

**Exercise 3 - Cost of Quality**

**Answer Key**

*Categorize the list of cost and activities as prevention (P), appraisal (A), internal failure (IF), external failure (EF) or "cost of doing business" (CDB). Note: There may be different opinions about categorization. Several right answers exist.*

<u>EF</u>	complaints handling	<u>EF</u>	expired drugs
<u>A</u>	customer surveys	<u>EF</u>	wrong drug prescribed
<u>P,A</u>	quality assurance training	<u>EF</u>	adverse reaction
<u>A</u>	supervision	<u>EF</u>	lack of time for counseling
<u>A</u>	inspection	<u>CDB</u>	senior nurse
<u>EF</u>	loss of reputation	<u>EF</u>	improper counseling
<u>CDB</u>	regular equipment maintenance	<u>IF</u>	mis-filed record
<u>P</u>	management training	<u>EF</u>	child weighing omitted
<u>P</u>	on-site continuing education	<u>EF</u>	missed appointment
<u>IF,EF</u>	pricing error	<u>CDB</u>	stock of essential drugs
<u>EF</u>	wrong fee collected	<u>IF</u>	dirty treatment rooms
<u>IF,EF</u>	breakdown in cold chain	<u>CDB</u>	record books
<u>IF,EF</u>	inadequately sterilized needles	<u>CDB</u>	thermometer, stethoscope
<u>IF,EF</u>	stock out of essentials drugs	<u>CDB</u>	lack of fuel
<u>EF</u>	inaccurate diagnosis	<u>IF,EF</u>	incompetent HW(health worker)
<u>EF</u>	poor patient compliance	<u>P</u>	sterilization protocol
<u>EF</u>	excess waiting time for patients	<u>P</u>	job aids
<u>IF,EF</u>	incomplete patient records	<u>CDB</u>	nurse gowns
<u>EF</u>	hospital-acquired infections	<u>EF</u>	missed opportunity

## Exercise 4 – Cost-Effectiveness Analysis: A Case Exercise

### Answer Key

The following exercise is intended to give participants an opportunity to practice working with cost-effectiveness analysis. This exercise does not include a step-by-step calculation of cost or effectiveness but rather intends to challenge participants to assess how these would be calculated if the need were real.

*This case exercise was inspired by a case example in Reynolds and Gaspari (1986).*

#### **Background -**

Imagine that you are a health economist that was recently invited to be part of a research team by the Ministry of Health (MOH). The team is trying to evaluate the cost-effectiveness of a proposed new training approach to train community health workers as health promoters in primary healthcare. The new training approach that the MOH is interested in trying involves using a core staff of trainers and audiovisual materials. The MOH thinks that this approach, pioneered by the Census Bureau to train census workers, will be fast and effective.

In contrast, the existing training program relies on a Train the Trainer approach where central MOH trainers train regional trainers who in turn train district supervisors. District supervisors in turn train rural clinic nurses who then train CHWs. To date, the program has not been completed to standard and more than 60% or 700 of the CHW have not yet received their training. CHWs were *supposed* to receive 3 weeks of basic health training in groups of 15 to 30 in rural health clinics close to their home, as well as an additional week of training at a regional center. In actuality, CHWs only receive 2 weeks of basic and the quality of the training is considered of poor quality.

You are being brought on to determine the “cost-effectiveness” of the new training approach relative to the traditional approach in order to determine whether the new approach should be used.

#### **1. What information would you need to know about the new program in order to compare it to the traditional system?**

##### Possible answers:

The answer to this question is particularly relevant in setting the stage for CEA, namely clearly defining the alternatives solutions that you are trying to evaluate with CEA. Defining the new program will highlight the major differences it has as compared with the traditional approach. This information will be useful in making sure that the necessary and relevant cost information will be collected, and also in understanding what factors may affect the sensitivity of the CEA (for example, what aspect of the alternative will, if changed, result in a significantly different CEA conclusion). The later forms the basis for sensitivity analysis, an important practice in cost analysis. Defining the alternatives also ensures that the alternatives will be compared fairly.

In the example, the analyst may want to know more about the following aspects of the program:

- the duration of the training
- the materials required for the training
- the number and types of trainers
- the class size the training can support
- the location of the training
- the level and frequency of supervision required following the training,
- the role of the supervisor
- Other: the training content (to confirm that it's similar or the same as the traditional training), the training method

**2. What types of costs would you consider measuring to evaluate cost-effectiveness of the programs?**

Possible answers:

The most efficient way to measure the cost of alternatives in CEA is to focus on those costs that are relevant to the decision being made and that are expected to vary based on the alternative being selected. Costs that are expected to be the same for all alternatives (for instance the cost of facilities and equipment) can be excluded. Where the costs of the alternatives are expected to change based on the scale of the alternative, determine the costs for achieving the same objectives (e.g., the cost of each alternative to train 1000 CHWs).

