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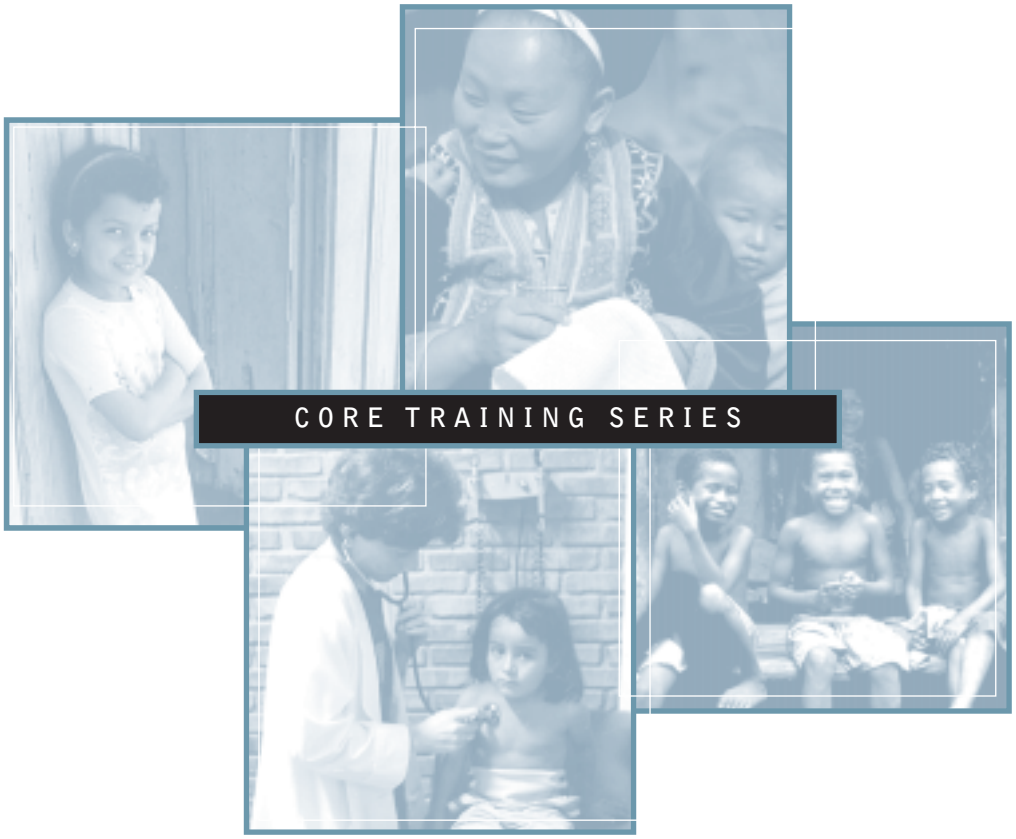

Cost and Quality in Healthcare

Reference Manual

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The Quality Assurance (QA) Project is funded by the U.S. Agency for International Development (USAID), under Contract Number HRN-C-00-96-90013. The QA Project serves countries eligible for USAID assistance, USAID Missions and Bureaus, and other agencies and nongovernmental organizations that cooperate with USAID. The QA Project team consists of prime contractor Center for Human Services; Joint Commission Resources, Inc.; and Johns Hopkins University (including the School of Hygiene and Public Health [JHSPH], the Center for Communication Programs [CCP], and the Johns Hopkins Program for International Education in Reproductive Health [JHPIEGO]). The QA Project provides comprehensive, leading-edge technical expertise in the design, management, and implementation of quality assurance programs in developing countries. Center for Human Services, the nonprofit affiliate of University Research Co., LLC, provides technical assistance and research for the design, management, improvement, and monitoring of health systems and service delivery in over 30 countries.

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Module 1- Defining Quality

On Quality

There is no right or wrong definition of quality. There are really multiple dimensions of quality, depending on the variety of perspectives on quality (for example, the perspective of the client/family, the community, the provider or the organization/healthcare administration). It is also important to acknowledge that the differences and seemingly opposite definitions of quality can operate at once and may need to be reconciled (e.g., a provider's technical accuracy of not giving injections conflicts with a parent's expectations of a shot as the best available treatment). Still, compliance with standards (technical accuracy) is a major underpinning of quality.

On Quality Assurance

Anything you do to measure (assess) or improve quality can be considered as Quality Assurance (QA). For example, supervision, keeping medical and facility records, reminding each other of proper diagnostic techniques, doing patient education, training staff in standards of care, fixing problems, gathering monitoring (MIS) data and so on can all be thought of being quality assurance activities.

Quality assurance can consist of three different levels: a QA tool (such as flowchart), a QA approach (such as problem-solving teams) to a QA program (teams, an accreditation program, etc).

QA looks for sources of problems in **systems and processes**, not bad performers. For instance, giving the patient the incorrect medication from the dispensary might happen if the medicines are not properly labeled.

The following is an excerpt from a Quality Assurance Project publication on institutionalization of QA in healthcare[1]. The excerpt provides some additional explanation of quality and QA principles.

[1] QAP, 2001a.

"Fundamental Principles of Quality Assurance for Application in Developing Countries:

> Much of the approach to quality assurance and its institutionalization presented in this paper is built on the teachings and principles of established leaders in the field of quality, notably W. Edwards Deming, Joseph M. Juran, Avedis Donabedian, and Donald Berwick.[2] The Quality Assurance Project (QAP) has adapted the methods, approaches, and strategies of these leaders for use in developing countries. Within a relatively short time, many developing countries have progressed from providing rudimentary health services for a limited set of people, to more extensive coverage with a broad package of services. In the face of such rapid progress, it is not surprising that several traditional components of QA were commonly overlooked (e.g., setting standards, monitoring for compliance, or incorporating new technologies into professional training). Thus, QAP's approach to quality assurance for developing countries incorporates more traditional QA methodology (e.g., accreditation, regulation, and standards) with newer methods, such as continual quality improvement.[3]

Dimensions of Quality

1. **Technical performance:** The degree to which the tasks carried out by health workers and facilities meet expectations of technical quality (i.e. comply with standards).
2. **Effectiveness of care:** the degree to which desired results (outcomes) of care are achieved.
3. **Efficiency of service delivery:** The ratio of the outputs of services to the associated costs of producing those services
4. **Safety:** the degree to which the risks of injury, infection or other harmful side effects are minimized
5. **Access to services:** The degree to which health care services are unrestricted by geographic, economic, social, organizational or linguistic barriers
6. **Interpersonal relations:** Trust, respect, confidentiality, courtesy, responsiveness, empathy, effective listening and communication between providers and clients.
7. **Continuity of services:** Delivery of care by the same health care provider throughout the course of care (when appropriate) and appropriate and timely referral and communication between providers.
8. **Physical infrastructure and comfort:** The physical appearance of the facility, cleanliness, comfort, privacy and other aspects that are important to clients.
9. **Choice:** When appropriate, client choice of provider, insurance plan, or treatment.

