

# Cost Analysis for the Management of Acute Coronary Syndrome using Different Quality of Care Indicators

Bernadette A. Tumanan-Mendoza<sup>1,2</sup>, Victor L. Mendoza<sup>3</sup> and Dante D. Morales<sup>1</sup>

<sup>1</sup>Manila Doctors Hospital, United Nations Avenue, Manila

<sup>2</sup>Department of Clinical Epidemiology, College of Medicine, University of the Philippines Manila

<sup>3</sup>De La Salle Health Sciences Institute, College of Medicine, Dasmariñas, Cavite

## ABSTRACT

**Objective.** This study determined the economic burden for nonfatal uncomplicated acute coronary syndrome (ACS) using 100% compliance to certain a) non-invasive or b) invasive and non-invasive diagnostic and therapeutic interventions with class I recommendations in the American College of Cardiology-American Heart Association (ACC-AHA) clinical practice guidelines for ACS in three tertiary hospitals using the societal perspective. It also determined the costs using the patient's perspective in the setting of one private tertiary hospital.

**Methods.** This study was a cost analysis that included a) costs of patient's resources, b) production losses, and c) costs of other resources or sectors, from hospitalization to one month post-discharge for ACS. Several models were constructed due to variations in the costs of diagnostic and therapeutic interventions in the three settings.

**Results.** Using the societal perspective, one model for non-invasive options yielded the following (costs as of January 31, 2009): hospital A, Php87,014 - 124,799; hospital B, Php75,592 - 96,072; hospital C, Php71,969 - 92,148. Excluding fibrinolytic therapy, the lowest total cost would be Php65,000. However, if coronary angiography was added to the models for hospital C, the cost was Php107,154 - 134,574 (coronary angiography was not available in hospitals A and B). Using the patient's perspective, the adjusted mean cost for the model which used the least expensive medication was Php96,421 (Standard Deviation = 34,076).

**Conclusion.** The economic burden for nonfatal uncomplicated ACS may range from Php65,000 - 134,574.

**Keywords:** *cost analysis, nonfatal acute coronary syndrome, economics, out-of-pocket payments, ACS quality of care indicators*

## Introduction

Acute coronary syndrome (myocardial infarction and unstable angina) ranks high as a cause of mortality in many developed countries. With the trend towards globalization, socioeconomic, cultural and demographic transitions are taking place in many less developed countries, and acute

coronary syndrome has become an important contributor to the total burden of disease and death in many countries of the developing world. In the Philippines, myocardial infarction and unstable angina accounted for 16.5% and 13.2% of total deaths, respectively, in 2000, increasing to 17.6% and 12.8% of total deaths, respectively, in 2004.<sup>1</sup>

With the goal of improving quality of care and thus reducing morbidity and mortality attributed to acute coronary syndrome, clinical practice guidelines (CPGs) have been formulated, among which are the American College of Cardiology-American Heart Association (ACC-AHA) CPGs on acute myocardial infarction and unstable angina.<sup>2,3</sup> In the Philippines, the ACC-AHA CPGs have been adapted with modifications in specific practice settings. Moreover, several studies have been done using compliance to guideline recommendations as parameters to determine quality of care in some tertiary centers. On the other hand, the economic burden of acute coronary syndrome (ACS) in the Philippines has not yet been determined.

In the Philippines, the cost of healthcare is usually borne through out-of-pocket payments. The national average out-of-pocket payments were estimated to be 60.9% and 48.4% of the total health expenditures in 2002 and 2005, respectively.<sup>4,5</sup> Healthcare delivery through the public sector comes in the form of public hospitals and facilities which are beset with funding problems. On the other hand, the national health insurance program (PhilHealth) provides coverage for in-patient and some out-patient services. PhilHealth's beneficiaries are increasing steadily, from 64.5 million out of 88.6 million population (73%) in 2007 to about 77 million as of March 2009. By 2010, it is estimated that 82% of the projected population of 94 million Filipinos will have PhilHealth coverage.<sup>6,7</sup> In addition, PhilHealth claims that its benefit payments have also increased from 6.8 billion pesos to more than 18 billion pesos from 2000 to 2008.<sup>6</sup> Although this increasing number of beneficiaries and payments can be considered positive developments, PhilHealth's coverage is still rather limited. Moreover, for chronic conditions like coronary artery disease (which includes survivors of acute coronary syndrome), no coverage for continuing medical care (out-patient visits and maintenance medications) is provided.

In view of the above scenario, this study was undertaken.

## Objectives

**General Objective:** With societal and patient perspectives in mind, this paper determined the economic burden (hospitalization up to a month post-discharge) of nonfatal uncomplicated acute coronary syndrome (acute myocardial infarction or unstable angina) using compliance to certain Class I recommendations of the 2002 and 2004 ACC-AHA clinical practice guidelines as quality of care indicators. (Please refer to appendix A for definition of the classes of recommendations).