Various classifications are available for measuring costs, e.g., looking at fixed versus variable costs, direct versus indirect (often used), average or marginal costs, or capital and recurrent costs. Using the latter classification, types of cost include:

<i>Recurrent</i>	<i>Capital</i>
Personnel (opportunity cost)	Rent or land
Fringe benefits	Buildings
Fees for consultants	Equipment
Materials and supplies	
Communications (e.g., tel., fax)	
Contract services	
Miscellaneous	
Other	

In this example, the analyst may decide that the cost of certain materials that will be given to the CHW trainees during the training will not be costed (e.g., manuals, ORT sample packets). If it is assumed that each training program will train the same number of people, this cost will be constant regardless of the alternative selected. The same is true for example for participant travel costs if the new approach will be conducted in locations similar to those in the old program.

Other costs that may be considered are:

<b>Personnel Costs</b>	<b>Materials</b>	<b>Travel</b>	<b>Capital Costs</b>	<b>Other Direct Costs</b>
Trainers' salary + fringe opportunity costs	Training materials and supplies	Travel and per diem of trainers during training	All equipment, vehicles, buildings (discounted)	Communications (telephone, postage)
Supervisor salary + fringe opportunity costs (post-training)		Travel and per diem of supervisors during post-training supervision		Contract services (cleaning of training sites, rent of facilities and equipment, utilities such as water, electricity, fuel or heat)
Central staff salary + fringe opportunity costs (during training)		Travel and per diem of central office staff during training		Miscellaneous (printing, making copies, messenger services)

**3. What effectiveness measure would you consider to evaluate the cost-effectiveness of the programs?**

Possible answers:

Two decisions need to be made for this:

- 1. Which outcome criteria to use based on the short- or long-term results you are interested in (output, effect, impact), and
- 2. Which measure to use for the specific criteria. On the first point, it is useful to consider that longer-term results are usually more difficult to measure and may also be influenced by factors other than the interventions that are being compared in CEA. Hence, impact measures are usually not recommended for CEA. On the second point, measures can be counts, ratios, proportions or percentages. In case where more than one criteria and/or measure are available, choice of which effectiveness measure to use can be made based on the level of effort, time and resources required to calculate the measure.

Examples of criteria for assessing effectiveness of primary healthcare programs include:

<b>Output</b>	<b>Effect</b>	<b>Impact</b>
Contacts made	Enrollees	Infant mortality
Visits made	Active users	Child mortality
Referrals made	Dropouts	Neonatal mortality
Appointments	Households using ORT	Perinatal mortality
Individuals served	Households using growth charts	Fetal mortality
Households served	Children immunized	Weight at birth
Examinations given	Malaria prophylaxis	Height for weight
Cases treated	Family planning acceptors	Incidence (of disease)
Education sessions held	Wells constructed	Maternal mortality
Units of commodity distributed	Latrines constructed	Crude birth rate
	Pregnant women receiving prenatal care	
	Supervised deliveries	

For CEA specifically applied to training, other criteria that can be used include:

<b>Output</b>	<b>Effect</b>	<b>Impact</b>
CHWs trained	<u><b>Effect on CHWs:</b></u> <ul style="list-style-type: none"> <li>• <i>Knowledge:</i> <ul style="list-style-type: none"> <li>- Trainees who understand (through verbal and written examination): symptoms XX (e.g., diarrhea), how to prepare ORT, how to follow treatment protocol</li> </ul> </li> <li>• <i>Skills:</i> <ul style="list-style-type: none"> <li>- Trainees who can: prepare ORT solution, prepare salt-sugar solution</li> </ul> </li> </ul>	Not recommended for CEA

- *Behavior:*
  - Households contacted
  - Cases identified
  - Cases supervised
  - Households supplied with ORT

**Effect on Parents (for example):**

- *Knowledge:*
  - Parents who understand: symptoms, how to prepare solution, how to follow treatment
- *Skills:*
  - Parents who can: prepare ORT solution, prepare salt-sugar solution
- *Behavior:*
  - Parents using ORT at onset of diarrhea

Parents using ORT during course of diarrhea

Examples of measures include:

	<b>Output</b>	<b>Effect</b>	<b>Impact</b>
<b>Counts</b>	Number of CHWs visits to households with children aged 1-3	Number of households using ORT	Number of deaths of children aged 1 to 3 from diarrhea
<b>Percentages</b>	Percent of households with children aged 1 to 3 visited by CHWs	Percent of households using ORT	Percent of children 1 to 3 dying of diarrhea

Usually, the economist is not working alone when developing and measuring effectiveness measures. Note also that data on effectiveness usually also may need to be collected prospectively, especially for new approaches that have not been tested or used before. Alternatively, the expected effectiveness of alternatives may be determined by extra-polating from experiences with the alternatives in different settings (e.g., with census worker training in this example), or using sensitivity analysis to evaluate CE under various expected result scenarios.