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[2] Deming, W.E. 1982. *Quality, Productivity, and Competitive Position.* MIT Center for Advanced Engineering Study: Cambridge, MA. Juran, J.M. 1988. *Juran's Quality Control Handbook* (Fourth Edition). USA: McGraw-Hill, Inc. Donabedian, A. 1980. *Explorations in Quality Assessment and Monitoring*, Volumes I, II, and III. Ann Arbor, MI: Health Administration Press. Berwick, D. 1995. *Improving Health Care Quality*. Boston: Institute for Healthcare Improvement.

[3] Nicholas, D., L. Winter, X. Crespin, and A. M. Boukar. 1997. Results of CQI in Africa: the Niger experience. In *The Effectiveness of CQI in Health Care: Stories from a Global Perspective.* ASQC Health Care Series. Milwaukee: ASQC Quality Press Publications.

During the last eight years, QAP's work experiences in over 25 developing countries have indicated that despite variations among QA programs in different countries, a common set of essential elements is needed for QA to become institutionalized in an organization or health system. The QAP approach to quality assurance is founded on the importance of client perspectives and needs, systems and processes, the use of data for decision-making, and teamwork to solve problems. These four related principles are described below:

Client perspective and needs – QA recognizes that health services exist to meet the health needs of clients.[4] This principle emphasizes the importance of knowing who the clients are, while understanding and trying to meet their needs and expectations. Clients include those within the organization (often referred to as "internal" clients)—who have needs and expectations from other colleagues to be able to do their work well—as well as external clients (the target population and other stakeholders).

Systems[5] and processes[6] – QA recognizes that unclear, redundant, or incomplete systems or processes may be a source of problems in the delivery of quality care. Instead of blaming the people working in these systems for poor performance, QA activities involve people in the prevention, detection, and resolution of problems within processes or systems, in order to improve the quality of care.

Data-based decisions – QA emphasizes the need to improve processes by understanding how they function. This principle promotes decision-making based on accurate and timely data, rather than on assumptions. Understanding and using data also means understanding variation: whether variation is a normal part of the process or whether it indicates a real change.

Teamwork – QA focuses on participation and teamwork to solve problems and implement quality solutions, recognizing that the impact of QA activities is most powerful when the participation, experience, and knowledge of major participants and stakeholders is included.

These principles serve as the foundation for QA, and reflect that QA is not just a set of activities, but also a fundamental set of beliefs and values that become a "way of doing things" in an organization. These principles

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[4] The term "client" refers to the health services' target population, whether it is for curative, health education and promotion, rehabilitation, or prevention services.
[5] A system is the arrangement of organizations, people, materials, and procedures associated with a particular function or outcome. A system is made up of inputs, processes, and outputs (outcomes, effects, and impact).
[6] A process is a series of actions that transforms inputs into outputs.
[7] The quality management literature often includes leadership as the fifth principle. In our model of institutionalization, we include leadership within the model.

are in accordance with those espoused in the quality management literature.[7] In addition to technical QA activities to define, monitor, and improve quality, other support functions are needed to sustain QA in any organization. Also necessary is an implementation structure, as well as an enabling environment that supports QA through its policies, institutional core values, committed leadership, and allocation of necessary resources. When such an environment and structure exist within an organization, and QA activities are carried out with the appropriate support, certain changes occur in the organizational culture, leading to a "culture of quality." This culture is one in which staff view quality as a primary objective of their work and value it as a reward in itself, and where clients expect quality care among their rights as human beings, citizens, and payers of care. The existence of such a culture of quality is an indication that QA has become integrated into the "fabric" of the organization. It is truly "institutionalized" and will be sustained.

The most comprehensive, yet perhaps the simplest definition of quality is that used by advocates of total quality management: "Doing the right thing, right, right way." The QAP describes [nine] dimensions of quality: [technical performance, effectiveness of care, efficiency of service delivery, safety, access to services, interpersonal relations, continuity of services, physical infrastructure and comfort, choice.]

While drug distribution, manpower planning and allocation, and technical and professional training systems contribute and are necessary for quality care, quality assurance is the lynchpin ensuring that systems and processes work effectively and in synchrony to achieve quality care.

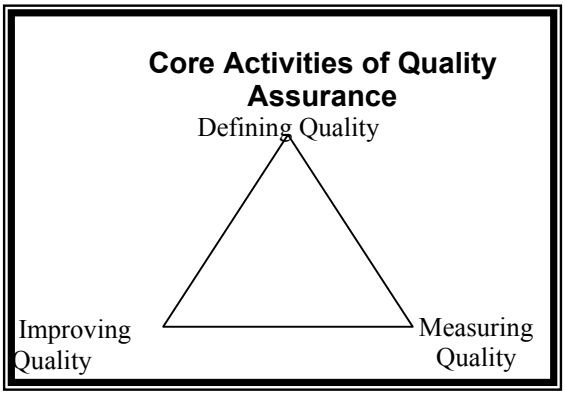
Quality assurance is a core set of activities that contribute to defining, designing, assessing, monitoring, and improving the quality of healthcare. There is no "correct" sequence to implementation of these activities: appropriate selection and implementation of QA activities will depend on the capacity of the health delivery system and the presence of other essential elements in the QA framework. However, these QA activities are synergistic in nature, with the greatest impact on quality of care being achieved when all of these activities are carried out in a coordinated fashion. Each angle of the triangle contains a core activity. A progression of related subactivities are listed along the contiguous arm in the smaller triangles following each description.

Defining quality: clarifying what is needed to produce quality. Includes defining, setting, and updating clinical and administrative standards for health services (based on the best scientific evidence currently available), communicating standards, and design of accreditation, licensing, or certification standards. Stakeholder perception of quality (including client and community input) is an important contribution to defining

quality.

Measuring quality: systematic identification of what level of quality the system is currently producing. Includes collecting and analyzing data that provides information about level of adherence to established guidelines and standards, problems encountered that limit adherence, and opportunities for quality improvement through audit, supervisory assessments, self-assessment, or other methods.