Corresponding author: Bernadette A. Tumanan-Mendoza, MD, MScCE, MScHE

Manila Doctors Hospital  
United Nations Avenue, Manila 1000  
Telephone: +632 521-1704  
Email: bernadette.tumanan@gmail.com

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**Specific Objectives:**

The specific objectives of this study were to determine the economic costs (hospitalization up to one month follow-up after discharge) for nonfatal uncomplicated ACS using the following indicators:

1. 100% compliance to certain non-invasive diagnostic and therapeutic interventions with class I recommendations in the 2002 and 2004 ACC-AHA CPGs for ACS;
2. 100% compliance to certain invasive and non-invasive diagnostic and therapeutic options with class I recommendations;
3. practice patterns and charges in a private tertiary hospital.

The first and second indicators were used in three tertiary hospitals using the societal perspective while the third was used in only one of the three tertiary hospitals (a private hospital in Metro Manila) using the patient's perspective.

**Methods**

The ACC-AHA recommendations for acute coronary syndrome (the revised ACC-AHA CPGs for myocardial infarction and unstable angina as of 2002 and 2004) were reviewed. They were grouped into diagnostic and therapeutic interventions as well as invasive and non-invasive maneuvers. Using several Class I recommendations as parameters for quality of care, a cost analysis for uncomplicated ACS was performed with the assumption of 100% compliance to these recommendations. The indicators for quality of care that were included in this analysis were the following: a) non-invasive diagnostic examinations—ECG, cardiac biomarkers, either troponin or CK-MB, 2D-echocardiography, lipid profile determination and treadmill exercise test; b) invasive procedure which referred to the performance of coronary angiography; c) therapeutic interventions—administration of anti-thrombotics, i.e., either aspirin, clopidogrel or heparin (low molecular weight or unfractionated heparin), nitrates, morphine, fibrinolytic therapy, beta-blockers, ace-inhibitors (or angiotensin receptor blockers), and statin therapy. The costs were then determined in three tertiary hospitals, two of which are private hospitals while the third is a government hospital. Moreover, two hospitals are located in Manila while the other is located in a suburban area about 30 kilometers south of Manila. These hospitals were selected since relevant data on practice patterns on ACS were available from these centers. While 100% compliance to the guidelines represents the "ideal world" scenario, the data on practice patterns represent the "real world" scenario. Moreover, the three centers represent varied settings—private, public and suburban area.

**A. Identification, Measurement and Valuation of Costs (Societal Perspective)****1. Hospitalization Costs**

The first step in any cost analysis entails identification of the cost centers. In this study, these were identified following Drummond's recommendations as to the classification of costs<sup>8</sup> rather than labeling them as either direct or indirect costs. These are: 1) cost of healthcare resources consumed; 2) cost of patient/patient's family resources; 3) productivity/production losses; and 4) cost due to consumption of other resources/sectors. These cost centers were valued as of January 31, 2009.

The first category refers to the costs of setting up and running a healthcare program as well as the costs of treating the possible adverse effects or events attributable to the

program. Included in this type of cost are variable costs (supplies) and fixed or overhead costs (rent, or capital costs). For this study, no costs under the first type of cost were identified whether the societal or the patient's perspective was used since there is no need to build a new facility. This is in view of the fact that the study settings (three tertiary hospitals) already have provisions for managing patients with acute coronary syndrome. Thus, no new or dedicated structure or healthcare facility needed to be built for patients with acute coronary syndrome. Furthermore, facilities for the follow-up examinations and treatment were also in place and the consequent follow-up costs were included in the other types of cost, e.g., maintenance medicines and professional fees were included in the out-of-pocket payments since the burden of these costs falls on the patients or their families.

On the other hand, the second type of cost refers to the out-of-pocket payments made by the patient or the patient's family during hospitalization. These included: 1) emergency room charges; 2) use of ICU charges; 3) admission kit; 4) room and board (ICU and regular room); 5) diagnostic examinations; 6) medications; 7) supplies; and 8) professional fees. For this category, specific charges in the case of services or resources consumed in the hospital (emergency room and ICU charges, room and board, diagnostic examinations, etc.) were used rather than actual costs since these were the real costs borne by the patient or his family.

