Cost of Hospitalization for Acute Coronary Syndrome in the Philippines

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Abstract

INTRODUCTION: Acute coronary syndrome (ACS), specifically myocardial infarction, accounted for approximately 41% of deaths due to coronary artery disease in 2013. A large number of Filipinos are affected by ACS; thus, it is important to determine its hospitalization cost. The study objectives were to (1) define the hospital care pathways for ACS; (2) determine the resources used; (3) estimate the hospitalization cost for uncomplicated ACS; and (4) determine the difference between the estimated hospitalization cost and the coverage provided by the Philippine Health Insurance Corporation (Philhealth).

METHODS: A cost analysis study was done. Mixed qualitative and quantitative data collection tools consisted of consultations with local cardiologists, key informant interviews, and self-administered survey forms. Sensitivity analysis was performed through scenario analysis.

RESULTS: The ACS hospital care pathway was derived after consultative meetings with invasive and noninvasive cardiologists. Using this pathway, the resources used for ACS hospitalization were identified, and the total hospitalization costs were calculated. For medical treatment alone, the costs were approximately Philippine peso (₱) 67,000 to ₱90,000, whereas for medical treatment with percutaneous coronary intervention (PCI), the costs were approximately ₱265,000 to ₱425,500. In comparison, Philhealth's maximum coverage for ACS with PCI is ₱39,750.

CONCLUSION: There is variation in the ACS hospitalization cost, depending on the management strategy used and the type of hospital where a patient is confined. Medical plus reperfusion with PCI increases the cost four to five times when compared with medical treatment alone. Huge out-of-pocket expense is demonstrated because of the large discrepancy between the actual hospitalization costs to Philhealth's ACS coverage.

KEYWORDS: acute coronary syndrome, cost analysis, Philhealth

INTRODUCTION

Ischemic heart disease or coronary artery disease (CAD) ranked as the no. 1 cause of mortality in 2016, accounting for 12.7% of all deaths in the Philippines.[1] Myocardial infarction, in turn, accounts for approximately 41% of CAD deaths in 2013.[2] The spectrum of ischemic heart disease may range from acute coronary syndrome (ACS) and stable angina (non-ACS).

Acute coronary syndrome can be any of the following: non–ST-elevation myocardial infarction (NSTEMI), unstable angina (UA), and ST-elevation myocardial infarction (STEMI).[3]

Among patients with STEMI ACS, reperfusion needs to be initiated as soon as possible, through either primary percutaneous coronary intervention (PCI) or fibrinolysis/thrombolysis to limit infarct size. Of the two, primary PCI was shown to be superior in reducing mortality, reinfarction, or stroke.[4] In a PCI-capable facility, primary PCI should be done within 90 minutes from medical contact or up to 24 hours from onset of symptoms if with severe heart failure, hemodynamic/electrical instability, or persistent ischemic symptoms.[4-6] For non–PCI-capable hospitals, immediate transfer to a PCI-capable facility is recommended if it is estimated that primary PCI (immediate PCI without intervening fibrinolysis) can be carried out within 120 minutes from onset of symptoms.7 Otherwise, eligible patients should receive fibrinolytic therapy within 30 minutes from arrival and be transferred to a PCI-capable facility either for rescue PCI if the initial fibrinolytic therapy is unsuccessful or for routine PCI strategy to be carried out within 24 hours.[5,7,8]

In the Philippines, health care delivery is obtained through a combination of out-of-pocket expenses and health insurance coverage (provided by public/private sectors). Despite this coverage, greater than 54% of the annual health expenditure was paid through out-of-pocket between 2014 and 2017,[9–11] compared with the Philippine Health Insurance Corporation's (Philhealth's) share of the total health expenditure of 14.2% in 2014.[10] Philhealth implements the National Health Insurance Program. In 2017, Philhealth claimed coverage for approximately 97 million members and dependents, representing approximately 93% of the population.[12] Philhealth's coverage is mostly for hospitalization through its case rate payments based on the patient's final diagnosis. Private health insurance through health maintenance organizations may be obtained through varying premiums for different packages.