Improving quality: systematically improving the quality of care by addressing the gaps between current practices and desired standards, through management decisions, rapid-cycle problem solving, team-based problem solving, process improvement, and quality redesign. Performance improvement activities also contribute to improving quality."



Further reading:

QAP (Quality Assurance Project). 2001a. Institutionalization of Quality Assurance, Project Report. Bethesda, MD: Published for the U.S. Agency for International Development (USAID) by QAP.

Module 2: Cost and Quality

What is Cost?

As with the definition of quality – which varies based on the perspective we are looking from (i.e., whether it is from the perspective of the client, the provider, the health care facility or the community in general) –, there can be multiple definitions of cost. The definition may also vary slightly based on who incurs the cost.

In non-technical terms, the word "cost" connotes a loss or a sacrifice, that may or may not be quantifiable, but is usually incurred in the course of gaining something.

"Cost" also implies the value of that something that is disbursed to obtain a benefit or is the quantity of one thing that is exchanged for a service or a product. In more technical jargon, cost can be defined in economic and financial terms described below:

- ***Monetary or financial cost*** – expenses incurred for an input or to provide a product or service, at a given time (e.g., prices paid for medical supplies, price charged for a clinical service).
- ***Economic or opportunity cost –*** the value of benefits forgone by using resources to provide alternate products or services (e.g., the value of employee's time engaged in work outside of primary job duties, the value of resources spent on an unnecessary lab test).
- **"*Accounting*" *cost*** – costs applied to reflect the real value of a product or service at a given time; the cost is not actually incurred (e.g., depreciation allowance for medical equipment).
- **"*Shadow*" *prices*** – costs applied to goods and services whose true value is not the same as listed (e.g., value of donated equipment, the time of volunteer staff).

It is important to note that in health care quality assurance, some of the most important costs are those costs that are, as Deming described, "unknown and unknowable". These are costs that result from poor quality but may not be recognizable directly or immediately, for example the cost of a dissatisfied customer, the cost of a frustrated health worker or the cost of prolonged infection.

Generally, costs or resources are divided into three major categories: costs related to people and their time (personnel), costs of equipment or capital (machine), and cost of resources that are frequently replenished (materials and supplies).

These general categories of cost can be analyzed in different ways depending on the specific need.

Refer to the Glossary of Terms available in the participant's manual for some definitions of the more common dimensions of cost. Note, the terminology for the dimension often tend to be applied in different ways by different professionals, though a standard definition of the terms is generally accepted in the field of economics or accounting. It is therefore often very important to clarify the specific meaning being applied to a given term in a given situation. Hence, one may look at:

Direct vs. Indirect Cost
This typically is used when the cost of a specific good or service is being assessed, and the person is evaluating the resources that are used directly or primarily to produce that good or service, versus those that are indirectly used to produce that good or service. The indirect costs or resources are therefore not easily traced to that good or service. Examples of direct costs for examples are hospital supplies, pharmaceuticals, labor costs for some personnel. Indirect costs are typically called overhead costs, such as the cost of electricity, insurance, salaries of executive personnel.

Obvious vs. Hidden Cost
Using these dimensions, the distinction is made about whether a cost (or resource) is incurred directly (obvious) or whether the costs are incurred due to morbidity, premature mortality or loss of productivity (hidden). For example, for a patient receiving treatment for a disease, obvious costs are the expenses paid for receiving services, purchasing drugs, and transportation to and from the care facility. Hidden costs are the value of goods and services that were not produced because of the patient being ill or dying prematurely. In the quality field, from the perspective of the organization, hidden costs may be the lost revenue from a patient not returning to the organization because of dissatisfaction with the service. In this scenario, an obvious cost may be the cost of providing the particular patient the service as well as the cost, for example, of responding to or correcting the patient's complaints.

Some dimensions of cost look at whether an expense varies in time (e.g., within a year or more frequently), whether the expense depends on the quantity or volume of goods and services produced. In this case, the terms "*capital*", "*investment*" *or* "*fixed*" *cost* would be used vs. "*recurrent*" *or* "*variable*" *cost*. Note the terms for "capital" and "investment" cost may also be used fairly specifically, for example to refer to expenditures required to finance permanent or semi-permanent capital goods such as buildings, equipment (capital) and resources expended one time initially to launch a program or intervention (investment).

For example, a fixed cost can include rent, equipment lease payments, and some wages or salaries. Variable costs can also include some salaries, as well as drugs, and diagnostic tests.

Unit Cost
The term unit cost is frequently used to mean the cost to produce (or the cost per) one unit of a good or service. For example the unit cost of a delivery is the cost of delivering one pregnancy, and may include direct and indirect costs (such as gloves and drugs, as well as some portion of the cost of the operating room and the delivering staff's time).

Average Cost
The term average cost is also the cost of producing one unit of a good or service but is derived by dividing the total cost of producing all the units of a good or service by the number of units. For example, the average cost of a delivery in a clinic that only provides delivery services (for simplicity sake, assume this is the case) can be obtained by dividing the total cost incurred for running that clinic by the number of deliveries the clinic actually produced. This can also be used as an estimate of the unit cost of a delivery.

Incremental Cost
The term incremental cost is the cost that differs among alternative courses of action. For example, the incremental cost of a program to immunize 500 children versus a program that can immunize 250 children is the amount of additional resources (e.g., additional supplies and staff) needed to implement the larger program.

Further Readings:

Reynolds, J., Gaspari, K.C. "Cost-Effectiveness Analysis" PRICOR, Monograph Series, Method Brochure No. 2, 1986, pages A-1 to A-17.

Quality in Cost Terms

One of the objectives in the field of cost and quality is to define and manage the cost of quality, requiring that the investments made in improving quality (e.g., through quality assurance) are justified by the rewards/benefits obtained by minimizing or eliminating poor quality.

In this challenge, the type of quantifiable costs defined above are certainly important and need to be assessed, e.g., to quantify the cost of a quality assurance program, or the value of resources saved by improving the quality of clinical service delivery.

This perspective allows us to put quality in cost terms where the cost of poor quality is made equivalent to the time and money spent on something that does not help the client and is the cost of not doing things right the first time and having to do them over.

Waress[8] describes this idea by saying that "costs associated with quality are those costs that would not be expended if quality was perfect."

Tying these definitions to QAP's definition of quality described earlier ("Quality is compliance with standards"), the cost of quality includes:

a) costs incurred in achieving/maintaining quality standards, and

b) costs resulting from not achieving/maintaining quality standards.