**4. What kinds of analyses would you conduct based on the information you would have conducted so far or any additional information you would like to collect?**

Possible answers:

**1. Analysis of cost: For example:**

- Compare the magnitude of costs (which is most costly alternative)
- Percent distribution of costs by cost components (e.g., percent of total costs represented by travel costs)
- Absolute difference in costs by cost categories (e.g., travel costs of one alternative are \$ \_\_\_\_ higher than those of the other alternative)
- Relative difference in costs by cost categories (e.g., travel costs of one alternative are x% higher than those of the other alternative)

**2. Analysis of effectiveness**

- Differences in the magnitude of effectiveness
- Absolute differences in effectiveness
- Relative difference in effectiveness

**3. Analysis of CE**

- Compare ratio of effectiveness per unit of cost of each alternative (the higher the better)

**4. Other:**

- Sensitivity analysis, also to evaluate scalability of the alternatives (whether expanding the size of the programs (e.g., train many more CHWs) maintains similar CE results)
- Analysis of equity (though not necessary for this training program): whether the most CE alternative also allows for a fair distribution of resources
- Difference in time to complete both programs

**Exercise 5 – Cost-benefit Analysis: A Case Exercise**  
*Evaluating a Resource Utilization Question (Teams)*  
**Answer Key**

The purpose of this case study is to facilitate the understanding of the application of cost-benefit analysis methodology . It is an opportunity to apply the methodology to a real life scenario. The exercise does not provide a step-by-step calculation of cost or benefit. However, it provides some basis for assessing issues of cost and benefits in a healthcare setting.

**Background**

You are a director at a district hospital and you have been concerned about the high turn over rate of staff, particularly in areas of critical care—emergency and delivery rooms. This has overburdened the hospital budget since money had to be averted from other services and used to provide training to the new staff.

As a result of a training you attended on quality improvement, you decided to form a quality improvement (QI) team that would investigate the problem. The team consisted of doctors, nurses, office administrators, lab personnel, and cleaning staff. The purpose of the team was to critically examine the issues from all angles and to present solutions as well as monitoring their implementation.

After a number of weeks, the team presented you with a report detailing the issues and actions to be taken to resolve the problems. The report pointed out that the high turn over rate is affecting all staff, including medical and administrative staff.

The report indicated that physicians were overwhelmed by their workload and lack of support from senior management. Nurses were frustrated because of shortage of drugs and crowded conditions in the emergency room area during peak hours. Cleaning staff felt they were underpaid and mistreated by other hospital staff.

The quality improvement team suggested a number of solutions, including better scheduling of staff time, rewarding outstanding employees, and the need to conduct interpersonal communication training for all staff.

As a director, you decided to keep the QI team active for a year so that they can monitor the implementation of the solutions and improve on them as needed.

The regional medical officer was making a routine visit to the hospital and she learned about your QI team. She felt that this process is wasting time and adding more work to the already overburdened staff schedule. However you felt that in the long run this process would save the hospital money and improve staff morale, which would reduce the turn over rate. You decided to use a cost-benefit analysis to make your case.



**Discussion Questions:**

**1. How can you determine that the new QI team is cost beneficial?**

Possible answers:

Two possible perspectives can be useful:

- a) CBA can be used to choose from the best range of alternatives. In this example, QI team is the alternative compared to continuing with the current system. In determining whether the team is cost beneficial, we need to consider the costs relative to the benefits of each alternative.
- b) Alternatively, a return-on-investment analysis (which is a specific form of CBS) can be used to determine whether the benefits of the intervention (QI teams) exceed the costs of the resources needed to implement the intervention. Based on the trade-off (and usually considering other factors that are not necessarily quantifiable but are important in the implementation or viability of the intervention), the decision-maker can decide whether the costs are worth the benefits. The benefits can also include the value of costs averted (e.g., not incurring the cost of training a higher-than-normal number of new staff can be translate as a cost saving and therefore a benefit)

**2. Which costs and benefits would you consider measuring in the analysis?**

Possible Answers:

First, anyone conducting a cost analysis needs to decide whose perspective they are including, patient, provider, payer or society. In this case, it is appropriate for the facility to consider its own cost and how to better utilize these.

The following table represents some of the costs and benefits of the intervention (prepared for traditional CBA analysis). The challenge here resides in converting the intangible benefits (improvement in morale, improvement in health service) to tangible ones that can be calculated in the analysis.