In 2017, Philhealth claimed expansion of its Z Benefit package, which covers treatment for catastrophic illnesses such as coronary artery bypass surgery (CABG).[13] Despite this, Philhealth's coverage is still limited. In 2009, a study on ACS hospitalization cost in three tertiary hospitals in the Philippines showed that the hospitalization cost for nonfatal uncomplicated ACS patients who received medical management ranged from Philippine peso (₱) 65,000 to ₱134,574 (US $1271–$2631).[14-15] This is way above the present Philhealth's case rates for ACS of ₱12,000 and ₱18,900 (US $235–$370) for UA and myocardial infarction (STEMI and NSTEMI), respectively.[16]

Considering that the average annual Filipino family income in 2015 was approximately ₱267,000 (US $5221),[17] many patients will hesitate to undergo invasive procedures and opt for medical treatment alone excluding thrombolysis, which is less efficacious but less costly. This implies inequity in access to health care as those in the higher socioeconomic strata can afford the high out-of-pocket cost of the reperfusion strategies in addition to medical treatment. In view of the large number of Filipino patients impacted by ACS and inequity in access to some of its treatment modality, it is important to determine the costs of the different care pathways of ACS hospitalization.

The aim of this study was to determine the hospitalization cost of treating ACS when undergoing the following: (*a*) medical treatment with/without fibrinolytic therapy and (*b*) medical treatment with invasive procedures (coronary angiogram with/without angioplasty or PCI), using the hospital's perspective.

The primary objectives of the study were to:

(1) define the hospital care pathways for treating individuals presenting with uncomplicated ACS;
(2) determine the resources used according to the care pathways; and
(3) estimate the hospital care pathways cost for treating individuals presenting with uncomplicated ACS.

The secondary objective was to estimate the difference between the above hospitalization cost and Philhealth's coverage for ACS.

The results of the study will hopefully initiate discussion with policy makers of the present Philhealth ACS coverage and propose possible revisions in coverage especially those requiring PCI.

METHODS

Mixed qualitative and quantitative data collection methods were utilized. These included meetings conducted for group discussions, key informant interviews, and surveys. These were undertaken for the care pathway formulation and determination of professional fees (PFs) and unit costs of relevant resources for ACS hospitalization.

The study's design is that of a cost analysis. A cost analysis deals with the cost of the alternatives or options being considered, but not their outcomes or consequences.[18]

Formulation of ACS Hospital Care Pathway

Consultative meetings were conducted in two private hospitals, one located in an urban area and the other in a suburban area. Both institutions are tertiary training hospitals and PCI-capable. General and interventional cardiologists practicing in both the private and government sectors and the urban and suburban areas were invited to attend.

A short introduction of the project was given by the author, after which the proposed ACS hospital care pathway based on literature was presented. This was then followed by discussions

about the current ACS guideline recommendations and local clinical practice among the meeting attendees. The meetings, although not considered formal focus group discussions, were guided by this method.[19,20] The author encouraged participation among all the attendees. It was emphasized that the pathway would serve as the framework for the ACS hospitalization cost analysis. The pathways for STEMI, NSTEMI, and UA were individually tackled, from the time the patient presents in the emergency room (ER) with chest pain/angina or anginal equivalent until hospital discharge. Although the proposed pathway (Figure 1) was guided by the latest European Society of Cardiology and American College of Cardiology/American Heart Association guidelines, the attendees revised the initial pathway, as per their practice and guideline recommendations. These revisions were summarized and presented. The pathways were then deemed final after approval by the attendee.

Identification, Measurement, and Valuation of Resource Used
As STEMI, NSTEMI, and UA share the same diagnostic and treatment modalities except for specific instances, the resource used and costs were determined through the hospital units that an ACS patient passed through: (1) ER; (2) catheterization laboratory; (3) coronary or intensive care unit (coronary care unit [CCU]/intensive care unit [ICU]); and (4) regular room. The diagnostic procedures and medications were those with class I recommendations from the latest European Society of Cardiology (2017) and American College of Cardiology/American Heart Association (2007 and 2014) recommendations, many of which were included in the 2014 local guidelines for CAD.[5,7,21-23]

In the ER, the modalities are electrocardiogram and troponin. In a non–PCI-capable hospital, the cost of fibrinolysis/thrombolysis (streptokinase/alteplase) was included in the ER stay. Afterward, these postthrombolysis patients must receive clopidogrel in addition to aspirin.[7] The cost of the loading doses of these medications was included in the ER cost.