Note however that, despite this seemingly explicit definition of quality in cost terms, the second component (b) is not always obvious or easy to know. We often can quantify just the tip of the iceberg.

A fairly widely used model to analyze and organize the cost associated with quality is the *"Cost of Quality"* model. This model breaks down the costs associated with quality into 4 major components: prevention costs, appraisal costs, external failure costs and internal failure costs.

The first two components (prevention and appraisal) refer to the "cost of achieving/maintaining standards". The last two (internal and external failure) are the "cost of *not* achieving/maintaining standards."

Prevention Cost is the cost incurred to prevent "defective" units of service from being produced (e.g., sterilization protocol).

Appraisal Cost is the cost incurred to detect defective units of services before they are given to clients (e.g., inspection of drug stocks).

Internal Failure Cost is the cost incurred when services are identified as

[8] Waress, et al., 1994.

defective before they are given to clients (e.g., use of non-essential list of drugs or expired drugs).

External Failure Cost is the cost incurred when services are identified as defective after they reach the client (e.g., adverse reaction to drugs, or administration of wrong drug).

Further Readings:

- Castañeda-Méndez, K. "Value-based Cost Management for Healthcare: Linking Costs to Quality and Delivery." Quality Resources, A Division of The Kraus Organization Limited, New York, NY, 1996, pages: 73 - 104.

- Waress, B.J., Pasternak, D.P., Smith, H.L. (1994) "Determining Costs Associated with Quality in Health Care." Health Care Management Review, 19(3):52-63.

Module 3: Relationship between Cost and Quality

Common Assumptions and Beliefs about Cost and Quality

Now that we have tried to briefly define cost and quality in cost terms, what can we say about the relationship between cost and quality?

One assumption is that improved quality requires additional resources. This assertion is only partially true or at least to the extent that quality improvement activities (such as the work of QA teams) require the investment of personnel's time and effort. Also, it is acceptable that more advanced technologies to improve the delivery of quality care may require additional resources.

However, the assertion needs to be balanced in three regards.

The first is that additional resources do not guarantee improved quality (e.g., the purchase of a state-of-the-art medical equipment may do nothing for quality if the skill of personnel to operate the equipment is not upgraded too).

Second, the use of quality standards has the potential to reduce variation. In the field of QA, decrease in variation is well recognized as the principal approach to reducing waste of resources and hence saving costs. Finally, improved quality often leads to increased efficiency and reduced-rework, which in turn may result in saved resources.

Another commonly held assumption is that costs of poor quality are easily seen and fixed.

However, as was described earlier, much of the costs of poor quality are hidden, "unknown and unknowable." Part of the reason for this is that the causes of poor quality are often complex and embedded in the health system.

Relationship between Cost and Quality

One **theory in quality economics** advanced by Ishikawa[9] proposes that there is an inverse relationship between cost and quality. This concept relies on the fact that as quality increases, it leads to a reduction in waste in the system that in turn promotes productivity.

Improved productivity implies that a product or a service can be produced at the lowest cost possible, hence better quality is ultimately linked to lower cost.

This view of the cost-quality relationship is based on the premise that quality controls cost. But in fact, the **relationship may be more dynamic** and depends on both cost and quality. More specifically, Donabedian et al[10] suggest that two factors are important:

1) The availability or constraint of resources, and

2) Strategies for providing care, i.e., how resources are used to provide care

In this instance, the "ideal" healthcare provider is defined as one who "selects and implements the strategy of care that maximizes the health status improvement [or quality] without wasted resources." This concept of the ideal healthcare provider defines a frontier of health improvement that represents the highest possible level of improvement that can be achieved given an available level of resources.

This conceptual model embodies an important relationship between cost, quality and efficiency.

For a given cost (or resource level), it is possible to fall to a lower level of quality by adapting a less effective strategy for delivering care. In the hands of the ideal provider, improvement in health care quality would always require additional resources.

For the provider in real life (one working in a dynamic environment, faced with daily challenges that affect her work), additions in cost can have multiple effects on quality. If the additional cost is due a necessary element of care being acquired (e.g., provide a drug that may not have been in stock previously), the quality of care can be expected to increase. If however, the additional cost was spent on a harmful element (e.g., the wrong drug was given and was contraindicated with a previously administered drug), quality may actually decline.

[9] Ishikawa, 1985.

[10] Donabedian, et al. 1982.

Finally, there may be no effect on quality if the additional cost was incurred for a useless element (e.g., for a diagnostic test that contributes no insight into the medical condition of the patient). The converse of this relationship between cost and quality for the 'real life' provider holds in the instance that costs are removed/reduced. Note that in general, this model underscores the role of the provider in defining the relationship between cost and quality.

Another important philosophical viewpoint in quality improvement and cost is **Taguchi's Loss Function.**

According to Taguchi, an important dimension to quality is the loss or cost that any deviation from a target quality value creates for society. Taguchi even goes as far as defining the loss as a function: " a cost coefficient multiplied by the square of the difference between the specified target value of quality and the measured value of the specific quality characteristic". The cost coefficient usually acknowledges the cost of re-work and replacing a product, for example, but it may also be fairly subjective. For example, a service department may decide to include the cost of a customer's inconvenience, fuel and vehicle wear in the cost estimate. In this way, this model supports a broader system's thinking that all outputs are inputs.

Further Readings:

- Fleming, S.T. "The Relationship between Cost and Quality of Hospital Care: A Review of the Literature." Medical Care Review, 47(4): 487-502, 1990.

Module 4: Analysis of Cost and Quality

Major Levels of Cost Analysis

When beginning on a cost analysis exercise (e.g., to manage cost spending, decide on what investment to make, or determine the cost impact of a given intervention or change), a couple of the very first questions that are asked are "What is cost?" and "Whose cost are we talking about?" The first of the two questions was addressed in an earlier module where we looked at the various types and dimensions of cost (see Module 1).

The second question, not unrelated to the first, is also important in helping to define the relevant and important boundaries for cost analysis. Answering this question helps guide decisions on what costs are important to consider and measure and which are outside the realm of interest to meet the specific cost analysis objective.

The answer to the second question will naturally vary depending on the responsibility of the analyst within the health system, i.e., whether the person is a health facility administrator responsible for running a facility or an MOH-level official responsible for allocating resources/funding.