The cost of emergency room and intensive care unit resources consumed or utilized by the patient while he was still in the specific facility were measured and valued. These included use of oxygen, monitoring devices like cardiac monitor and pulse oximeter, ECG (rhythm) strips as well as the electricity being consumed by such devices. In addition, admission kit consisting of thermometer, tissue paper and plastic utensils were also included under this type of cost. On the other hand, the costs for the room and board (ICU and regular room) were obtained from the three hospitals ranging from ward, private room and suite or deluxe room (lowest room rate to the most expensive room rate). It was assumed that patients stay in the hospital for seven days (mean duration of days of ACS patients in the PINAS I and PINAS II studies<sup>9,10</sup>) with three days being spent in the ICU and four days in the regular room. For the diagnostic procedures, the costs were also based on the charges obtained from the study settings, which depended on the type of room the patients stayed in.

The costs of medications were computed based on the prices obtained from the biggest drugstore chain in the country. Although other authors recommend the use of international prices or the wholesale acquisition costs of medicines,<sup>11,12</sup> the prices from a local drugstore chain were used since these were the real costs paid through out-of-pocket resources. Moreover, the prices from this drugstore chain were utilized since this store has a nationwide presence, controls 80% of the retail pharmaceutical market and claims a uniform pricing scheme.<sup>13</sup> In addition, variations in the cost of the different brands or generics were considered in this study. This was accomplished by listing the prices of available brand names of a specific medication and a range was obtained from the lowest- to the highest-priced brand. The lowest price drug was used in the first model (Model 1) in the analysis while the most expensive brand was used in the sensitivity analysis.

The supplies utilized by the patients in the PINAS II study were identified and listed. The costs of these supplies were then measured and valued using the costs obtained from the drugstore chain mentioned in the earlier paragraph. However, in cases where they were not available in the drugstore chain,

the costs were obtained from one of the tertiary hospitals (using the lowest possible cost).

Variations exist in the professional fees of physicians who provide care for acute coronary syndrome patients (fee-for-service) although a uniform fee is imposed by health insurance companies. Fees were noted (from available billing statements) to be from Php10,000 - 30,000 in one of the hospitals while they were estimated to be from Php10,000 - 20,000 in the other two study settings. On the other hand, a random survey of the professional fees for the coronary angiogram revealed a range of Php15,000 - 25,000.

The third type of cost relates to the cost of production losses defined as "wealth lost to society due to disease."<sup>14</sup> On the other hand, the United States Panel on Cost Effectiveness in Health and Medicine preferred the term *productivity cost* which refers to the "the costs associated with lost or impaired ability to work or to engage in leisure activities due to morbidity and lost economic productivity due to death."<sup>15</sup>

Valuation of productivity costs may be problematic. In view of these problems, several approaches had been formulated by economists, one of which needs country-specific estimates which may vary over time.<sup>14</sup> The Organization for Economic Cooperation and Development (OECD) defined *labor productivity* as "the ratio of a volume measure of output to a volume measure of input."<sup>16</sup> This definition was adopted locally; hence, the cost of labor productivity was computed by dividing the gross domestic product (GDP) by the number of employed persons (as determined by the labor force survey or LFS).<sup>17</sup> Meanwhile, "GDP refers to the value of all goods and services produced domestically; the sum of gross value added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the values of their outputs)."<sup>18</sup> The latest available estimation of GDP and number of employed persons, i.e., data for October 2008 (which was still in effect in January 2009, the base year used for costing) were used in this study.<sup>19,20</sup>

The fourth cost center refers to the cost of consumption of other resources or sectors. The cost of volunteer work and the productivity cost incurred by the patient's relative/s are included in this type of cost. Other related costs incurred by the patient's relatives while attending to the needs of the patient in the hospital included transportation costs as well as the cost of meals. This last type of cost was estimated by assuming that one companion (usually a family member) was always present during the entire duration of the patient's hospitalization and that this person was gainfully employed. Hence, cost of lost productivity of the companion was also estimated in the same manner that the patient's production losses were computed. For the transportation and meal expenses, conservative estimates of Php100.00 (using public transportation) and Php400.00 (average cost of three meals from the hospital canteen) per day were allotted, respectively.

## 2. Follow-up Costs

The costs of follow-up up to a month post-discharge were also included in the four types of costs that were listed above. This time, the out-of-pocket expenses included medications, additional diagnostic examinations and professional fees. The costs of lost productivity and use of other resources (enumerated in the previous section) were also included. However, in contrast to the previous section, production losses for the caregiver during the follow-up visits were computed for half a day of absence from work per visit (it was estimated that the follow-up visit would consume about four hours or half a day's regular working time to account for travel to

and from the clinic as well as waiting and actual consultation time). Moreover, food (snacks) and transportation allowances (based on the conservative estimates mentioned above) were allotted for both the patient and his companion.

Appendices B and C give a summary of the hospitalization and one month follow-up costs that were identified for acute coronary syndrome and how they were measured and valued using the societal perspective.

