VALUE ENGINEERING - A PRACTICAL APPROACH TO MANAGING COST IN CRITICAL CARE

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I.  INTRODUCTION

Critical care, being highly capital and equipment intensive, is very expensive care. This not only poses a big problem for the patient but also for the health care providers who often express their inability to provide resources. Lot of strides have been made in the management of hospitals aimed at reducing cost. Introduction of Day care surgery, Hospital concept, Laparoscopic and key hole surgery with early discharge from the hospital are only few examples. It is because of cost reduction such as above the load on critical care could have increased for, more and more patients, admitted with complication, often land up in critical care unit. This scenario, in addition to ever rising cost of critical care, forces the intensivists to reduce cost without compromising quality of care in the intensive care units. Individual intensivists and health care professionals can and even do cost reduction from time to time. However, such isolated efforts cannot sustain it and only a systematic collective approach can sustain it. Since cost reduction holds the key to making critical care affordable, it is our primary duty to sustain cost reduction in critical care units. It is needless to mention that business houses are out to sell their products after camouflaging our ideas and through processes often making us spend more. It may not affect us as health care givers but it hits the health care provider and the hapless patient for whom we are supposed to be focused and concerned. It is therefore mandatory that we make our employer spend less and the patient pay less for the similar or even better service we offer.

Value Engineering (VE) is a unique systematic collective cost reduction approach which has been immensely successful in engineering industry. It could be equally effective in hospitals and critical care units. It is defined as systematic step by step approach intended to achieve the desired functions of a product, process, system or services at an overall minimum cost without in any way affecting quality, reliability, performance, delivery, safety or the environment. While cost reduction is the basic objective of this approach, it focuses on product/service function and through creative ideas invariably minimizes unnecessary costs.

VE was first developed and perfected by Lawrence D Miles, a purchase executive in General Electric company (GEC), USA during world war II; thanks to the material shortage in the armament industry prevailing at that time. Under trying circumstances, Larry Miles was asked to find out alternatives with reduced cost which he did without altering quality of service. Larry called it ‘Value Analysis’. Later this technique was adopted by US Navy-Bureau of Ships in 1954 and it was directed at Cost Avoidance (during the design stage) of millions of dollars. It has been since then known as Value Engineering (VE). Tata Iron and Steel Company is a pioneer in India in adopting this technique since the late 80’s. A study of 500 completed projects shows that in addition to reducing cost in all cases, there was improvement in other areas such as quality, productivity maintainability, performance, durability, reliability and availability (Fig 1).

Value of a particular service is calculated as:

\[
\text{Value (V)} = \frac{\text{Needed performance (P)}}{\text{Over all cost (C)}}
\]

Needed performance is decided by the customer (patient) and it is the job of every physician to determine this as exactly as possible. Value (V) can be increased by

a. Decreasing costs (C) while increasing performance (P)

\[
V = - \frac{P}{C}
\]
Decreasing $C$ while ensuring some level of $P$.

C

\[ V = - \frac{C}{P} \]

c. Increasing $C$ and $P$ but increase of $P$ is $> \text{increase of } C$.

\[ V = -\frac{C}{P} \]

d. Increasing $P$ while maintaining same level of $C$.

II. REASON FOR POOR VALUE

It is believed that any service/product has approximately 20-30% unnecessary cost added to its actual cost resulting in its diminished value. This is caused by the following ways.

1) Lack of Information: Continued application of a particular service to meet a needed performance even when the situation has changed could increase the cost of service such as continuing to use the oxygen manifold to get oxygen in the ICU even when it is leaking.

2) Honest Wrong Beliefs: Many clinicians believe that intra arterial line placement often causes gangrene of the fingers/ toes and therefore should not be used in ICU even when this method of Blood Pressure measurements is very cost effective.

3) Habitual Thinking: Thinking and doing things in the traditional way is a frequent cause of poor value. “Using the ECG leads supplied by the original supplier of the ECG monitor is very good” - a thinking that most clinicians possess. That changing this mindset would make them save a lot of unnecessary cost does not so easily get registered in them.

4) Negative Attitude: Some people believe that they are already doing the best and there is therefore no scope for improvement. They think that cost is synonymous with high quality and therefore very thought of reducing costs upsets them. Using high cost antimicrobials when the same or even better desired performance can be achieved by low cost antimicrobials is one such example.

5) Shortage of Time: Most of us are in a hurry to finish the work at the earliest. This affects the decision making during discussions resulting in a not so cost affective solution.