Generally, we may consider that there are various levels of analysis which are not necessarily exclusive of one another. The following is a list, though not an exhaustive list, intended to illustrate the different ways cost is analyzed, by:

- Cost categories, i.e., To assess the cost of drugs, labor or equipment
- Activities, such as assessing the cost of meetings, training
- Processes, the series of activities that are sequenced to produce a service, for example, cleaning a delivery room, preparing the patient and delivering a baby
- Services, such as deliveries or outpatient antenatal care consultations
- Programs or interventions, such as community outreach programs or clinical guidelines; programs or interventions may include multiple processes
- Departments within the same facility, such as radiology, laboratory, emergency, maternity, etc.
- Organizations, possibly comprising multiple departments or programs all accounted for under one cost system for instance health systems and subsystems, such as primary health care clinics versus hospitals, or regional district health systems, including patient costs and long- and short-term economic costs (such as [lost] productivity cost, quality of life costs).

The following are useful guidelines for embarking on cost analysis:

- Define the objective of the cost analysis (why)
- Decide on the level of cost analysis (where, who)
- Measure what is relevant to the decision (what)
- Decide on the level of precision required
- Set time period of analysis.

Further Readings:

- Reynolds, J. "Cost Analysis – Module 8, Primary Health Care Management Advancement Programme." Washington, DC: Aga Khan Foundation, 1993.
- Reynolds, J., Gaspari, K.C. "Cost-Effectiveness Analysis" PRICOR, Monograph Series, Method Brochure No. 2, 1986.

Methodologies to Analyze Cost and Quality-Related Problems

Several methods and approaches can be used to link the analysis of cost to analysis of quality. The options may differ based on whether: 1) one is trying to analyze the impact of a specific intervention or practice on cost and quality, or 2) whether one is looking to more systemically monitor and analyze cost and specifically the cost of quality (described in Module 3). Hence, this course elaborates primarily on some of the approaches in each of these categories, focussing on the ones that are likely to have the most common application in health delivery and public health practice:

A. Methodologies to evaluate and compare the impact of a specific intervention on cost and quality	**B. Methodologies to evaluate and monitor cost as well as the cost of poor quality**
• Cost-effectiveness analysis • Cost-benefit/return on investment analysis • Cost-utility analysis	• General cost accounting and cost management • Activity-based cost management • Cost of Quality Analysis • Analysis of inefficiency (poor quality)

Cost-effectiveness analysis (CEA)

A. Methodologies to evaluate and compare the impact of a specific intervention on cost and quality

Methodologies in this category aim to assess the cost of a given input (such as a new program or intervention) relative to the benefit that is derived from this input. The methodologies may differ primarily in the way that they measure quality, i.e., in monetary terms (cost- benefit, return on investment), or in non-monetary terms such as indicators (cost-effectiveness) or indices (cost-utility). Note, various textbooks and manuals exist on each of these methodologies and may differ in their exact definitions of the terms.

CEA is a methodology that has been used for a while and has shown to be primarily useful in guiding decision-making among alternatives:

- alternative interventions to achieve the same goal, e.g., a sanitation program versus an oral-re-hydration program to reduce the occurrence of cholera in a given region
- alternative means of implementing an intervention to achieve the same objective, e.g., alternate methods for contraception in family planning programs (to increase couple-years-of protection)
- trade-offs in varying the size, scope and composition of a given strategy, e.g., one or more "immunization days" with the result of children being immunized

CEA can also be used to evaluate the effect of introducing a new intervention/change, often using a before and after type of analysis by comparing the cost and effectiveness of the previous system relative to that of the new system. For example, the Quality Assurance Project conducted an analysis in a pilot project in Russia to determine the cost-effectiveness of using new evidence-based guidelines for women hospitalized with pregnancy induced hypertension (PIH). The study, which collected information on the cost of care for hospitalized women with PIH six months before and then six months after the new guidelines began to be used, found that the new guidelines saved 40% of the cost of care per patient. Also, analysis of indicators of quality such as the number of women developing complications or number of deaths due to PIH, showed that the new guidelines actually had the beneficial effect of also improving quality of care for women (reduced complication rates and death averted). The two findings suggested that the new guidelines were a cost-effective treatment for PIH.

Generally then, CEA allows managers/analysts to make decisions about the optimum alternative given the desired objective or the existing level of resource constraint.

Essentially, CEA is derived from the measurement of a ratio: the level of quality (effectiveness) achieved divided by the cost of achieving that level. The result is a measure of the level of quality achieved per dollar. Where alternatives are being compared, CEA can also be measured based on the change in the level of quality (effectiveness) that is obtained relative to the additional cost required, for each alternative/intervention/strategy.

The guidelines for using CEA are relatively straightforward with specific guidelines for the cost to be measured and the indicator(s) to use for "quality" (or effect).

Regarding measurement of cost for CEA, generally, the guideline is to:

- Concentrate on those costs that are relevant to the decision (those that depend on the choice made): often this implies focussing on direct costs that are expected to vary based on the size and scope of the alternative/intervention/strategy
- Focus on those that are expected to vary with each alternative, that is to say not measured costs that will stay the same regardless of the alternative/intervention/strategy

Regarding measuring the level of quality (effectiveness) achieved, the general guidelines are:

- decide on which outcome criteria to use, i.e., whether to measure effect on output (e.g., number of children immunized), on effect (e.g., number of eligible habitants using the facility), or impact (number of deaths)
- define indicators that can be easily quantified, are easy to measure, and are linked to all the alternatives/interventions/strategies, i.e., will change depending on the alternative selected

Still, it is important to remember that CEA has some limitations:

- Conceptual limitations
- Interpretational limitations
- Measurement limitations
- Data limitations
- Calculation limitations

Further reading:

- Reynolds, J., Gaspari, K.C. "Cost-Effectiveness Analysis" PRICOR, Monograph Series, Method Brochure No. 2, 1986.
- QAP (Quality Assurance Project). 2001b. Improving Family Planning Provider-Client Communication in Indonesia through Self-Assessment and Peer Review. Quality Assurance Project Case Study. Published for the U.S. Agency for International Development (USAID) by QAP: Bethesda, Maryland, U.S.A. [Upcoming publication]

Cost-benefit analysis (CBA)/ Return on investment (ROI)

CBA is useful when comparing the cost of resources for a specific quality improvement intervention to the benefits of that intervention. In CBA, health benefits are expressed in monetary terms, i.e., in units common to those used to measure cost. In this respect, CBA is sometimes more difficult to use in health care settings where the benefits of "providing health" is often undervalued in monetary terms.