Emergency room care for all types of ACS included (1) diagnostics: chest x-ray, complete blood count, creatinine, electrolytes, prothrombin time, activated partial thromboplastin time, and transaminases, and (2) therapeutics: aspirin, β-blockers, angiotensin-converting enzyme inhibitor or angiotensin receptor blocker, nitrates, and anticoagulant. Other ER costs included the use of a cardiac monitor, establishing an intravenous access, charges for miscellaneous items, and PF of the ER physician.

The catheterization cost included the catheterization laboratory charges for the procedure plus the medications administered in the unit. The catheterization cost was applicable to STEMI, NSTEMI, and high-risk UA patients (after risk stratification via treadmill exercise test [TET]).

However, differences in the catheterization laboratory charges exist as NSTEMI and high-risk UA patients are sent to this facility on a scheduled basis, whereas for STEMI patients, additional charges are incurred as the patients are sent there on an "emergency" basis.

In the CCU/ICU, the costs included the charge for the stay in this unit; repeat electrocardiogram; determination of creatinine, fasting blood sugar, and lipid; two-dimensional echocardiogram; and continuation of the medications started in the ER. Charges for the use of oxygen, infusion pump, cardiac monitor, and pulse oximeter were also included in this cost. A 2-day CCU stay was assumed for all ACS patients.

Based on discussions in the consultative meetings and a recent study on the prevalence of hospitalization of CAD in

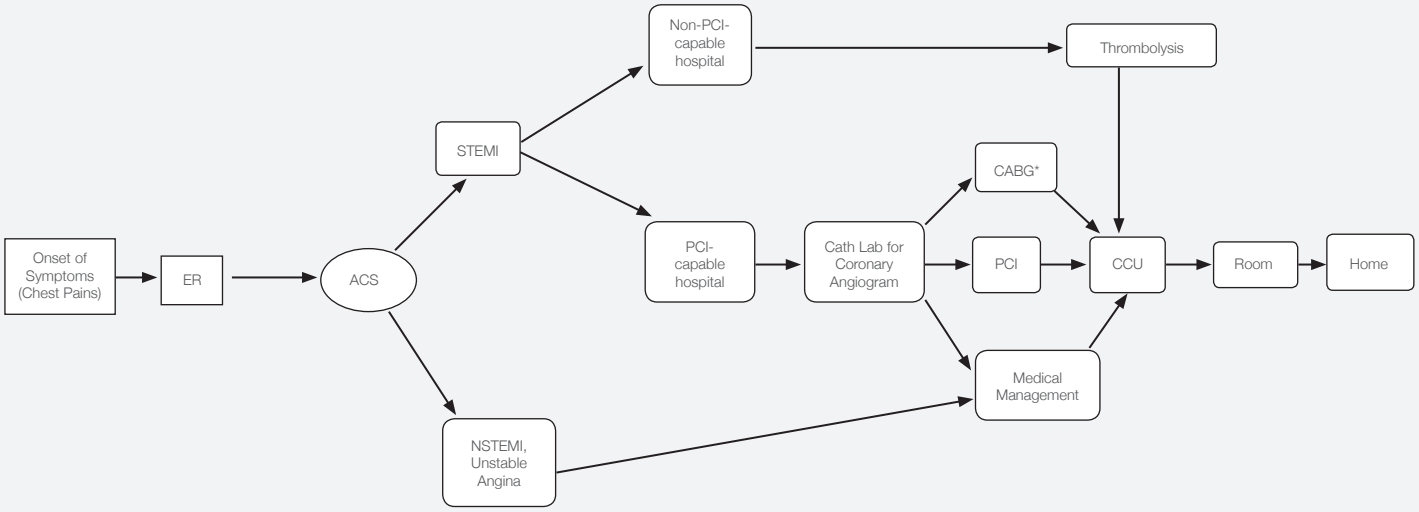

FIGURE 1. Proposed acute coronary syndrome hospital care pathway
ACS=acute coronary syndrome; CABG=coronary artery bypass graft surgery (although not included in the costing, it is included in the figure as this might be the required procedure due to the coronary angiogram results); CCU=coronary care unit; ER=emergency room; NSTEMI=non–ST-elevation myocardial infarction; PCI=percutaneous coronary intervention; STEMI=ST-elevation myocardial infarction; UA=unstable angina.