6) Change in Technology and Specification: As technology is changing rapidly, the products processes and systems tend to get obsolete quickly in favour of new economical and more efficient ones. Such changes if ignored lead to sub-optimal performance. New monitors and gadgets are some of the clear examples.

III. STEPS OF A VE PROJECT

- Orientation phase
- Information phase
- Function phase
- Creation phase
- Evolution phase
- Recommendation phase
- Implementation phase
- Audit phase

These steps have only one objective and that is to identify & minimize the unnecessary costs resulting in improved value.

1) Orientation Phase: This comprises of 3 steps such as training in VE, selection of projects and selection of team leader and members. The project is selected on the basis of a Pareto analysis of all the costs. The Pareto law of 20-80 means 20% items account for 80% of costs. For example Pacemakers, Oxygen and antimicrobials account for nearly 60% of total cost in Tata Main Hospital ICU and therefore projects taken up in such areas would reduce the overall cost of ICU treatment substantially (This has infact been done with the first two items). The team leader should be a senior member for ease of implementation of the recommendations and the members should be picked up from the most impacted users such as intensivists, nurses and even electronic engineers working in ICU. The article on “Indigenous improvisation in the use of ECG lead in a multi-disciplinary ICU” is a clear example depicting the formation of such a team.
2) Information Phase: The team collects all relevant data. Even though it is not possible to collect all of 100% correct data, it is assumed that 50% of accurate data could be collected within a given item; based on this a decision can be taken. The attitude of team needs to be “You Win - I Win”. While asking questions for gathering data to various specialists the members must realize that those who are answering are most knowledgeable and they would be the same people who make the decision to implement. It is important to get right kind of information and therefore the right kind of searching questions need to be asked.

3) Function Phase: Function is what makes an item work (Use Value) or sell (Esteem Value). It is described in two words an active verb and measurable noun and classified into Basic Functions and Secondary Functions. In the above mentioned article, malfunctioning of the ECG set was due to frequent fracture of the connecting wire which comprises of inner wire and insulator. The inner wire receives (verb) signal (noun), transmits (verb) signal (noun), resists (verb) stress (noun) and provides (verb) flexibility (noun). The earlier two functions are basic functions and later two are the secondary functions. Larry Miles said “All cost is for function”. A customer does not want to pay for unnecessary function. Take the example of a customer wanting to have fruit juice only and not the container and therefore he does not wish to pay for the container; but since without the container, it cannot be marketed, even though it is unnecessary, it cannot be avoided. In the same article, the insulator or the wire only protects the wire and therefore an unnecessary cost but it cannot be avoided as otherwise wire will be subjected to wear and tear and aesthetics of the wire would be lost.

The function phase finds an answer to three questions: 1) What does it do? 2) What does it cost? and 3) What is its worth? After determining the level of function (Basic or Secondary), a function - cost analysis is done where costs are ascribed to each function. Worth is defined as the lowest cost to achieve the basic function.

4) Creation Phase: An attempt is then made by the team to generate alternative method to answer “what else could do the same function?” A brain storming session is required at this stage to generate multiplicity of ideas and ideal attributes of an item (in the article, ECG set).

5) Evaluation Phase: The attributes are evaluated on the basis of a four point scale (3,2,1,0) and each is compared with the rest in the Evaluation Matrix. The cumulative score of each attribute is calculated and ranked in the descending order. The most appropriate ideas or suggestions are matched against the attributes in the Decision Matrix to find out the best suggestion.

6) Recommendation Phase: The VE team then develops and refines the best suggestion by detailed testing and decide on the implementation plan. The presentation of the recommendations to the users i.e, clinicians and nurses, is a part of this phase.

7) Implementation Phase: The ‘work orders’ for the necessary actions are prepared and the design is finally made. Once it is introduced, the observations and results are noted, analyzed and discussed in the team meetings before it is finally sent for approval.

8) Audit Phase: Two types of audits are performed: 1) Technical audit and (2) Cost audit. During the technical audit, the VE group comprising of value engineers and experts assess the technical advantages as claimed by the VE team members. The cost audit is then done to assess the actual savings which may be one time or recurring (every year). Most of our projects in critical care setting are associated with a recurring saving.

The article presented in this issue is the brain work of the team members who are directly involved in the management of Cost in ICU at Tata Main Hospital. This article has been recognized in the highest level (MD’s level) of Tata Iron and Steel Company’s Annual VE night in the year 1998-99. This work suggests that VE efforts in critical care could be successful in bringing about cost reduction without comprising quality.
REFERENCES


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Fig. 1: Overall VE Effectiveness