(Strictly speaking in Economics, CBA is a method used to make decisions between different projects in multiple sectors (health, agriculture, transportation, etc.) by having a common metric for evaluating their economic benefit. Two approaches are used to evaluate the benefit: a) the human capital approach, which expresses benefit as the income that a productive person can earn by being restored to health, and b) the willingness-to-pay approach, which assesses benefit as the amount that an individual is willing-to-pay for receiving health-restoring care, presumably also considering the income that he/she will be able to earn once restored to health. Both approaches have strengths and weaknesses which have been explored in greater depth elsewhere.[11]

CBA is primarily derived by determining the net benefit of a given intervention, i.e., the additional (monetary) benefits derived from the intervention minus the additional cost of implementing the intervention. A variation of this analysis is to derive an index termed "return on investment" which is expressed as a percentage (rate of return) and derived by dividing the additional benefit by the incremental cost (said investment) of the intervention. This expression of cost-benefit can then be used to compare among alternative interventions and guiding the selection of interventions with higher rates of return (everything else being equal).

To express 'quality' (benefit) in monetary terms usually implies that we are talking about cost savings or additional revenues that may result in introducing a quality improvement intervention/change. In this case, similar to CEA, CBA can be used to compare alternative interventions/strategies in terms of the savings or revenues they generate relative to the cost required for implementing them. The challenge in CBA is often to define the costs that will be measured to assess benefits. When dealing with quality improvement and quality assurance, there may several ways of assessing this:

[11] Over, 1997; Ray, 1984.

- Monetary benefits can be derived from reducing a level of waste that exists in the system. For example, the benefit to a hospital of using a new evidence based clinical guideline can be considered the cost/money saved from reduced use of unnecessary (or non-indicated) drugs, or reduced length-of-stay, i.e., translates into reduced number of beds being administered (for example in the case of pregnancy-induced hypertension in Abdallah et al., 2001).

- On a patient or disease basis, benefits may be estimated in terms of complication/higher cost care being avoided (i.e., cost averted). In many cases, the cost that is averted may also benefit groups other than the one implementing the intervention/change. For example, the benefit of a program that promotes preventive or primary care of patients with chronic diseases includes the reduction in/saving of the hospital care costs from fewer patients seeking emergency care for their condition. Conditions such as blood pressure, diabetes or prenatal care are examples where this applies. The benefits/cost saving also accrue to the patient who would not have to endure the economic, physical and psychological consequence of developing complications (dealing with lost work, disability and illness).

- Benefits may also accrue from increased revenue. For example, an IEC (information, education, communication) campaign to inform about quality services in a health center or hospital would recover its cost from having more users using its services; they may also pay for their services or the health facility may be reimbursed by the state or insurance agency with fees to recover its costs. Another situation may be where improved quality may improve the client's perception of the quality of service and therefore increase their willingness to pay (more) for the services. Both situations result in income revenue.

Recall also the Flowchart of Cost Recovery reviewed in Module #3 illustrating the concept of quality and willingness-to-pay.

There are some important considerations when we begin to use monetary measurements to evaluate the cost-quality relationship with CBA:

- What is the timeframe we are working with when we evaluate the benefit/reward of a quality improvement initiative/intervention? Often, there is a lag between the time the initial investment is made (e.g., training of facility in quality improvement techniques) and the rewards from that investment accrue. Methodological (e.g., discounting and present value analysis) and analytical solutions may need to be used.

- As mentioned earlier, the benefit from a QI activity may extend beyond the organization or unit that is investing in the quality improvement initiative. The total benefits (in terms of public health or health system strengthening) may themselves justify the investment, but incentives or other mechanisms may need to be considered in justifying the intervention to the organization to begin with.

Further reading:

- Abdallah, H., O. Chernobrovkina, A. Karatkova, R. Massoud, and M. Scheglova. 2001. The Impact of New Evidence-Based Clinical Guidelines on the Cost of Managing Pregnancy-Induced Hypertension in Hospitals, Tver, Russia. *Operations Research Results* (*submitted for publication*). Published for the United States Agency for International Development (USAID) by the Quality Assurance Project (QAP): Bethesda, Maryland.

Cost-utility analysis (CUA)

CUA is an extension of CEA and is used when trying to compare the CE of alternative projects that have different effect measurements. CUA therefore relies on a general index that measures outcomes in terms of "improved general health", for instance gains in quality of life (e.g., QALYs or quality-adjusted life years) or gains in productive life years (e.g., DALYs or disability-adjusted life years). Using this index allows decision-makers to compare for example the cost versus the benefit of a vitamin A supplementation program with a program to control TB to improve health in a country or region. The interventions have different target populations but each contributes to greater public health. CUA is therefore usually most beneficial for policy level advocacy or national decision-making, where decisions have to be made to allocate limited dollars among multiple programs.

Necessarily, the index to assess 'effectiveness' is subjective. Though often relying on epidemiological data to estimate the effect of various health interventions, several assumptions need to be made to project their expected effect on a population scale. For instance, the index YHLL (years of life lost) is derived from the sum of years of life lost because of premature mortality and years of life lived with a disability, adjusted for the severity of the disability. Several articles are available to discuss the strengths and weaknesses of this and other CUA approaches.[12] For instance, one criticism of the methodology is that the results may not lead to equitable decisions, for instance by leading to interventions that marginalize a certain group of the population from getting priority attention.

[12] Morrow and Bryant, 1995; Anand and Hanson, 1995; Murray and Lopez, 1996.

Still, formulations for determining the cost-utility of an intervention are being refined and in most cases are accompanied with software to guide the analysis. For example, the elements in the equation for YHLL evaluate the impact of an intervention on the likelihood of a person dying from non-treatment (i.e., no intervention) – which is reflected in the loss of life (expected life for age of death) – and the extent of the reduction in quality of life (duration and extent of disability a person has to live with). DALYs (disability adjusted life years) have also been used to reflect the burden of disease in a region, highlighting the different priority health areas in different regions.[13]

Further readings:

- Morrow, R.H., J.H. Bryant. "Health Policy Approaches to Measuring and Valuing Human Life: Conceptual and Ethical Issues." *American Journal of Public Health,* 1995 (85): 1356-1360.
- Murray, C., A.D.Lopez. "Evidence-Based Health Policy - Lessons from the Global Burden of Disease Study." *American Associate for the Advance of Sciences*, *1996(247): 740-743.*
- Anand, S., Hanson, K. "Disability-Adjusted Life Years: A Critical Review" Working Paper Series 95.06, Harvard Center for Population and Development Studies, 1995.