the Philippines (unpublished), a total of 5 hospitalization days, 2 days in ICU, and 3 days in a regular room were assumed for all patients. Regular/ward room costs included cost of stay in the unit plus the cost of continuation of medications. Patients with UA who had been chest-pain–free for at least 2 days underwent TET for risk stratification. The cost of TET was included in the room cost for UA patients. Patients with high-risk UA who underwent catheterization were transferred back to their room after successful reperfusion as they were assumed already stable prior to the procedure.

Hospital charges for laboratory procedures, medications, and other materials and supplies were obtained from the particular department (eg, pharmacy) of a private hospital, which provided access to these data. Whenever possible, the "at cost" prices were obtained in addition to those with markups (charges).

Charges for the catheterization laboratories and room accommodations were obtained from a selection of tertiary hospitals capable of providing invasive interventions in urban and suburban areas.

The charges for cardiac rehabilitation were listed separately from the other costs. This program, part of the proven effective ACS regimen, includes supervised low-level exercises.[24] The charge for this was similarly obtained from the private hospital and applied to all patients.

The costs of complications such as heart failure and concomitant medical illnesses were not included in the study. Likewise, the cost of CABG was excluded as Philhealth provides a separate Z Benefit package for CABG.

Professional Fees
The range of cost for the PFs for the different scenarios was obtained through a one-page questionnaire fielded to the group of cardiologists who attended the consultative meetings. Responders completed the form independently from each other. In addition to the meetings, a convenient sample of general and interventional cardiologists was asked to complete the PF questionnaire.

After explaining the study objectives, the respondents were asked to fill up the items applicable to their practice, for example, urban area of practice. They were also asked whether they were the attending physician (AP; general cardiologist/noninterventional cardiologist), or interventional cardiologist, or both. The respondents were given instructions to fill up their lowest and highest possible PF for the conditions listed. Furthermore, they were instructed that the lowest PF should not correspond to zero, even if there are cases whereby no PF was charged among indigent patients.

Base, Best, and Worst-Case Scenario Analyses
The cost of hospitalization was computed for the different types of pathways. A number of possible settings, e.g., public, or private hospital were reported. Three scenarios were defined: base ("best guess"), best ("most optimistic") and worst-case scenarios ("most pessimistic").[18]

The base case scenario was characterized by lower costs but relatively realistic scenario – ward accommodation, cost of medicines with markups, two charges for PF, i.e., from the attending general cardiologist and interventional cardiologist, etc. The best-case scenario utilized the lowest cost in the range of all the resources used – cost of medicines without markups, ward accommodation, one charge for PF (interventional cardiologist is also the attending cardiologist). The worst-case scenario, in contrast, utilized the highest cost in the range in all the aspects of the resources used. For fibrinolysis, streptokinase was used in all scenarios since this is preferred in the local setting due to its lower cost as compared with alteplase. The means, e.g., mean PF refer to the arithmetic mean of the cost components. The use of this mean is considered to be more useful in predicting the overall cost[25, 26] and is in "accordance with economic theory which deems that the arithmetic mean (unlike the median) best informs resource allocation given a budgetary constraint".[27]

Costing of coronary catheterization procedure for all ACS categories involved 1-vessel coronary angioplasty - culprit artery. This was done in compliance with guideline recommendations regarding prioritization of the culprit or infarct-related artery.[7] Moreover, timing of angioplasty on the other stenotic arteries may vary, that is, doing all of them in one sitting or in stages.[7] The hospitalization costs were then compared with Philhealth's case rates.[16, 28]

RESULTS

ACS Hospital Care Pathway
Two consultative meetings with cardiologists were conducted to validate the proposed pathway. Four cardiologists attended the first meeting, whereas 11 attended the second. Attendees in both meetings consisted of seven interventional and eight noninterventional cardiologists. Although both meetings were conducted in a private hospital, some of the attendees also practice in a government hospital or in both urban and suburban areas. After thorough discussions, a revised ACS hospital care pathway was derived (Figure 2).