## B. Identification, measurement and valuation of costs using the patient's perspective

The identification, measurement and valuation of the cost centers using the patient's perspective also utilized the approaches mentioned above using the societal perspective. However, differences exist in the valuation of 1) cost of hospitalization and 2) productivity cost.

Practice patterns related to the diagnostic and therapeutic management of acute coronary syndrome in a tertiary private hospital (hospital A) were obtained from the PINAS II study.<sup>10</sup> This study was a survey on the practice patterns on acute coronary syndrome in hospital A which also looked into the compliance of these practice patterns with the recommendations of the ACC-AHA CPGs on acute coronary syndrome. Data on hospitalization costs were obtained from the hospital charges for the ACS patients admitted from the period January 1, 2007 to August 2007. The cost centers identified were charges from a) emergency room, b) ICU, c) central service, d) heart station, e) laboratory, f) radiology, g) pharmacy and h) room and board. The assumptions on the physicians' professional fees using the societal perspective were also used for the analysis using the patient's perspective.

On the other hand, the estimation of production losses utilized the minimum wage existing during the time of the study rather than the GDP divided by the number of employed persons. Moreover, the range for the minimum wage for the national capital region (NCR) as of 2007 was Php325 - 362.<sup>21</sup> The highest of the range, i.e., Php362 was used for the computation in this study.

The total cost using the patient perspective was adjusted to its value as of January 31, 2009 to reflect the current value. In addition, this adjustment would enable the above cost to be compared to the cost using the societal perspective.

## Results

### Societal Perspective (Base Case and Sensitivity Analyses)

Tables 1 and 2 give a summary of the cost of hospitalization and follow-up costs up to a month post-discharge for acute coronary syndrome in the three tertiary hospitals using the societal perspective. Model 1 (ward) constituted the base case analysis of the cost analysis. This model utilized the lowest end of the range of charges for the room rate, laboratory examinations, professional fees as well as the prices of the medicines. On the other hand, a sensitivity analysis was imperative due to variations in the costs (charges or prices) of the other resources. Sensitivity analysis may be performed either by changing the cost of the identified cost centers one at a time (one-way sensitivity analysis) or at least two of the costs identified at the same time (multi-way analysis). In this study, sensitivity analyses (multi-way) were performed by varying the room charges (private room instead of ward) which also necessitated using a different charge for the diagnostic examinations (affected by room rate). In the same context, assumptions in the professional fees to be used for the costing were also varied by the change in the room rates.

Furthermore, Model 1 corresponded to the use of non-invasive diagnostic procedures (ECG's, cardiac markers—troponin and CK-MB) and therapeutic interventions which included fibrinolytic therapy, aspirin, clopidogrel, nitrates, beta-blockers, ace-inhibitors and statins. Model 2 utilized the same diagnostic and therapeutic interventions as Model 1; however, it used the highest range in the price of medicines of similar generics. Likewise, corresponding increase in the charges in the other types of costs (e.g., laboratory examinations) were imputed to the change in the type of room utilized. Model 3 differed from Model 1 in that it did not utilize fibrinolytic therapy but incorporated the use of coronary angiography (which was available in hospital C but not in hospitals A and B) as the invasive diagnostic procedure; however, it was similar to model 1 in all the other aspects of the costs. Finally, Model 4 used the same diagnostic and therapeutic options as Model 3; however, it used the most expensive brand in the medicines with the same generic names. Again, as with Model 2, corresponding increases in the other charges were also included in the analysis.

On the other hand, if fibrinolytic therapy will not be used due to its relatively prohibitive cost as was seen in the practice patterns (discussed in a later section), the cost in models 1 and 2 will be reduced by Php7,000 (the cheapest price obtained for the fibrinolytic therapy in the drugstore chain).

**Patient's Perspective**

The analysis using the patient's perspective utilized the data from the charges for 61 patients admitted at one of the tertiary hospitals from January – August 2007. Excluded from the data were hospital charges for those who had fatal outcomes. However, in contrast to the models for the societal perspective (i.e., uncomplicated ACS), some of the patients included in this analysis had cardiac complications (nonfatal) like congestive heart failure although treatment of other conditions like infections or diabetes mellitus were excluded in the cost analysis.

The summary of the costs for acute coronary syndrome are listed in Table 3. These costs also included the same costs identified in the analysis using the societal perspective except for differences in the valuation of the hospitalization costs and productivity losses. Two models were constructed using the patient's perspective, Models 5 and 6. The hospitalization costs were similar in both models since it was based on the data on practice patterns and hospital charges; however, the lowest rates in the range of follow-up costs were used for Model 5 and the highest ones for Model 6. The costs were shown both in 2007 and in adjusted values as of January 31, 2009.