Cost management

B. Methodologies to evaluate and monitor cost as well as the cost of poor quality

Methodologies in this group are primarily approaches for managing cost, but even here, it is important to recognize that with good cost management, there are opportunities to use cost information to guide quality improvement activities. For instance, knowing high cost areas in an organizations allows a manager to explore opportunities for reducing costs (while not harming quality) where the high cost is a result of significant waste in the organization.

It is useful to reiterate that this course really aims to provide just an overview of each methodology. Each methodology can be explored in more detail in a variety of sources.

Further readings:

- Reynolds, J. and C. Gaspari "Cost Analysis – Module 8, Primary Health Care Management Advancement Programme (PHC MAP) Series." Washington, DC: Aga Khan Foundation, 1993.
- MSH Cost and Revenue Analysis Tool: http://erc.msh.org/finance/tools/coreisen.htm
- Hanson, K., L. Gilson "Cost, Resource Use and Financing Methodology for Basic Health Services – A Practical Manual." Bamako Initiative Technical Report Series, Number 16. UNICEF, 1993.

[13] Murray and Lopez, 1996

- Creese, A., D. Parker, eds. "Cost Analysis in Primary Health Care: A Training Manual for Programme Managers." World Health Organization. 1994
- Over, A.M. "Economics for Health Sector Analysis: Concepts and Cases" published by the Economic Development Institute of the World Bank, 1997.

Activity-based costing (ABC)

ABC is essentially a tool that can be used with traditional accounting systems organized around cost centers, with the added benefit that it more accurately calculates the cost of providing a unit of service. This unit cost of a service includes both direct and indirect costs, and essentially allocates indirect costs based more closely on the actual level of resources that are used to produce that service.

ABC, together with its affiliated management tool, activity-based management (or ABM), was designed to provide a more explicit link between cost management and process management and improvement. Beginning with applications in the manufacturing industry, ABC continues to have more and more applications in the health care arena. In the US, where managed care and cost-reimbursement guidelines are more closely linked to procedures performed on a patient, it has been used for its ability to link cost with DRGs (diagnosis-related groups), facilitating cost cuts aimed at removing unnecessary (non-compliant or non-indicated) procedures.

Traditional accounting differs from ABC accounting in the following way: Traditional accounting allocates costs/resources directly to the products and services – often based on general assumptions. ABC on the other hand first allocates costs or resources consumed to activities performed in the organization and then traces the activities to the products and services that use the activities. One of the primary methods for allocating indirect costs to activities is based on the proportion of time personnel in the organization spends on the activity. The reference readings on ABC provide a more in depth explanation of this.

Hence, one of the greatest advantages of ABC is that it allows you to look at the processes that your organization actually performs (something that is familiar to quality improvement and assurance efforts) and allows you to assess the financial importance of doing things as they are.

ABC allows you to identify high resource consuming activities, a first step in assessing what influences the high cost of operations. By dissecting costs into activities, it also is a window into evaluating value-added versus non-value-added activities, where value-added activities are defined to include those activities that directly contribute to meeting the objectives of the organization (i.e., contribute to high quality care). Examples of non-value-added activities are unnecessary waiting time, and repetitions. Managers therefore may become armed with a tool to target and reduce non-value-added activities.

Another level of analysis is looking at the costs of primary activities (i.e., those activities that represent services provided to a client [e.g., a primary activity may be delivering a baby, or providing a root canal]), versus the cost of secondary activities (essentially all the activities that are completed to make primary activities possible). From a management perspective, it is desirable to minimize the cost of secondary activities (essentially streamlining processes for delivering a service) relative to the cost of primary activities.

It is important to remember that ABC is, like most cost management systems, only a tool. It needs to be combined with sound quality management approaches to derive the most benefit from having such an innovative tool.

Further readings:

- Chan, Y.L. (1993) "Improving Hospital Cost Accounting with Activity-based Costing." *Health Care Management Review* 18(1), pp.:71-77.

- Waters, H., H. Abdallah, D. Santillán, and P. Richardson (2000) "Application of Activity-based Costing (ABC) in a Peruvian NGO Healthcare System." *Operations Research Results*. 1(3) Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project (QAP): Bethesda, Maryland.

- Cokin, G. "Activity-Based Cost Management: Making It Work" New-York: McGraw-Hill, 1996.

Cost of Quality (CoQ)

CoQ was reviewed in Module 2.

Once data on components of the cost of quality methodology have been collected, the manager can use the information to evaluate the magnitude and appropriateness of the costs of quality. For example, the manager can generate a report card showing what proportion of the total cost of quality (appraisal + prevention + external failure + internal failure) is attributable to the different components. If failure costs represent a relatively larger share of total cost of quality, this suggests that more investment in appraisal or prevention types of activities would be beneficial. Note, some level of investment in prevention and appraisal costs is considered necessary even if quality is close to perfect (i.e., failure costs close to zero).

Further readings:

- Castañeda-Méndez, K. "Value-based Cost Management for Healthcare: Linking Costs to Quality and Delivery." Quality Resources, A Division of The Kraus Organization Limited, New York, NY, 1996.

Analysis of inefficiency

One of the underlying themes so far has been that tools and methodologies for cost management are only as good as a manager's ability to use them to identify and capture opportunities for improvement. In this argument, a good manager may still be able to improve "quality" without sophisticated tools.

Another underlying theme in cost-quality analysis is the idea of efficiency based on a quality improvement principle of doing the right thing at the lowest possible cost. Essentially, the methodologies reviewed so far have tried to identify costs that would not have been incurred if quality standards had been achieved (doing things right the first time). The objective is to use this information to guide the application of quality improvement approaches to minimize this cost.

Here, we explore how it may be possible to analyze and improve efficiency in ways not mentioned above. The ideas here are not exhaustive and you should encourage participants to discuss methodologies they have used or ideas that can be explored.

Essentially, efficiency is the achievement of objectives without wasted resources. Implicitly, efficiency is achieved when the maximum amount of output is produced for the least cost (quality objective constant). However, in reality, it may not be difficult to see how we can deviate from this rule. For example, sources of inefficiency include (but are not limited to):

- High variation in the processes for delivering a product/service, which itself may be due to a lack of standards or procedures, or lack of knowledge of these and therefore non-compliance with standards and procedures, among other things
- Using unnecessarily high cost inputs (which have the same or functionally similar quality)
- Poor productivity, which may be due to a myriad of issues, not excluding, poor processes, a poor match between skill and performance expectation, etc…
- Non-value added activities, i.e., repetition of work, or work that has no benefit for support quality of service or meeting objectives

The goal of inefficiency analysis is to quantify the magnitude of the (waste) problem with the aim of guiding improvement efforts to those areas that generate the most waste (are most inefficient). Like other methodologies, the goal of this analysis is simply to guide management, and is not separate from management responsibility/ability to further analyze and resolve the root causes of the problem.

