

# Cost Benefit Analysis and Cost Estimating: Sedated vs. Unsedated Colonoscopy at One VAMC

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## Abstract

A Cost Benefit Analysis of sedated vs. unsedated colonoscopy based on the VA perspective and a 24- hour time horizon is presented. Study data came from the NCHCS Sacramento VA, GI Clinic on demand sedation study, a RCT comparing air vs. water techniques. Data were also used from the VA Allocation Resource Center (ARC) Web, VA DSS Costing Data; workload data, as well as reports from the Veterans Support Service Center (VSSC) Web. VA's direct costs are primarily personnel and medications. Since both procedures use the same space, that direct cost is ignored when examining the difference between the procedures. Fixed costs are costs that do not vary with level of output. The VA perspective obtains a difference of approximately \$58 per procedure, favoring the unsedated alternative, regardless of whether the air or the water technique was used.

## Narrative

This paper reviews an examination of changes to delivering colonoscopy through Cost Benefit Analysis (CBA), which is a group of economic comparisons to help decision makers. All CBA studies must first identify the costs and the outcomes (benefits) for the alternative approaches used to deliver the service. In this case, we are focused on: sedated vs. unsedated colonoscopy procedures at the VA Northern California Health Care System (NCHCS). When we began this pilot evaluation, a decision was required about the perspective – whether cost is defined from the VA's view, the patient's, or both (which would be

society's view). The view proposed in this paper is the VA's, but we have highlighted the patient's view for completeness. Then, the study period, or "horizon," was selected. To simplify the problem for this case, the 24 hours around the colonoscopy was selected. Finally, the focus had to be determined, which was to narrow the scope to only the direct costs to the VA. These decisions frame the analysis and the question being asked.

This framing determines the cost difference of the two procedures for the VA organization. This paper will review CBA cost definitions and terminology and describe the collection and evaluation of local VA data for this specific situation. Practical cost estimation will be applied to illustrate the type of information that can be derived in the VA for this pilot evaluation. The methods are described as:

**Before collecting any data, it is important to do the following:**

1. Recall your objective. In this case, "Is it less costly to the VA to perform unsedated colonoscopies?" This is a simple cost comparison.
2. Document the activities of the procedure carefully, including items that can be valued with a "typical cost value."
3. Estimate future requirements and their values, which may require assumptions.
4. Determine where there is "no difference" between the options being compared to eliminate those costs from your comparison.

- Estimate a value or make tangible even those activities that seem intangible, if used in your comparison.

### Data Sources

The data used for this comparison were collected from a number of sources. Study results came from the NCHCS Sacramento VA, GI Clinic on demand sedation study.<sup>1</sup> Data were also used from the VA Allocation Resource Center (ARC) Web,<sup>2</sup> VA DSS Costing Data,<sup>3</sup> workload data,<sup>4</sup> as well as reports from the Veterans Support Service Center (VSSC) Web.<sup>5</sup>

### The Application

Cost identification requires that we examine all relevant and available costs or estimate what we need. Remember that the focus is on a 24-hour period and that the perspective is the VA's view of costs to the VANCHCS. Costs can either be a one-time expense or a slice of an ongoing cost (e.g., depreciation of equipment). Direct costs are those directly related to the procedure. Thus, VA's direct costs are: personnel and medication. (Note: since both procedures use the same space, that direct cost is ignored when examining the difference between the procedures). Fixed costs are costs that do not vary with level of output. Intangible costs are benefits or dis-benefits that are not easily quantified but might affect the use of the procedure or service. For instance, from the VA's perspective, intangibles could cause negative or positive press.

The estimate takes into account the identified costs associated with each procedure. It uses only direct medical supplies and personnel costs. In order to simplify the costs, additional assumptions were developed, when needed. These assumptions included:

- Each technician, nurse practitioner, registered nurse, and physician "typically" works a five-day/40 hour work week.
- The VA salaries are not per procedure, so the staff would be present at the clinic, even when no procedures were being preformed.
- Additional fixed costs that remained the same for both

procedures were not part of the analysis but are shown in the final tables for completeness.