About 65.6% of the included patients had Philhealth coverage while 47.5% availed of the senior citizens' discount. The following table summarized the mean amount and standard deviation of the Philhealth coverage and senior citizens' discount.

Moreover, 13 patients (21%) had coverage from private health maintenance organizations (HMOs) while eight (13%) were provided hospitalization coverage (in full or with minimal co-payments) by their place of work (either as employees or dependents of employees of private or government corporations). However, these percentages in coverage are not exclusive of each other, e.g., patients with coverage from HMOs also have PhilHealth benefits.

**Discussion**

The study showed a range of costs for hospitalization and one month post-discharge costs for acute coronary syndrome using a hundred percent compliance to several Class I recommendations of the ACC-AHA guidelines. This was done by constructing several models whereby varying combinations of the Class I recommendations, either non-invasive or invasive options were utilized. On the other hand, prior to this cost study, compliance to these recommendations was determined in the study settings. It was found that compliance to a majority of the quality of care indicators was high as shown in Table 5.<sup>10,23,24</sup> This was deemed both relevant and important prior to the construction of the models, since low compliance rates would render the models irrelevant and useless.

Meanwhile, economic constraints played a major role in the low compliance rates noted for coronary angiography and fibrinolytic therapy. In this context, the costing models accounted for the inclusion or exclusion of these costly options. However, these models could only account for some and not all the possible combinations of the Class I recommendations. For example, some patients may receive angiotensin receptor blockers instead of angiotensin converting enzyme inhibitors due to intolerance to the latter. Moreover, variations exist not only in the cost of medicines but in the other cost centers as well. In addition, although one model accounted for the use of coronary angiography, the cost of possible angioplasty or coronary artery bypass graft surgery was not accounted for in any model. On the other hand, this study tried to make these models as useful as possible by including the relevant costs for treating patients with uncomplicated acute coronary syndrome in the background of limited resources.

**Table 1A. Cost of hospitalization and follow-up in hospital A**

	Ward	Private	Suite
<b>Model 1</b>	74,953	92,970	112,738
Hospitalization Costs	12,061	12,061	12,061
Follow-up Costs	<b>87,014</b>	<b>105,031</b>	<b>124,799</b>
<b>Total Costs</b>			
<b>Model 2</b>	77,133	95,149	114,918
Hospitalization Costs	18,615	18,615	18,615
Follow-up Costs	<b>95,748</b>	<b>113,764</b>	<b>133,533</b>
<b>Total Costs</b>			

**Table 1B. Cost of hospitalization and follow-up in hospital B**

	Ward	Private	Suite
<b>Model 1</b>	64,441	77,006	84,931
Hospitalization Costs	11,141	11,141	11,141
Follow-up Costs	<b>75,582</b>	<b>88,146</b>	<b>96,072</b>
<b>Total Costs</b>			
<b>Model 2</b>	66,620	79,185	87,110
Hospitalization Costs	17,695	17,695	17,695
Follow-up Costs	<b>84,315</b>	<b>96,880</b>	<b>104,805</b>
<b>Total Costs</b>			

**Table 2. Cost of hospitalization and follow-up in hospital C**

	Ward	Big Private	Deluxe (Suite)
<b>Model 1</b>	61,018	71,398	81,198
Hospitalization Costs	10,951	10,951	10,951
Follow-up Costs	<b>71,969</b>	<b>82,349</b>	<b>92,148</b>
<b>Total Costs</b>			
<b>Model 2</b>	63,197	73,577	83,377
Hospitalization Costs	17,505	17,505	17,505
Follow-up Costs	<b>80,702</b>	<b>91,082</b>	<b>100,882</b>
<b>Total Costs</b>			
<b>Model 3</b>	96,203	113,823	123,623
Hospitalization Costs	10,951	10,951	10,951
Follow-up Costs	<b>107,154</b>	<b>124,774</b>	<b>134,574</b>
<b>Total Costs</b>			
<b>Model 4</b>	98,382	116,002	125,802
Hospitalization Costs	17,505	17,505	17,505
Follow-up Costs	<b>115,887</b>	<b>133,507</b>	<b>143,307</b>
<b>Total Costs</b>			

**Importance of perspective/viewpoint of the study**

This cost analysis was conducted using two perspectives, the society and the patient's perspectives. The perspective which represents the viewpoint of the analysis is very important since it affects what types of cost are included and how they will be measured and valued.<sup>25</sup> In addition, the viewpoint can put the analysis in a decision-making context. Usually, the perspective determines who will bear the cost (or who will benefit from the implementation of a health program or creation of a health facility). However, the societal viewpoint, being the broadest considers all types of costs (and benefits) regardless of who will pay the costs or receive the benefits in a particular geographical area or country.<sup>25</sup>