All ACS patients must receive medical management. The care pathway separated into several branches, depending on the ACS category. Patients diagnosed with STEMI received medical management followed by either thrombolysis or PCI, depending on the PCI capability of the hospital. Patients with STEMI initially treated in a non–PCI-capable hospital were referred to a PCI-capable hospital within 24 hours for the needed invasive procedures especially if ischemic symptoms persist. Similarly, medical management was followed by invasive procedures among NSTEMI patients. In patients with UA, medical therapy was followed by risk stratification via TET. High-risk patients were sent for coronary angiography, whereas medical therapy was continued for low-risk patients, and then these patients were sent home.

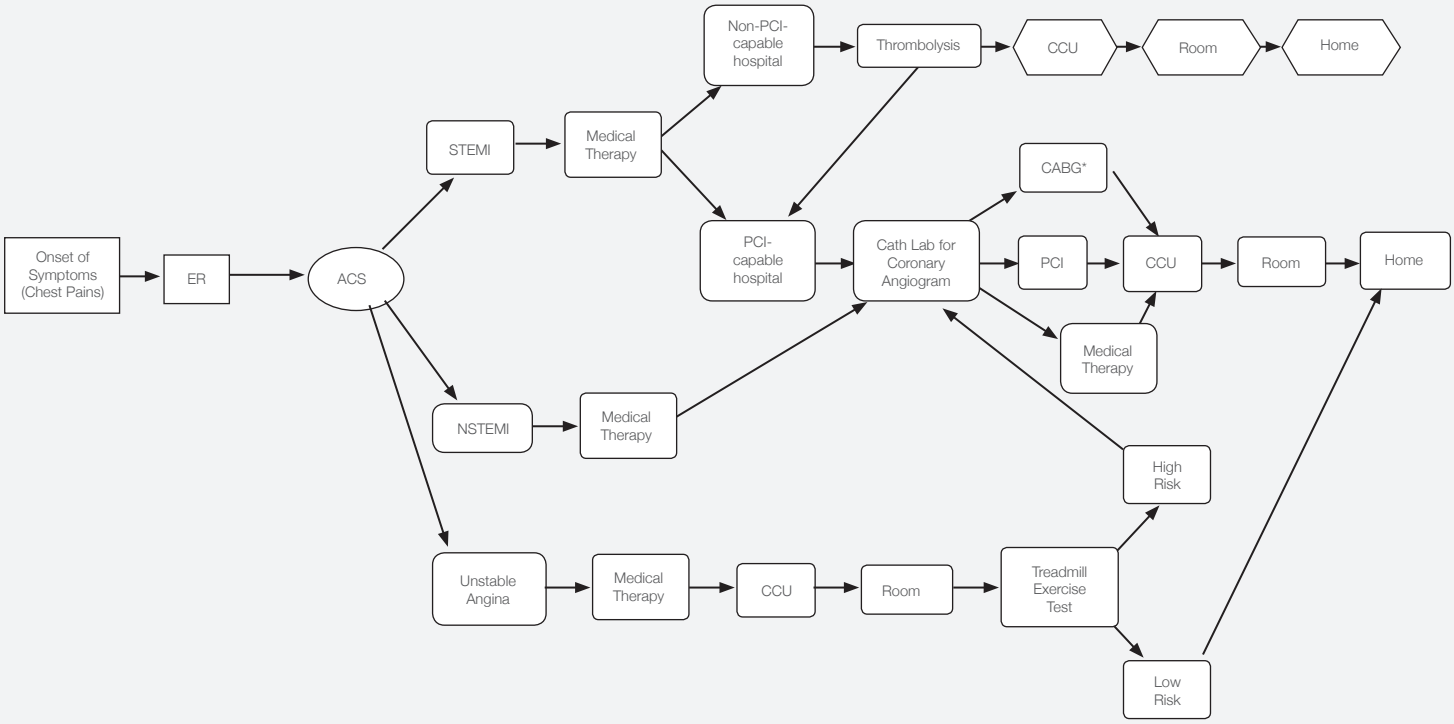

FIGURE 2. Revised acute coronary syndrome hospital care pathway
ACS=acute coronary syndrome; CABG=coronary artery bypass graft surgery (although not included in the costing, it is included in the figure as this might be the required procedure due to the coronary angiogram results); Cath Lab=catheterization laboratory; CCU=coronary care unit; ER=emergency room; NSTEMI=non–ST-elevation myocardial infarction; PCI=percutaneous coronary intervention; room=regular room accommodation (can be private room or ward); STEMI=ST-elevation myocardial infarction; UA=unstable angina.

The coronary angiogram results determined the type of procedure that will follow, either PCI or CABG. Although the cost of CABG was excluded in this study, it is included in the pathway, as this may be the procedure of choice for some cases. In a few instances, no further procedures may be needed.

Costs of the ACS Hospital Care Pathways
Based on the pathway seen in Figure 2 and the stages that an ACS patient underwent (from ER to discharge), the costs of several ACS pathways were determined.

Table 1 lists the cost of the specific resources used during ACS hospitalization for patients given medical intervention alone. The costs of medications (with and without markups) were added to the cost incurred in the specific unit.

Professional Fees
A total of 24 of the 25 cardiologists surveyed responded to the questionnaire regarding the PFs, 15 of them were in the consultative meetings, whereas 9 were surveyed individually. There were 12 interventional and 12 noninterventional cardiologists; 12 were practicing in the urban area alone and 9 in suburban area alone, whereas 3 were practicing both in the urban and suburban areas.