**Alternative A: Without QI Team**

<b>Costs</b>	<b>Benefits (in monetary terms)</b>
Cost of training new staff owing to loss of skilled workers	<b><u>Negative Benefits:</u><sup>1</sup></b> Cost of overtime paid to existing staff to cover workload
Cost related to recruitment of new staff	Cost of paying temporary workers  Patient care costs for services that are expected to be most affected by staffing (high turnover may be associated with waste from lack of continuity in coordination of care, hiring temporary and potentially lower skilled/experienced workers who may, for example, order unnecessary tests, be more prone to errors and inefficiency)
	<b><u>Positive benefits:</u><sup>2</sup></b> Revenue for key services mostly affected by high-turnover of staff, e.g., emergency and delivery → from reduced productivity of staff because of low moral means less is done (fewer patients seen) in more time; → from dissatisfied clients are willing to pay less (and/or less willing to pay)

**Alternative B: With QI Team**

<b>Costs</b>	<b>Benefits (in monetary terms)</b>
Time and resources spent on team meetings	<b><u>Negative Benefits:</u><sup>1</sup></b> Cost of overtime paid to existing staff to cover workload
Time cost of supervising teams	Cost of paying temporary workers
Recruiting cost (e.g., cost of administrative tasks associated with recruiting)	Patient care costs for services that are expected to be most affected by staffing (high turnover may be associated with waste from lack of continuity in coordination of care, hiring temporary and potentially lower skilled/experienced workers who may, for example, order unnecessary tests, be more prone to errors and inefficiency)
Cost of new staff training	
[Opportunity cost of team work though difficult to measure <sup>3</sup> ]	<b><u>Positive benefits:</u><sup>2</sup></b> Revenue for key services mostly affected by high-turnover of staff, e.g., emergency and delivery → from reduced productivity of staff because of low moral means less is done (fewer patients seen) in more time; → from dissatisfied clients are willing to pay less (and/or less willing to pay)

**3. What kind of information needed to conduct the analysis?**

<sup>1</sup> Note, when calculating a CBA using a negative benefit means that the alternative with the lower ratio is the more desirable. Negative benefits are costs that incurred as a result of the specific alternative.  
<sup>2</sup> Data on these factors may be used for CBA and analyzed separately (the higher the CBA ratio the more attractive the alternative), or in conjunction with figures for “negative” benefits to generate a “net benefit”. Analysis of CBA ratios will depend on the ultimate values of the benefits.  
<sup>3</sup> For example, productivity lost from not carrying out prior responsibility, so e.g., value of services (revenue) lost. Note however this is often insignificant since most often, team activities are conducted during non-productive hours (i.e., patients are not around, like after-hours or late afternoons)

Possible answers:

Information on the individual items in the table above is necessary. The following are examples of the type of information that would be collected:

- Time and resources (e.g., materials, supplies) for team work, obtained from the team for example
- Patient care costs, e.g., for services in the areas that are likely to be affected by staff turn-over (e.g., in this hypothetical case, major patient services in the emergency and delivery rooms), for the time period corresponding to the two alternatives; information will most likely be obtained from medical records review for example (and adding information on the cost of different elements of care)
- Revenue figures for time periods corresponding to the two alternatives. Revenue levels depend mostly on factors other than the turnover of staff (e.g., level of demand for certain services, level of perceived quality of the facility and therefore utilization); alternative approaches may therefore be considered to understand whether improving quality by reducing staff turnover rates would lead to higher revenues, e.g., willingness-to-pay survey with patient (allowing for a reasonable of time to elapse after the implementation of solutions to reduce staff turnover)

## **Exercise 6 – Analysis of Cost and Quality Related Problems: A Case Exercise**

### **Answer Key**

#### **PART I:**

*Imagine the following hypothetical scenario:*

You are a cost scientist working in a hospital that is implementing a quality assurance program to enhance the cost-effectiveness of its services. One specific intervention that is going on is the use of clinical guidelines to enhance the care to pregnant women suffering from pregnancy-induced hypertension (PIH).

One day, the Director of Maternity Services in your hospital calls you in to her office to discuss an important situation. You are just sitting down when in a serious tone she reveals to you that she has just received the latest report of hospital revenue and was surprised by the findings regarding their services for PIH. Looking at the (simplified) table below, she observes to you that admission rates to the hospital for the treatment of PIH have been declining. She observes that the decline is significant because admission rates are lower relative to rates for the same period last year. She says she thinks that the decline is in large part due to the clinical guidelines that were implemented for PIH at the end of 1998. Since women with PIH are being better managed in the outpatient setting, fewer are being referred for inpatient care. Your hospital and its health system are the main care center for the population of women of childbearing age in the area.

