

# Cost/Volume/Profit Analysis on CT Patient Throughput when Substituting Breeza® Flavored Beverage for Conventional Flavor Enhancers in the Administration of Oral Iodinated Contrast

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## Introduction

Hospital administrators are frequently required to determine the financial impact of substituting supplies, equipment or labor currently used in the provision of services, for alternatives.

One tool employed by administrators to evaluate the financial impact of such decisions is **Cost/Volume/Profit (CVP) analysis**. This paper will utilize CVP to determine the financial impact of substituting Breeza for the conventional flavor enhancer used in the administration of an oral contrast agent.

The basic CVP formula is the breakeven formula:  $\frac{FC}{CMu}$  where FC is fixed costs, and CMu is contribution margin per unit.

Contribution margin is revenue per unit minus the variable cost per unit. The formula calculates the number of units needed to achieve breakeven. When the CMu is multiplied by the number of units calculated to achieve breakeven, the result represents the amount of revenue available to cover total fixed and variable costs.

To illustrate the application of the formula, consider the situation where an administrator is approached by an equipment vendor seeking to lease newly developed software for an MRI scanner.

The vendor may promise increased net revenue, despite the increased investment in the new software, due to the increased speed of the scanner's image processing time, resulting in increased patient throughput. If the annual license fee for the software is \$250,000 and the contribution margin per unit of the typical MRI scan is \$1,400, throughput would have to increase by over 178 scans per year to breakeven.<sup>1</sup>

## Determining Breeza's Breakeven Point

When faced with the decision to substitute Breeza for the traditional flavor enhancer used in the preparation of oral iodinated contrast administered in connection with abdominal CT scans, an administrator's CVP analysis should include a computation of the effect of the decision on the department's breakeven number of scans performed, as well as the incremental revenue generated resulting from changes in scan throughput related to the substitution.

The assumptions used in this analysis are as follows:

1. Total fixed costs remain constant over the range of scan volumes assumed.
2. Average revenue per scan and variable costs per scan remain constant over the range of scan volume assumed.
3. Average revenue per scan (not necessarily the facility's charge per scan) is \$390.13, the 2014 Medicare APC fee, unadjusted, for CT scans of the abdomen and pelvis.<sup>2</sup>
4. The patient will drink two bottles of Breeza per scan at a cost of \$5.92.
5. The cost of the currently used contrast flavor enhancer is \$1.00 per scan.
6. Oral contrast flavor enhancers cannot be separately billed.

To calculate breakeven, consider the following fixed costs<sup>3</sup> and contribution margin allocated to a CT scanner operation located in a not-for-profit institution:

Table 1:

Fixed Costs Per Scan	
Supervisor Wages and Benefits	\$14,275
Radiology Equip. Service Contr.	\$88,102
Office Equip. Service Contr.	\$2,599
Other Repair and Maintenance	\$2,150
Depreciation (or Lease, etc. costs)	\$180,000
Janitorial Services	\$12,500
Building Maintenance	\$1,000
Fixed Building Costs	\$15,000
Property Taxes	\$0
Insurance	\$10,421
Utilities Expense-Fixed	\$11,000
Marketing Expense	\$1,000
Miscellaneous Expense	\$9,300
<b>Total Fixed Costs</b>	<b>\$347,347</b>

Table 2:

CT Abdomen and Pelvis with Contrast Per Scan Revenue and Expenses	
<b>Revenue</b>	<b>\$390.13</b>
Variable Costs	
Variable Labor	\$50.00
Variable Facility Costs	\$2.00
Supplies including contrast	\$40.00
Breeza® flavored beverage	\$5.92
Other	\$10.00
<b>Total Variable Costs</b>	<b>\$107.92</b>
<b>Contribution Margin</b>	<b>\$282.21</b>

Applying the formula to Table 1 and Table 2, the number of scans needed to breakeven resulting from the switch to Breeza increases by 21 as shown below:

#### Breakeven (Fixed Costs/CM per Unit) With Breeza

$$\frac{\$347,347}{\$282.21} = 1,231 \text{ Scans}$$

#### Breakeven (Fixed Costs/CM per Unit) With Conventional Flavor enhancer

$$\frac{\$347,347}{\$287.13} = 1,210 \text{ Scans}$$

Breakeven scans increased as a result of the impact of a decrease in the contribution margin resulting from an increase in variable costs due to the substitution of Breeza for conventional flavor enhancer used in the administration of an oral contrast agent.