Seven of those practicing in the urban area practice in both government and private hospitals, whereas five are in private hospitals only.

The lowest and highest PFs for patients who received medical treatment only for UA, NSTEMI, STEMI with or without thrombolysis, and for ACS with invasive interventions were obtained. It took the responders approximately 10 minutes to answer the survey form. The PFs represent the fees charge by a cardiologist engaged in private practice whether in a private or government hospital. In this study, these PFs represent the cardiologist's fees as (1) AP or interventional cardiologist, for whom the AP refers his patient to do the PCI. The interventional cardiologist could be both the AP and the one who performs the PCI; hence, his PF in these cases reflects both aspects of care. PFs can be affected by the duration of hospitalization and complexity of case. However, the cardiologists agreed to assume a duration of 5 days. The complexity of the case is reflected in the different categories of ACS and the number of vessels opened up during angioplasty.

The highest in the range of PFs corresponds to the amount that the cardiologist deems should be charged; however, this amount is lowered because of "discounts" influenced by the patient's ability to pay.

The overall mean and SD of the PFs for all types of provisions as well as by urban public, urban, private, and suburban private hospitals are shown in Table 2. However, this does not include the anesthesiologist's fee. Referral to an anesthesiologist is not

TABLE 1. Cost of the Different Components of ACS Hospitalization for Patients Given Medical Treatment Alone (Without Professional Fees)

Cost Center		Range of Costs in Philippine Peso (₱)		Observations
		"At cost" for Meds (Without Markup)	"As Charged" for Meds (With Markup)	
UA/NSTEMI/STEMI	Emergency room charges/cost	15,211	15,693	Cost of ER resources obtained from single hospital
	ICU or CCU charges/costs	27,440	28,110	Mean cost from all hospitals
	Room charges/costs Ward Private	 7851 13,061	 9234 14,444	
STEMI with thrombolysis	Emergency room charges/cost Plus streptokinase Plus ateplase	 19,661 117,571	 21,846 147,982	Cost of ER resources obtained from single hospital
	ICU or CCU charges/costs	26,889	27,820	
	Room charges/costs Ward Private	 7516 12,726	 8799 14,009	
Cardiac rehabilitation		6500	6500	Charge obtained from single hospital

ACS=acute coronary syndrome; CCU=coronary care unit; ER=emergency room; ICU=intensive care unit; NSTEMI=non–ST-elevation myocardial infarction; STEMI=ST-elevation myocardial infarction; UA=unstable angina.