She indicates to you that she worries about the potential loss in net revenue (net revenue = revenue – cost) that this decline means for the hospital and wonders if they should be looking at their costs, though she does not have an idea yet of what to look at specifically. She asks you if you could look into the matter and get back to her soon about what plan of action to take. You agree and tell her that you will get back to her in a day.

*Appendix 1 is a brief description of the clinical guidelines.*

**Table 1: Revenue for Treatment of PIH (Roubles)**

	Outpatient Department			Inpatient Admissions			Total Revenue
	# of patients	Price per patient	Total	# of patients	Price per patient	Total	
<b>1998</b>	300	1,500	450,000	300	2,500	750,000	1,200,000
<b>1999</b>	300	1,500	450,000	100	2,500	250,000	700,000

NOTE: **Revenue** = Price x Volume (or number of patients)  
**Cost** = Cost per patient x Volume (or number of patients)  
**Net Revenue** = Revenue – Cost

**Questions:**

Please discuss the following questions in small groups. *Note:* there are several possible answers to the questions below.

**1. What is the impact of clinical guidelines for PIH on the cost of clinical care?**

**a. What information do you need in order to investigate the question?**

- Information on the old and new guidelines to compare the difference in procedures being used in one versus the other; at both inpatient and outpatient levels
- Example: information on the type of tests used, types of drugs, type of procedures (e.g., surgery etc (see next sub-question)
- Perhaps, information to confirm that guidelines were being followed

**b. List the items that you need to measure. Discuss which are direct and indirect costs?**

- Direct costs: tests used, drugs used, major procedures,
- Indirect costs: cost of hospital-day (including cost of staff coverage, auxiliary staff, food, and perhaps infrastructure costs such as electricity, water and other materials and supplies)
- Other: number of patients seen at outpatient and inpatient level, number women hospitalized, duration of hospitalization

**c. How would you measure the costs of these items? What information sources would you access? Use the table in the Appendix 2 to guide you, if useful.**

Cost item	Information need	Source other than medical record
<u>Tests (during hospitalization)</u> <ul style="list-style-type: none"> <li>• Blood-related (hemoglobin, hematocrit, platelet count, plasma creatinine)</li> <li>• Liver function</li> <li>• Urinary protein and creatinine</li> <li>• Other fetus surveillance (Ultrasound?)</li> </ul>	<ul style="list-style-type: none"> <li>• Type of test performed, also whether point of care versus via lab or other</li> <li>• Number performed of each test</li> <li>• Cost of/charge for test</li> </ul> <p style="text-align: center;">OR</p> <p>Estimate of cost based on activities and inputs required to perform test – need more detail<sup>4</sup></p>	<ul style="list-style-type: none"> <li>• Laboratory, provider interview</li> </ul>
<u>In-patient drugs</u> <ul style="list-style-type: none"> <li>• Magnesium sulphate (after CG)</li> <li>• Other (pre-CG)</li> </ul>	<ul style="list-style-type: none"> <li>• Type and dosage of drug administered</li> <li>• Total amount of doses administered</li> <li>• Cost of drug per dose– variable if varied by dosages</li> </ul>	<ul style="list-style-type: none"> <li>• Pharmacy</li> </ul>

<sup>4</sup> Activity-based costing approach can be used to determine cost. More information will be provided on this methodology as needed.

## Appendix 4

Cost item	Information need	Source other than medical record
<u>Hospital care</u> <ul style="list-style-type: none"> <li>• Cost of hospital-day</li> <li>• Cost of provider time for consultation and monitoring (e.g., nurses, obstetrician-gynecologist, anesthesiologist, midwife(midwives), therapist)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of days hospitalized</li> <li>• Rate for cost of hospital-day (all inclusive of infrastructure, food and personnel time cost)</li> </ul> <p style="text-align: center;">OR</p> <p>Cost of bed:</p> <ul style="list-style-type: none"> <li>• Based on total cost of maintaining hospital services (e.g., electricity and other utilities, food, janitorial services, housekeeping, etc.) divided by number of hospital beds) or</li> <li>• Based on other reasonable/acceptable method of estimation</li> </ul> <p style="text-align: center;">+</p> <p>Cost of provider time:</p> <ul style="list-style-type: none"> <li>• Type of personnel involved in hospital care</li> <li>• Number of each personnel type</li> <li>• Time devoted by each personnel</li> <li>• Average annual salary (including benefits package) for each provider</li> </ul>	<ul style="list-style-type: none"> <li>• Interview with hospital administration</li> <li>• Provider interviews or estimation</li> <li>• Hospital administration</li> </ul>
<u>Medical Procedure</u> <ul style="list-style-type: none"> <li>• Caesarean</li> <li>• Induced labor</li> <li>• Treatment in Intensive Care Unit (for mothers)</li> </ul>	<ul style="list-style-type: none"> <li>• Type of procedure performed</li> <li>• Charge for or cost of each procedure</li> </ul> <p style="text-align: center;">OR</p> <p>Cost of Provider Time:</p> <ul style="list-style-type: none"> <li>- Type of personnel involved in the procedure</li> <li>- Number of each personnel type</li> <li>- Time devoted by each personnel for completing procedure</li> <li>- Average annual salary (including benefits package for each provider)</li> </ul> <p style="text-align: center;">+</p> <p>Cost of Medical Inputs:</p> <ul style="list-style-type: none"> <li>- Type of inputs required for the procedure</li> <li>- Amount of each input required for procedure</li> <li>- Cost per unit of input</li> </ul>	<ul style="list-style-type: none"> <li>- Provider interviews or estimation)</li> <li>- Hospital administration</li> <li>- May need additional information from provider or estimation</li> <li>- Interview with hospital purchasing, for instance</li> </ul>