In view of the difference in perspectives used in this study, the measurement and valuation of several cost centers varied. For instance, the measurement and valuation of the cost of productivity was affected by the type of perspective. From a societal viewpoint, this was measured by dividing the gross domestic product with the number of employed persons, while if the patient's perspective was considered, it was measured through the average minimum daily wage. The rationale can be discerned by taking into consideration that production losses reflect a society's/country's economic losses if some of its population will not be able to go to work due to illness. In contrast, the minimum daily wage reflects the patient's loss in terms of his income if he gets sick. Likewise in the hospitalization cost, although identification of the cost

**Table 3. Cost of hospitalization and follow-up in hospital\* (patient's perspective)**

	Model 5 (as of 2007)	Model 5 (as of Jan 31, 2009)	Model 6 (as of 2007)	Model 6 (as of Jan 31, 2009)
Mean Hospitalization Charges (Standard Deviation)	66,541 (31,787)	71,333 (34,076)	66,541 (31,787)	71,333 (34,076)
Other hospitalization costs	7,868	8,435	7,868	8,435
Sub-total (hospitalization costs)	74,409	79,768	74,409	79,768
Follow-up Costs	15,534	16,653	18,615	19,956
<b>Total Costs</b>	<b>89,943</b>	<b>96,421</b>	<b>93,024</b>	<b>99,724</b>

\*Consumer Price Index for 2007 = 144.4; January, 2009 = 154.8<sup>22</sup>

centers revealed the same items, measurement and valuation differed. As mentioned earlier, the societal cost used the prices of a local drugstore chain in valuating cost of medicines and supplies, while in the analysis using the patient's perspective, hospital charges were used for the hospitalization cost, since these represent the cost borne by the patient.

**Table 4. PhilHealth coverage and senior citizens' discount**

	Mean	Standard deviation (SD)	Range
PhilHealth Coverage (66%)	10,853	5,492	5,200 – 34,800
Senior Citizens' Discount (48%)	11,233	7,055	2,629 – 22,265

**Coverage under the National Health Insurance Program**

The government tries to alleviate the economic burden of healthcare through its national health insurance, commonly known as PhilHealth. Although PhilHealth provides some out-patient packages, most of the benefits it provides come in the form of its inpatient coverage. Under the present PhilHealth classification, inpatient disease conditions are categorized into four case types, from A to D (increasing severity) with category A having the lowest rate ceilings or allowances for inpatient coverage. The patients in this study with unstable angina were classified as Case Type A while those with acute myocardial infarction were classified as Case Type B. One may argue or wonder about the above classification (especially the A classification) since either condition may be debilitating or even fatal. In contrast, coverage for some minor surgical procedures is the same as or even surpasses that of unstable angina.

Table 6 lists the maximum allowances for unstable angina and acute myocardial infarction based on the benefit item listed that were existent and applicable for the patients in this costing study (inpatients in tertiary hospitals).

This coverage may be deemed minimal. For example, the lowest possible cost (and not hospital charges) of giving low molecular weight heparin (either for unstable angina or acute myocardial infarction for five days) was Php6,485.00. On the other hand, the maximum allowance for drugs and

**Table 5. Compliance to several quality of care indicators for ACS in the 3 study settings<sup>6,18,19</sup>**

Quality of Care Indicator	Hospital A	Hospital B	Hospital C
	2007	2007	2006-2007
	%	%	%
<b>A. Diagnostics</b>			
ECCG	100		100
Troponin or CK-MB	100		97
2D Echo	89	81	87
Lipid profile/LDL-C	86	87	89
Coronary Angiography	8		3; 9 (service; private)
<b>B. Therapy</b>			
Aspirin	72		100
Clopidogrel	40		75
Heparin	92		74
Aspirin or Clopidogrel or Heparin	100	100	
Beta-blockers	87	97; 95	91
ACE-Inhibitor	70	(arrival;	98
Nitrates	87	discharge)	100
Lipid lowering agent (statin)	94	80	99
Fibrinolytic therapy	26	9	46

medicines for unstable angina and AMI were Php3,000, and 9,000, respectively. Moreover, the maximum professional fee allowances for a specialist practicing in a tertiary hospital (the study setting) for unstable angina and acute myocardial infarction were Php1,000 and 1,500, respectively. In contrast, surgeons may be given maximum fees of Php16,000, while anesthesiologists may receive maximum fees of Php5,000, for case types A-C.<sup>26</sup>

Starting April 5, 2009, the benefits were upgraded by PhilHealth.<sup>27</sup> In view of this, the benefits for acute coronary syndrome were revised as shown in Table 7.