TABLE 2. Summary of Professional Fees

Condition/Treatment	Urban (Private 1) In Philippine Peso(₱) n=15		Suburban (Private 2) In Philippine Peso(₱) n=15		Urban (Public) In Philippine Peso(₱) n=7		All Hospitals In Philippine Peso(₱) n=37*	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Medical Treatment Alone								
STEMI, medical,no thrombolysis	18,067	8898	14,108	5043	10,643	5415	15,111	7499
STEMI, medical,with thrombolysis	19,967	10,407	14,108	14,108	11,000	5174	15,997	8546
Unstable angina, medical	13,679	6880	12,042	5624	9500	4735	12,197	6153
NSTEMI, medical	15,357	7955	13,625	5619	9929	5284	13,576	6875
With coronary intervention (PCI)								
ACS with one-vessel PCI, as AP, not IC	22,500	11,774	15,540	14,136	20,000	10,488	19,479	12,383
	n=6		n=5		n=3		n=14	
ACS with one-vessel PCI, as IC, not AP	132,875	34,736	126,667	26,400	100,833	32,003	124,531	32,562
	n=7		n=6		n=3		n=16	
ACS with one-vessel PCI, as AP and IC	137,188	40,783	140,000	29,252	115,667	46,098	134,382	37,976
	n=8		n=6		n=3		n=17	

**n corresponds to the number of clinicians responding to each question; n for all hospitals (37) does not correspond to the total number of clinicians (24) as some practice in more than one hospital.*
ACS=acute coronary syndrome; AP=attending physician; IC=interventional cardiologist; NSTEMI=non–ST-elevation myocardial infarction; PCI=percutaneous coronary intervention; STEMI=ST-elevation myocardial infarction.

regularly done during coronary catheterization procedures. For coronary angioplasty, some of the cardiologists mentioned that referral to an anesthesiologist is dependent on the complexity of the procedure or on the financial capability of the patient. For those who refer to an anesthesiologist, the PF may range from ₱20,000 to ₱30,000 (US $391–$587) or is dependent on the invasive cardiologist's PF(30%–40%).

Cost of Coronary Angiography/Angioplasty

Table 3 shows the charges for the cost of coronary angiography with or without PCI in the three hospitals. The highest cost is due to the additional charges for procedures done on an "emergency" basis or "outside" of office hours. This happens for STEMI cases as it necessitates immediate/primary PCI. Moreover, the catheterization laboratory charges are affected by the type of accommodation in one hospital. However, in the other two hospitals, the charges are the same immaterial of the type of accommodation. Lastly, the type of approach affects the charges in one hospital, with higher charges for the radial artery approach than via the femoral artery.

The charge for a stent is pegged at ₱65, 000 per stent in one hospital. In the other hospitals, stent cost varies, depending on the type and brand used and the application of "stent packages," that is, discounted price if more than one stent is bought, resulting in decreased unit cost of a stent. Moreover, stents are acquired by the patient directly from the supplier in the government hospital, removing the markup by the hospital. This is also allowed in the other hospital, with the patient given the option of acquiring the stent either from the hospital (as charges for stent packages) or the supplier (per piece without markup).

The summary of ACS hospitalization cost using different scenarios is shown in Table 4. Hospitalization cost is affected by the type of ACS, that is, whether it is UA, NSTEMI, or STEMI and the type of treatment given. The variation among the base, best-case, and worst-case scenarios is big for medical treatment plus PCI but not for medical treatment alone. For medical therapy alone, the difference is influenced by the accommodation cost (cost is almost double between ward and private room) and PFs. For PCI, the difference is due to the variation in catheterization charges, stent cost, and PFs. These results exclude the anesthesiologist's fees. In certain instances, referral to an anesthesiologist is deemed necessary, resulting in additional PF.