## Appendix 4

Cost item	Information need	Source other than medical record
<u>Prescribed drugs</u> <ul style="list-style-type: none"> <li>• Antihypertensive medication</li> <li>• Other?</li> </ul>	<ul style="list-style-type: none"> <li>• Type and dosage of drug prescribed</li> <li>• Total amount prescribed</li> <li>• Cost of drug per dose) – variable if varied by dosages</li> <li>• (Total amount taken by patient)</li> </ul>	<ul style="list-style-type: none"> <li>- Pharmacy</li> <li>- (Patient interview?)</li> </ul>

### **PART II:**

After listening to the presentation of your preliminary analysis, the Director realizes that the problem is in good hands. You reinforce that the question of cost is an important one and also suggest that you consider evaluating the impact on patient care quality of the clinical guidelines that were instituted at the end of 1998. The Director concurs but stresses that she wants something 'simple' since she does not have many resources to spend on this evaluation. She encourages you to move ahead. After completing your data collection, your results show the following regarding costs and quality (hypothetical):

*Table 2: Cost of care Related to PIH (Roubles)*

	Average <b>outpatient cost</b> per patient	Average <b>inpatient cost</b> per patient admission
1998	1,000	2,000
1999	1,100	500

*Table 3: Sample indicators of Health Outcome Associated with Management of PIH*

	# of women with severe pre-eclampsia	# of neo-natal and fetal losses after 20 weeks gestation*	# of cases with protocol implemented for PIH	Total # of women with PIH
1998	50	10	0	300
1999	25	5	100	300

\* Assume average of 1 child per woman both years. Related to children of women with PIH.

**Questions:**

2. Using the provided information on cost:

**a. What is the effect of clinical guidelines on outpatient cost per patient? Discuss what might explain the change, if any, in the cost per outpatient visit.**

- Outpatient cost per patient increased by 10%
- Possible reasons include:
  - physician spends more time with each patient to make sure she correctly applies the new guidelines or the new guidelines take more time
  - Better screening at the outpatient level requires that more tests are done at the outpatient level therefore higher cost per patient

**b. What is the effect of clinical guidelines on inpatient cost per patient admission? Discuss what might explain the change, if any, in the cost per inpatient admission?**

- Inpatient costs per patient declined 75%
- Possible reasons include:
  - New guidelines rationalized the use of drugs, so drug cost per patient has gone down
  - Induced labor and more aggressive monitoring of patients may result in shorter length-of-stay for the women in the hospitals, reducing the cost of hospitalization

**c. What is the effect of clinical guidelines on inpatient *net* revenues for PIH? Hint: net revenue = revenue – cost**

$$\text{Net revenues 1998} = (2,500 \times 300) - (2,000 \times 300) = 150,000$$

$$\text{Net revenues 1999} = (2,500 \times 100) - (500 \times 100) = 200,000$$

Overall change in net inpatient revenues from 1998 to 1999: Increase by 50,000 Roubles (or 33%)

**d. What is the effect of clinical guidelines on outpatient *net* revenues for PIH?**

$$\text{Net revenues 1998} = (1,500 \times 300) - (1,000 \times 300) = 150,000$$

$$\text{Net revenues 1999} = (1,500 \times 300) - (1,100 \times 300) = 120,000$$

Overall change in net outpatient revenues from 1998 to 1999: Decrease by 30,000 Roubles (or 20%)

**e. What is the effect of clinical guidelines on overall *net* revenues for PIH, together for outpatient and inpatient? Discuss findings.**

$$\text{Overall Net revenues 1998} = 150,000 + 150,000 = 300,000$$

$$\text{Overall Net revenues 1999} = 200,000 + 120,000 = 320,000$$

Overall change in net revenues from 1998 to 1999: Increase by 20,000 Ruble (~7%).