Further Readings:

- *Case example Course Handout* based on an operations research study conducted by QAP II in Ecuador to look at the cost of inefficient and ineffective use of laboratory tests and resources in public hospitals.

Guidelines for Selecting the Appropriate Methodologies to Use

The selection of methodologies depends on the level of analysis that is required, and the cost-quality related question being analyzed. Other factors such as availability of information/data may also be a factor though, where possible, should be considered second to considering the objective of the analysis.

Bibliography

Abdallah, H., O. Chernobrovkina, A. Karatkova, R. Massoud, and M. Scheglova. 2001. The Impact of New Evidence-Based Clinical Guidelines on the Cost of Managing Pregnancy-Induced Hypertension in Hospitals, Tver, Russia. *Operations Research Results* (*submitted for publication*). Published for the United States Agency for International Development (USAID) by the Quality Assurance Project (QAP): Bethesda, Maryland, U.S.A.

Anand, S., Hanson, K. "Disability-Adjusted Life Years: A Critical Review" Working Paper Series 95.06, Harvard Center for Population and Development Studies, 1995.

Atkinson Jr., J.H., Homer, G., Mundt, B., Troxel, R.B., Whichell, W. "Current Trends in Cost of Quality: Linking the Cost of Quality and Continuous Improvement" Montvale NJ: National Association of Accountants, 1991

Castañeda-Méndez, K. "Value-based Cost Management for Healthcare: Linking Costs to Quality and Delivery." Quality Resources, A Division of The Kraus Organization Limited, New York, NY, 1996.

Chan, Y.L. (1993) "Improving Hospital Cost Accounting with Activity-based Costing." *Health Care Management Review* 18(1), pp.:71-77.

Cokin, G. "Activity-Based Cost Management: Making It Work" New-York: McGraw-Hill, 1996.

Creese, A., D. Parker, eds. "Cost Analysis in Primary Health Care: A Training Manual for Programme Managers." World Health Organization. 1994

Donabedian, A.; Wheeler, J.R.C.; Wyszewianski, L. "Quality, Cost and Health: An Integrative Model" Medical Care Review, 20 (10): 975-992, 1982.

Ealey, L.A. "Quality by Design, Taguchi Methods and U.S. Industry" Dearborn, Michigan: ASI Press, 1988.

Fleming, S.T. "The Relationship between Cost and Quality of Hospital Care: A Review of the Literature." Medical Care Review, 47(4): 487-502, 1990.

Hanson, K., L. Gilson "Cost, Resource Use and Financing Methodology for Basic Health Services – A Practical Manual." Bamako Initiative Technical Report Series, Number 16. UNICEF, 1993.

Harrington, H.S. "Poor-Quality Costs." New York: Marcel Dekker, Inc., 1987.

Horn, S., Hopkins, D.S.P., eds. "Clinical Practice Improvement: A New Technology for Developing Cost-Effective Quality Health Care." New York, NY:Faulkner&Gray, Inc., 1994.

Ishikawa, K. " What is Total Quality Control?" Englewood Cliffs, New Jersey: Prentice-Hall, 1985.

Legros, S., E. Goodrich, and H. Abdallah. 2000. "The Niger QAP/BASICS Joint Project." *Technical Report Summary 1(1). Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project (QAP): Bethesda, Maryland, U.S.A.*

Morrow, R.H., J.H. Bryant. "Health Policy Approaches to Measuring and Valuing Human Life: Conceptual and Ethical Issues." *American Journal of Public Health,* 1995 (85): 1356-1360.

Murray, C., A.D.Lopez. "Evidence-Based Health Policy - Lessons from the Global Burden of Disease Study." *American Associate for the Advance of Sciences*, *1996(247): 740-743.*

Musgrove, P. "Cost-Effectiveness and Health Sector Reform" Working paper No. 48, Human Resources Development and Operations Policy, 1995.

Over, A.M. "Economics for Health Sector Analysis: Concepts and Cases" published by the Economic Development Institute of the World Bank, 1997.

Player, S. "Activity-Based Analyses Lead to Better Decision-Making" Healthcare Financial Management, August 1998.

Pryor, T., Sahm, J. "Using Activity-Based Management for Continuous Improvement" Arlington, Texas: Integrated Cost Management System (ICMS), 1998.

QAP (Quality Assurance Project). 2001a. Institutionalization of Quality Assurance, Project Report. Published for the U.S. Agency for International Development (USAID) by QAP: Bethesda, Maryland, U.S.A..

QAP (Quality Assurance Project). 2001b. Improving Family Planning Provider-Client Communication in Indonesia through Self-Assessment and Peer Review. Quality Assurance Project Case Study. Published for the U.S. Agency for International Development (USAID) by QAP: Bethesda, Maryland, U.S.A. [Upcoming publication]

Ray, A. "Cost-Benefit Analysis – Issues and Methodologies" Published for The World Bank by Johns Hopkins University Press, Baltimore, Maryland, 1984.

Reynolds, J. "Cost Analysis – Module 8, Primary Health Care Management Advancement Programme (PHC MAP) Series." Washington, DC: Aga Khan Foundation, 1993.

Reynolds, J., Gaspari, K.C. "Cost-Effectiveness Analysis" PRICOR, Monograph Series, Method Brochure No. 2, 1986.

Sloan, M.D. "How to Lower Health Care Costs by Improving Health Care Quality: Results-based Continuous Quality Improvement." Milwaukee, WI: ASQC Quality Press, 1994.

Waress, B.J., Pasternak, D.P., Smith, H.L. (1994) "Determining Costs Associated with Quality in Health Care." *Health Care Management Review*, 19(3):52-63.

Waters, H., H. Abdallah, D. Santillán, and P. Richardson (2000) "Application of Activity-based Costing (ABC) in a Peruvian NGO Healthcare System." *Operations Research Results*. 1(3) Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project (QAP): Bethesda, Maryland, U.S.A..

World Bank "Executive Summary of the World Development Report 1993 – Investing in Health" Washington, DC, 1993.