PhilHealth claims that the revised package will result in an increase of about 35% on the annual benefit payments.<sup>28</sup> However, despite this projected increase in benefit payments, provisions for the different categories of benefit item can still be considered low. For example, considering that the ideal setting for managing acute coronary syndrome in the first few days is admission to an intensive care unit, the room and board coverage is way off the cost for an ICU stay per day. In fact, many patients in the PINAS I and II studies chose not to be admitted in the ICU due to the high cost entailed by the ICU provision of care.<sup>10</sup>

Furthermore, coverage of a specialist's professional fees for acute coronary syndrome can be considered relatively low compared to other specialists. As an example, a surgeon (diplomate or fellow) performing a procedure described as "shaving of epidermal or dermal lesion in the trunk, arm or legs with the lesion's diameter > 2.0 cm will receive Php1,960 or Php2,240 if the lesion is in the face, ears, nose, lips or mucous membrane."<sup>29</sup> If the severity of the condition is analyzed, surely unstable angina (which can be fatal or lead to other cardiovascular complications), deserves more consideration than the mentioned surgical procedure. In addition, Table 8 (which lists the fees for some procedures), further demonstrates the discrepancy in the coverage for acute coronary syndrome compared with many elective procedures.

Moreover, based on the maximum fees listed either in the old or new benefit schedule, the coverage for the professional fees for acute coronary syndrome is only up to four days of confinement for unstable angina and six days for acute myocardial infarction. This duration of hospitalization falls short of the average number of days observed in the PINAS II study (mean of 7.5 days with SD of five days).<sup>10</sup> In addition, patients who experience complications or undergo invasive procedures will definitely require longer days of confinement.

**Other Financing Sources**

Apart from PhilHealth which is available to patients in both public and private settings, other financing sources are via public hospitals where patients do not pay for room and board. However, variations exist with regards the financial support for diagnostic examinations and medications. Moreover, many public hospitals are limited in terms of their capability to manage patients with acute coronary syndrome necessitating transfer to tertiary or specialty centers.

Other subsidies are provided through the revenues of some government controlled corporations like the Philippine Charity Sweepstakes (PCSO) and Philippine Gaming Corporation (PAGCOR) as well as some non-government institutions and foundations. These entities give donations depending on the assessment of the patient's socioeconomic strata. Private hospitals also provide some (or minimal) subsidies through their corporate responsibility programs.

On the other hand, some patients have access to private health maintenance organizations or HMOs. Such HMOs

provide varying coverage (necessitating varying co-payments) dependent on the patient's premium which is determined by the patient's capacity to pay. Lastly, some fortunate few are employed by corporations or institutions which provide comprehensive health coverage with no or minimal co-payments as part of their employment package.

**Conclusions, Limitations and Recommendations**

Varying hospitalization and follow-up (one month post-discharge) costs for uncomplicated ACS were obtained depending on the assumptions as well as the perspective utilized. The cost may range from Php71,969 - 134,574. The lowest range of cost represented a model whereby no invasive interventions were included; however, fibrinolytic therapy was incorporated in the assumptions. If fibrinolytic therapy was excluded, the lowest total cost would be lowered to Php65,000.

The above costs prove that ACS represents a significant economic burden in the Philippines. Moreover, the models constructed focused only on uncomplicated ACS up to a month post-hospitalization with many of the assumptions in the cost centers using the lowest possible in the range given. The costs would definitely go up due to the higher rates or charges in other private hospitals (e.g., higher ICU and room

**Table 6. PhilHealth rate ceilings/maximum allowances\* (prior to April 5, 2009)**

Benefit Item	Unstable Angina	Acute Myocardial Infarction
Room & Board	400/day	400/day
Drugs & Medicines	3,000	9,000
X-ray, Lab & Others	1,700	4,000
Professional Fees (Specialist)	250/day, maximum of 1,000	250/day, maximum of 1,500

\*Ceilings/coverage for tertiary hospitals<sup>26</sup>

rates). In addition, the costing models focused on 100% compliance to many non-invasive recommendations in the ACC-AHA guidelines for ACS which were used as the quality of care indicators.

As mentioned in the earlier section, valuation of productivity costs can be beset with problems. Although this paper adopted the OECD definition of labor productivity, this entailed some underestimation. This is due to the exclusion of the contributions to the GDP of the large informal sector. Its accuracy is also diminished by the high unemployment rate in our country.