**f. From your analysis, what factors do you think drive the increase or decrease in net revenue?**



Based on results of the analysis in the table below, the major factors that drive the change in the net revenues from 1998 to 1999 are the change in number of inpatients seen and the reduction the cost of treating an inpatient once they are admitted. Specifically, a two-thirds reduction in the number of inpatients admitted (from 300 to 100 patients) has accounted for 46% of the overall change in net revenue (namely a reduction in net revenue from 1998 to 1999). This significant factor was off-set by a 92% saving in cost of inpatient care (from 600,000 to 50,000 total), which has accounted for 51% of the change (namely increase) in net revenue from 1998 to 1999. Finally, the increase in the total cost of outpatient care (by 10%) has only had a slight effect on the overall change in net revenues from 1998 to 1999, namely accounting for 3% of the change (decrease) in net revenue from 1998 to 1999.

	Inpatient						Outpatient						
	In Thousand Roubles						In Thousand Roubles						
	Price	Vol.	Total	Cost	Vol.	Total	Price	Vol.	Total	Cost	Vol.	Total	Grand
1998	2.5	300	750	2.0	300	600	1.5	300	450	1.0	300	300	300
1999	2.5	100	250	0.5	100	50	1.5	300	450	1.1	300	330	320
Impact on change in net revenue			↓ 500			↑ 550			0			↓ 30	↑ 20
% change			46%			51%			0%			3%	

**3. What can you say about the relationship between cost and quality as a result of using clinical guidelines for PIH?**

**a. Describe the trends in cost and in quality.**

While overall costs have actually decreased – resulting in overall positive net revenue, quality of care has actually increased. According to Table 3, the number of women who develop complication from having the PIH condition has been halved relative to 1998 figures (from 50 to 25 cases). Positive outcomes also seem to have accrued to children of women with PIH, where the number of neonatal losses were also halved (from 10 to 5 in 1998 and 1999 respectively). Given the 100% compliance rate with PIH guidelines, and in the absence of additional information on other intervention that may have been introduced over the same time period, it is reasonable that the changes in outcomes for women with PIH and their children is due to the implementation of the guidelines of care.

The overall prevalence of PIH (or number of cases of women with PIH in the population) however has not changed, suggesting that the guidelines do not have a preventive effect on the management of this condition among women of reproductive age.

**b. Given what you know in this hypothetical case example, would you use clinical guidelines? Why or why not?**

Given that the total cost of treating women with PIH in 1999 was 380,000 Roubles (50,000 in inpatient, and 330,000 in outpatient), we can say that through the use of the guidelines, it cost 15,200 to avert a complication or a case of severe pre-eclampsia ( $380,000 / (50 - 25)$ ) or 76,000 to avert a neo-natal/fetal loss. These figures may be convincing enough for using the clinical guidelines (e.g., relative to other known measures (not mentioned here) for averting complications or losses). Alternatively, the decision of whether to use the clinical guidelines or not can be made using a cost-effectiveness analysis:

	<b>1998 – without using guidelines</b>	<b>1999 – with using guidelines</b>
	900	380
# of cases with severe complications averted	250 (or 300 – 50)	275 (or 300 – 25)
Cost per severe complication averted	3.600	1.381

Based on the analysis above, it cost more to obtain a desirable outcome of an “averted complication of PIH” if clinical guidelines are not used. The analysis suggests that it is favorable to clinical guidelines (vs. not using them), though more information may be necessary to evaluate this conclusion, e.g., whether interventions other than clinical guidelines are available and are more cost-effective, whether there are any side-effects to using the clinical guidelines that need to be considered (that may affect the quality-of-life for the women for example), whether the guidelines can be used consistently, etc...

**4. Discuss the long-term effects/benefits to society of using the clinical guidelines.**

**a. What would be the impact of the clinical guidelines on the long-term cost of care?**

In the long-run, it can be expected that the cost associated with PIH may decrease. Fewer complications may result in fewer hospitalizations for women and children.

**b. What would be the long term to benefits mothers, children, or society of the clinical guidelines?**

Better outcomes for women allow women to achieve more productive lives, with associated benefits for themselves, their families and society in general. Better managed care for the children ensures that they are more likely to become more productive members of society.

