**

1. Newby D, Hill S. Use of pharmacoeconomics in prescribing research. Part 2: Cost-minimization analysis—When are two therapies equal? *Journal of Clinical Pharmacy and Therapeutics* 28(2):145–150, 2003.

**SUGGESTED READINGS**

- Basskin L. Using cost-minimization analysis to select from equally effective alternatives. *Formulary* 33(12):1209–1214, 1998.
- Briggs AH, O'Brien BJ. The death of cost-minimization analysis? *Health Economics* 10(2):179–184, 2001.