Table 1 shows seven activities that might have costs. In both the sedated (usual care) and in the unsedated (innovative care) approach, we see that many of these costs are the same and, therefore, can be ignored, since we are looking for the direct cost differences. Since sedation time and recovery time can be different depending on whether air or water is used, these are included.

In the comparison of Table 2, developed from a study of scheduled, on demand sedation at the Sacramento GI Clinic,<sup>1</sup> the two center columns represent the assumptions of time. An average sedation time of 12 minutes was made. If the right-most column, or more extreme option, of "scheduled, unsedated" procedure, was accepted by a facility and their staff, and/or the patient as the "innovative care," then some of the "VA's direct costs" could completely disappear (e.g., medication and additional required staff).

**Table 1:** What are the Expected Cost Differences?

Activity	Usual Care - Sedated	Patient-Centered Innovative Care - Unsedated
<b>If VA's Perspective is adopted:</b>		
3. Pre-procedure time	Same	Same
4. Procedure time	Same	Could be longer
5. Sedation time	Required – varies by air or water	None
6. Recovery time	Required – varies by air or water	None
<b>If Patient's Perspective is adopted:</b>		
1. Patient's family or driver	Same	Same
2. Patient's prep time	Same	Same
7. Patient's time to resume activity	~17 hr	Almost immediately <sup>8</sup>

**Table 2:** Assumptions

	Scheduled Sedated	Scheduled On Demand Sedation		Scheduled Unsedated
		Sedated	Unsedated	
<b>If VA's Perspective is adopted:</b>				
Pre-procedure time	Same			
Procedure time	Same			May be longer
Sedation time	Required	12 min	none	none
Recovery time (on site)	Required	Required	none	none
<b>If Patient's Perspective is adopted:</b>				
Driver	Required	Required	Required	No <sup>8</sup>
Prep time	Same			
Resume activity	~17 hr <sup>7</sup>	~17 hr <sup>7</sup>	Almost immediately <sup>8</sup>	Almost immediately <sup>8</sup>

Source: VA Sacramento GI Clinic On Demand Study 2006.

Table 3 reflects estimated costs associated with sedated and unsedated colonoscopies. Within each type of procedure, the option whether air or water method was used is shown. This table summarizes the calculation for personnel involved in the procedures. These are VISN 21 salary estimates (without benefits). (Note: To get a more inclusive estimate one could add 28% for benefits.) Personnel Costs are from the Veterans Equitable Resource Allocation (VERA) 2009 Labor Index for VISN 21 detailed to our (NCHCS) facility and were computed using four pay periods from FY08; i.e., “Normal Pay.” The difference per procedure in personnel costs is a cost savings of

\$56.40 for the unsedated care option over the sedated procedure. This impact is from VA salary costs alone.

There are different VISN 21 costs associated with the alternative medications used for sedation; benadryl 50 mg = \$0.81 cents, fentanyl 100 mg = \$1.38/vial, and versed 5 mg/5 ml = \$0.91 cents/vial. Table 4 associates these costs with colonoscopies performed either with air or water techniques in the on-demand sedation study. Although these costs are small per procedure, they are VA costs and, over numerous procedures, would add up and should be captured for completeness.

**Table 3:** Personnel Costs Associated with Procedures

VA Personnel Cost - Sedated Procedure							
ITEM	FTE	SALARY for each	\$ Per Pay Period	\$ Per Week	\$ Per Day	Per 8 hr Shift	Cost
RN	2	\$78,208	\$3,008	\$1,504	\$300	\$37	\$75
Physician	1	\$149,248	\$5,740	\$2,870	\$574	\$71	\$71
Technician	1	\$56,296	\$2,165	\$1,082	\$216	\$27	\$27
<b>TOTALS</b>	<b>4</b>	<b>\$283,752</b>	<b>\$10,913</b>	<b>\$5,456</b>	<b>\$1,091</b>	<b>\$136</b>	<b>\$174</b>
VA Personnel Cost - Unsedated Procedure							
RN	0.5	\$78,208	\$3,008	\$1,504	\$300	\$37	\$18
Physician	1	\$149,248	\$5,740	\$2,870	\$574	\$71	\$71
Technician	1	\$56,296	\$2,165	\$1,082	\$216	\$27	\$27
<b>TOTALS</b>	<b>2.5</b>	<b>\$283,752</b>	<b>\$10,913</b>	<b>\$5,456</b>	<b>\$1,091</b>	<b>\$136</b>	<b>\$117</b>

Source: Veterans Equitable Resource Allocation (VERA) 2009 Labor Index for VISN 21.