## Cost & Quality Core Course

### Pre/Post Course Questionnaire

#### Answer Key (answer in bold)

Write the letter of the example (right column) in the space next to the dimension of quality it matches (left column). More than one answer may be correct

- |                               |          |   |
|-------------------------------|----------|---|
| 1. Technical performance      | <b>g</b> | a. A nurse pays respectful attention to a patient   |
| 2. Access to service          | <b>c</b> | b. A health worker washes her hands between patients  |
| 3. Effectiveness of standards | <b>h</b> | c. The clinic is affordable to patients   |
| 4. Interpersonal relations    | <b>a</b> | d. A child is brought in for a cough also receives his immunization   |
| 5. Efficiency                 | <b>i</b> | e. The provider presents a patient with alternatives for dealing with a condition                                     |
| 6. Continuity                 | <b>d</b> | f. The clinic has a clean and comfortable waiting area  |
| 7. Safety                     | <b>b</b> | g. A health worker properly classifies a sick child   |
| 8. Infrastructure and comfort | <b>f</b> | h. A high-risk patient receives a needed cesarean section   |
| 9. Choice of services         | <b>e</b> | i. The clinic implements a cost-effective measure by immunizing a maximum number of patients with one vial of vaccine |

Write the letter of the example (right column) in the space next to the cost type it matches (left column). More than one answer may be correct

- |                                  |          |   |
|----------------------------------|----------|---|
| 10. Monetary cost                | <b>c</b> | a. value of employee's time engaged in work outside of primary job duties |
| 11. Economic or opportunity cost | <b>a</b> | b. donated time and equipment   |
| 12. "Accounting" cost            | <b>d</b> | c. wage rate of employees   |
| 13. Shadow price                 | <b>b</b> | d. depreciation allowance   |

Circle the letter of the single best answer:

14. Direct costs are costs:
- which do not vary with quantity or volume of output provided in the short run
  - that can be explicitly identified with a particular service or area**
  - that differ among alternative courses of action
  - that are artificially applied to reflect the real value of a product/service at a given time
15. Indirect costs are costs:
- that generally are most easily and directly seen as being incurred
  - that are calculated by dividing cost by a quantity of product/service) or a denominator
  - that cannot be easily identified in the product or service**
  - Cost incurred to prevent 'defective' units of service from being produced
16. Unit cost is:
- cost incurred when services are identified as being defective after they reach the client
  - the cost of resources used and replaced within one year's time
  - the cost of producing one unit of output (e.g., cost per product or service)**
  - the cost of resources expended one time initially to launch a specific intervention or program
17. Average cost is....
- total cost divided by output (quantity of product produced) or a denominator**
  - cost that varies with changes in output volume
  - cost that cannot be easily identified in the product or service
  - cost of an activity that meets internal or external customer requirements
18. What are the two major components of the cost of quality:
- The cost of achieving and maintaining standards**
  - The cost of not achieving and maintaining standards**

Write the letters of at least two examples (right column) in the space next to the type of cost of quality it matches (left column). More than two answers per cost type may be correct

- |  |             |  |
|--|-------------|--|
| 19. Prevention cost  | <b>e, g</b> | a. Excessive overtime<br>b. Unnecessary or inaccurate testing            |
| 20. Appraisal cost   | <b>f, h</b> | c. Providing immunization services<br>d. Medical and prescriptive errors |
| 21. External failure   | <b>d, b</b> | e. Staff credentialing<br>f. Quality audits                              |
| 22. Internal failure cost  | <b>a, i</b> | g. Color-coded folders<br>h. Calibration of lab equipment                |
| 23. Other (i.e., not cost of quality but cost of doing business) | <b>c, j</b> | i. Inaccurate or missing charts<br>j. Administering medication           |

Circle the letter of the single **best** answer:

	Always false	Sometimes true	Always true
24. Improved quality always requires additional resources	a	<b>b</b>	c
25. Cost of poor quality are easily seen and fixed	a	<b>b</b>	c
26. Increased resources do not guarantee improved quality	a	b	<b>c</b>
27. Cost can be reduced by improving quality	a	<b>b</b>	c
28. Cost of correcting problems are diminished when actions are taken as close to the problem as possible	a	b	<b>c</b>

Write the letters of at least two examples (right column) in the space next to the type of cost of quality it matches (left column). More than two answers may be correct.

***This methodology...***

***...is best used when:***

29. Cost-effectiveness analysis	<b>e</b>	a. Comparing alternatives with different effects which are not expressed monetarily
31. Cost benefit analysis	<b>d</b>	b. Analyzing organizational or system cost information viewed by activities
32. Cost of quality analysis	<b>c</b>	c. Analyzing organizational or system cost information related to quality/quality assurance only
33. Activity-based costing	<b>b</b>	d. Analyzing an alternative that has an effect that is monetarily quantifiable
34. Cost-utility analysis	<b>a</b>	e. Comparing alternatives with same measure of effect (that is not measured in monetary terms)
35. Cost management	<b>f</b>	f. Analyzing all organizational or system cost information