Despite the recent upgrade of PhilHealth benefits, coverage for ACS remains relatively low. In addition, the classification of unstable angina as under Class A (least severe disease), and acute myocardial infarction as under Class B needs to be reviewed. In view of this, there is a need for physicians and

**Table 7. Inpatient Benefit Schedule for Tertiary Hospitals (beginning April 5, 2009)<sup>27</sup>**

Benefit Item	Unstable Angina (Case Type A)	Myocardial Infarction (Case Type B)
Room and Board	500/day	500/day
Drugs and Medicines	4,200	14,000
X-ray, Laboratory and others	3,200	10,500
Professional Fees (Specialist)	500/day, Maximum of 2,000	600, Maximum of 3,600

organizations involved in the care of ACS patients to ask the concerned policy makers to reconsider the above classification and, consequently, the coverage for ACS.

The results of this study may be used by donors from both government and non-government institutions in extending financial assistance to ACS patients who belong to the lower socioeconomic strata. Lastly, the available financial support must be made known to patients or their families for them to be able to overcome the financial burden of acute coronary syndrome.

**Table 8. PhilHealth Coverage of some conditions or procedures<sup>26</sup>**

	RVU	Amount
Shaving of epidermal or dermal lesion – trunk, arms or legs; diameter >2.0 cm	35	1,960
Shaving of epidermal or dermal lesion – face, ears, nose, lips, mucous members; diameter > 2.0 cm	40	2,240
Blepharoplasty (lower or upper eyelid)	55	3,080
Blepharoplasty with excessive skin weighing down lid	70	3,920
Chemical pleurodesis (for recurrent or persistent pneumothorax)	60	3,360
Thoracentesis (diagnostic)	60	3,360
Hemorrhoidectomy	80	4,480
Cholecystectomy (any method)	200	11,200

(The coverage was obtained by multiplying the relative value unit, RVU, by the peso conversion factor, PCF; the corresponding PCF of Php56.00 for a diploma or fellow was used as the multiplier in this table).<sup>29</sup>

**APPENDICES**

**Appendix A Definitions of the ACC-AHA Classification of Recommendations\***

Class I: Conditions for which there is evidence and/or general agreement that a given procedure or treatment is useful and effective.

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment.

Class III: Conditions for which there is evidence and/or general agreement that the procedure/treatment is not useful/effective and in some cases may be harmful.

\*A more detailed table on recommendations with the corresponding level of evidence may be found in the 2004 ACC-AHA guidelines for acute ST-elevation myocardial infarction.<sup>3</sup>

**Appendix B Summary of the societal costs of treating acute coronary syndrome (Hospitalization Costs)**

Costs Identified	Measurement of Costs	Valuation of Costs
1A Cost of patient/patient's family resources		
a) ER charges	Unit charge (per hour or per day) of specific devices like cardiac monitors multiplied by hours or days used	Hospital charges
b) ICU charges		
c) admission kit	Cost of items included in the kit, e.g., thermometer, tissue paper	
d) Room & board	ICU rate x 3 days; regular room x 4 days	ICU and room rates from study settings (3 tertiary hospitals; ward, private and suite/ deluxe
e) Diagnostic examinations	Charges of some diagnostic examinations recommended in the ACC-AHA guidelines (unit charge multiplied by number of times performed)	Charges from the 3 tertiary hospitals
f) Medications	Unit price of specific medications multiplied by the number of doses	Prices obtained from the biggest drugstore chain in the country (lowest-highest price of different brands)
g) Supplies	Unit price of supplies identified	Prices obtained from same drugstore chain (above) or hospital if not available in the drugstore (lowest available hospital charge)
h) Professional fees	Professional fees from 3 tertiary hospitals	Php 10,000-30,000 (obtained via random survey)
1B Production Losses	Cost per day multiplied by duration of hospitalization (7 days)	GDP / average number of employed persons as of 10/2008 (latest available data)
1C Cost due to consumption of other resources (caregiver's time)		
Production losses	Cost per day multiplied by duration of hospitalization (7 days)	Same as above
Transportation	Average transportation cost/day multiplied by 7 days	
Food Allowance	Average cost of 3 meals/day (hospital canteen) multiplied by 7 days	

**Appendix C Summary of the societal costs of treating acute coronary syndrome (Follow-up Costs)**

Costs Identified	Measurement of Costs	Valuation of Costs
2A Patient's resources		
a) Medications	Unit cost of maintenance medications multiplied by 23 days	Prices obtained from the drug-store chain
b) Follow-up diagnostic examinations	Cost of follow-up ECG's/TET	Clinic/hospital charges
c) Transportation	Same assumption as above	
d) Food (snacks)	Average cost of snack in hospital canteen	
Professional fees	Php400 - 500/clinic visit multiplied by 2 (2 follow-up visits)	
2B Production Losses		
	Cost per day multiplied x 23 days	Same as above
2C Caregiver		
a) Production Losses	Minimum wage (half day) x 2	
b) Transportation	Same as above	
c) Snacks	Same as above	

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