**Table 4:** Medication Costs Associated with Procedures

SEDATED WATER			SEDATED AIR	
ITEM	Cost		ITEM	Cost
Benadryl	\$0.81		Benadryl	\$0.81
Fentanyl	\$0.78		Fentanyl	\$0.73
Versed	\$0.21		Versed	\$0.19
<b>TOTALS</b>	<b>\$1.80</b>		<b>TOTALS</b>	<b>\$1.72</b>
UNSEDATED - Water			UNSEDATED - AIR	
ITEM	Cost		ITEM	Cost
Benadryl	\$0.00		Benadryl	\$0.00
Fentanyl	\$0.00		Fentanyl	\$0.00
Versed	\$0.00		Versed	\$0.00
<b>TOTALS</b>	<b>\$0.00</b>		<b>TOTALS</b>	<b>\$0.00</b>
Type	Total benadryl in mg. Prior to cecum	Total fentanyl in mcg. Prior to cecum	Total Versed in mg. Prior to cecum	
SEDATION Air technique	50	52.7	2.04	
NO SEDATION Air technique	0	0	0	
SEDATION WATER technique	50	56.82	2.27	
NO SEDATION WATER technique	0	0	0	
<b>TOTAL Sedated</b>	<b>\$3.52</b>			
<b>TOTAL Unsedated</b>	<b>\$0.00</b>			
<b>Sedation Cost Difference</b>	<b>\$3.52</b>			

**Table 5:** Cost Estimate of Both Procedures, given the Water and Air techniques

	Sedated Water N=11	Unsedated Water N=39
<b>VA's Perspective:</b>		
Pre Op Procedure	Same	
Procedure	Same	
Medication	\$2	\$0
Personnel	\$174	\$118
Equipment	Same	
<b>TOTAL</b>	<b>\$176</b>	<b>\$118</b>
<b>VA's Perspective:</b>		
	Sedated Air N=23	Unsedated Air N=27
Pre Op Procedure	Same	
Procedure	Same	
Medication	\$2	\$0
Personnel	\$174	\$118
Equipment	Same	
<b>TOTAL</b>	<b>\$176</b>	<b>\$118</b>

All of the VISN 21's personnel and medication costs were used to calculate totals for each procedure in Table 5. Where there were "no differences," the amounts were indicated as "same" for either procedure.

### Variations on the Comparison Taken for VA's Perspective

If one were to look at this from the patient's perspective, the benefit of the "new" approach is not being sedated, and the patient's wages are not lost for the duration of arriving for the procedure, undergoing the procedure, and the following day. This would be the benefit to the patient. Our best estimate would be the value of that time at their expected wage, which we can estimate. It should be noted that estimating the patient's benefit this way assumes an "opportunity cost," because the patient could be working. Thus, recovery time and time until return to normal activity is "valued" at an estimated wage and fringe amount. Additionally, if unsedated patients can drive themselves home and can return to work either later that day and/or the next morning, there is less of a "cost" than if sedated. These are intangibles or societal costs that were not used in this VA perspective comparison but could be used in a patient's perspective comparison.

### Findings and Conclusion

The VA perspective obtains a difference of approximately \$58 per procedure, favoring the unsedated alternative, when the water technique is used. If the air technique is employed, the VA difference is again the \$58 savings for the unsedated.

In conclusion, within this particular pilot study, given our assumptions, the unsedated procedure would be a definite cost savings (benefit) to the VA because the VA is allocated funding from a workload-driven perspective. With further research it could be determined that more patients could be seen, less staff could be utilized and, therefore, used in delivering more services to other veterans, while we would be providing a safe and efficient alternative procedure.

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