**The decision the administrator will have to make is whether the resulting increase in breakeven point can be overcome by an increase in scan volume greater than 21 per year.<sup>4</sup>**

It is understood that different facilities will have different combinations of fixed costs, variable costs and revenue.

Table 3 calculates the additional number of scans needed, per year, to breakeven assuming a switch to Breeza, under a variety of assumptions.

Because the net increase in variable cost per scan of \$4.92 will lead to an increase in the breakeven point, the administrator must also evaluate the associated increase in patient throughput achieved as a result of the substitution of Breeza for the traditional flavor enhancer.

When assuming an average scan time of approximately 10 minutes per scan, theoretical scanner capacity is approximately 48 patients per eight hour shift. A variety of circumstances affect a hospital's inability to achieve theoretical capacity. One such circumstance is the adverse impact on scheduling when oral contrast is indicated.

Table 3:

Additional Scans (per Year) Needed to Breakeven under Various Assumptions							
Revenue per Scan	Variable Costs per Scan w/o Breeza	Variable Costs per Scan w/ Breeza	Fixed Costs				
			\$340,000	\$345,000	\$350,000	\$355,000	\$360,000
\$350	\$100	\$105	27	28	28	29	29
\$350	\$105	\$110	28	29	29	30	30
\$350	\$110	\$115	30	30	31	31	31
\$400	\$100	\$105	19	19	19	20	20
\$400	\$105	\$110	20	20	20	20	21
\$400	\$110	\$115	20	21	21	21	21
\$450	\$100	\$105	14	14	14	14	15
\$450	\$105	\$110	14	14	15	15	15
\$450	\$110	\$115	15	15	15	15	16
\$500	\$100	\$105	11	11	11	11	11
\$500	\$105	\$110	11	11	11	11	11
\$500	\$110	\$115	11	11	11	12	12

# Determining Additional Contribution Margins

In a previous study, Joustra<sup>5</sup> demonstrated that the use of Breeza reduced the time from order to start of the scan, on average, by 21 minutes, increasing scanner throughput. The administrator should consider the impact of increased throughput on a per shift basis. While 24 hour scanner capacity is not likely to be filled, first shift time slots are likely to be filled, resulting in scheduling backlogs for the more desirable time slots.

**Lost patient volume due to avoidable scheduling problems represents a significant opportunity cost for the hospital.**

Consider the following analysis where fixed costs and revenue per scan will not change as a result of a switch to Breeza. These charts calculate the contribution margin per scan and demonstrate the effect on contribution margin (cash flow) solely due to increases in patient volume resulting from the switch.

The administrator can interpret Table 4 in the following manner: If the radiology department can scan one, two or three, etc. additional patients per day as a result of improved

efficiencies gained from the use of Breeza, the department will generate additional cash flow (contribution margin) of \$75,803, \$151,605, \$227,408, etc. over the course of a year. **Notably, only 21 additional scans per year are needed to achieve breakeven.**

Not all facilities will be reimbursed at the Medicare national unadjusted rate of \$390.13, nor will they all incur variable costs of \$107.92 per scan (with Breeza).

Table 4:

Additional Contribution Margin per Year (250 days) with Additional Patient Throughput		
Additional Patient(s) Per Day	Additional Contribution Margin Per Day	Additional Contribution Margin Per Year (250 days)
1	\$283	\$70,803
2	\$566	\$141,605
3	\$850	\$212,408
4	\$1,133	\$283,210
5	\$1,416	\$354,013

**Table 5 displays the annual economic impact of the use of Breeza<sup>®</sup> flavored beverage over a variety of reimbursements and variable costs, to accommodate a variety of payor mix scenarios.**

Table 5:

Additional Contribution Margin Per Year (250 days)						
Revenue per Scan	Variable Costs per Scan	Additional Patients per Day				
		1	2	3	4	5
\$350	\$100	\$62,500	\$125,000	\$187,500	\$250,000	\$312,500
\$350	\$105	\$61,250	\$122,500	\$183,750	\$245,000	\$306,250
\$350	\$110	\$60,000	\$120,000	\$180,000	\$240,000	\$300,000
\$400	\$100	\$75,000	\$150,000	\$225,000	\$300,000	\$375,000
\$400	\$105	\$73,750	\$147,500	\$221,250	\$295,000	\$368,750
\$400	\$110	\$72,500	\$145,000	\$217,500	\$290,000	\$362,500
\$450	\$100	\$87,500	\$175,000	\$262,500	\$350,000	\$437,500
\$450	\$105	\$86,250	\$172,500	\$258,750	\$345,000	\$431,250
\$450	\$110	\$85,000	\$170,000	\$255,000	\$340,000	\$425,000
\$500	\$100	\$100,000	\$200,000	\$300,000	\$400,000	\$500,000
\$500	\$105	\$98,750	\$197,500	\$296,250	\$395,000	\$493,750
\$500	\$110	\$97,500	\$195,000	\$292,500	\$390,000	\$487,500

Other factors may contribute to increased throughput and total scan volume as a result of the use of Breeza in favor of other flavor enhancers. These include: increased patient compliance due to the improved taste leading to fewer incomplete scans; increased patient satisfaction scores leading to improved Medicare reimbursement; more repeat patient business and patient referrals as a consequence of a favorable experience; reduced backlogs, decreased likelihood that a patient would select a competitor with a shorter backlog.

## Conclusion

Despite an initial increase in variable cost associated with the use of Breeza, and the resultant, relatively minor, increase in breakeven scans, the administrator can expect an increase in revenue due to the increase in patient throughput and reduction in backlog for prime scan slots.



**John J. Cergnul, JD, CPA**  
**Biography**

Professor Cergnul was born in St. Louis, MO but was raised in Memphis, TN. He received his Bachelor of Business Administration from the University Of Notre Dame and his Juris Doctor from the University of Memphis. He passed the CPA exam while in law school and started his professional career in the tax department of the Memphis office of Touche Ross (now Deloitte). After a year with Touche Ross, Professor Cergnul moved to South Bend, IN with Coopers and Lybrand (now PricewaterhouseCoopers). He worked in Cooper's South Bend office and their Washington, DC National Tax Consulting office. During this time he also taught tax and accounting courses as an adjunct professor at The University of

Notre Dame and Indiana University-South Bend. He left public accounting in late 1984 for a career in radiology business management. He managed a large private radiology practice for 24 years. Professor Cergnul, while a radiology practice manager, was also active in the Radiology Business Management Association, serving in a number of capacities including that as President of the organization. In 2008, he followed his passion for teaching, leaving the private sector and now teaches tax and accounting courses full time at Saint Mary's College, at Notre Dame, IN.

Professor Cergnul has lectured to professional groups many times, on many tax and business topics. He is also a frequent guest on local radio and tv news programs. He is married with three children and four grandchildren.

<sup>1</sup> The CVP formula can predict the number of units needed to generate a target income as well by adding the targeted income to the fixed cost in the numerator of the formula. For instance, if the required rate of return on the investment in the software was 15%, \$37,500 would be added to the license fee and the numerator would become \$287,500 resulting in the need to increase scan volume by 205 units to achieve the required return on investment.

<sup>2</sup> Addendum B-Final OPPs Payment by HCPCS Code for CY 2014

<sup>3</sup> Cergnul, J. Cost/Volume/Profit Analysis: Strategic Decision Making. RBMA Bulletin Vol. 48, Issue 6, p. 12. Note that the article was prepared using financial information from an out-patient imaging center. The information used in this White Paper has been adjusted to approximate similar costs incurred in an in-patient facility.

<sup>4</sup> Because the number of breakeven scans increases by 1.736% (21/1210), scan volume would have to increase by at least the same percentage in order to achieve the same absolute contribution margin as before the switch to Breeza.

<sup>5</sup> Joustra, B.P.S, Timothy J.; Florida Hospital Tampa & Florida Hospital Carrollwood Breeza Trial White Paper