Comparison of Study Results With Philhealth's ACS Coverage

Table 5 shows the study results for the base case analysis as compared with Philhealth case rates and the corresponding difference, expressed in Philippine peso (₱) and US dollar (US $). Philhealth's coverage for STEMI or NSTEMI is ₱18,900.00 and ₱12,000.00 for UA. For PCI, the case rate is ₱30,300.00,[28] immaterial of the number of vessels opened up and stents used. For patients with two diagnoses, for example, ACS patients who underwent PCI, two Philhealth case rates will be applied. According to Philhealth's policy, 100% and 50% of the case rate is provided for the first and second diagnoses, respectively. In cases, where the second diagnosis is not given any coverage, the higher of the two case rates is chosen over the other. This is demonstrated as follows: patients with STEMI or NSTEMI who underwent PCI are provided 100% coverage for PCI, plus 50% of the case rate for myocardial infarction (MI). Patients with UA who underwent the same procedure, however, are given coverage for PCI alone because UA is not included in the allowed diagnosis for a second case rate. Using the results in Table 5, a STEMI patient who will undergo primary PCI, that is, no thrombolysis, will need to pay ₱306,779.

TABLE 3. Mean and Range of Cost of Invasive Procedures and Stents

Resource Used	Urban (Private 1) In Philippine Peso(₱) Mean (SD) [Range]	Suburban (Private 2) In Philippine Peso(₱) Mean (SD) [Range]	Urban (Government) In Philippine Peso(₱) Mean (SD) [Range]	All Hospitals In Philippine Peso(₱) Mean (SD) [Range]
Catheterization laboratory expenses (inclusive of dye, medications and materials)				
CA only	30,000 (NA)	31,056 (808) [30,300-31,812]*	22,355 (3795) [18,000-27,960]*	27,804 (4502)
CA + PCI	126,450 (4330) [122,400-130,500]*	134,988 (5343) [130,000-139,996]*	55,000 (17,728) [40,000-83,000]*	105,483 (38,110)
Cost of stent				
One stent	65,000 (NA)	54,292 (42,132) [24,50-84,084]	37,000 (31,820) [15,000-60,000]	NA
Two stents	130,000 (NA)	101,718 (40,333) [45,000-150,000]	75,000 (63,6400) [30,000-120,000]	NA

**Includes additional charges if done on an "emergency" basis or beyond office hours – applicable to primary PCI.*
CA=coronary angiography; NA=not applicable (due to single value or cannot combine "at cost" [no markups] and charged [with markups]); PCI=percutaneous coronary intervention.

TABLE 4. Hospitalization Cost for ACS Condition and Management

		Base Case, ₱ (US $)	Best Case, ₱ (US $)	Worst Case, ₱ (US $)
Medical	UA	74,974 (1466)	69,742 (1364)	81,666 (1597)
	NSTEMI	73,113 (1430)	66,931 (1309)	80,104 (1566)
	STEMI without thrombolysis	74,648 (1460)	67,645 (1323)	82,814 (1619)
	STEMI with thrombolysis	80,962 (1583)	71,566 (1399)	90,142 (1763)
Medical + PCI	UA with PCI	349,769 (6839)	268,409 (5248)	423,342 (8278)
	NSTEMI with PCI	346,529 (6776)	265,169 (5185)	420,102 (8214)
	STEMI with PCI	346,529 (6776)	265,169 (5185)	420,102 (8214)
	STEMI with thrombolysis + PCI	351,958 (6882)	268,733 (5255)	425,430 (8320)

ACS=acute coronary syndrome; AP=attending physician; IC=interventional cardiologist; NSTEMI=non–ST-elevation myocardial infarction; PCI=percutaneous coronary intervention; STEMI=ST-elevation myocardial infarction; UA=unstable angina.

TABLE 5. PaymentsComparison of Base Case Analysis with Philhealth Case

		Base Case, ₱ (US $)	Philhealth Case Rate, ₱ (US $)	Difference Between Base Case Cost and Philhealth Case Rate, ₱ (US $)
Medical	UA	74,974 (1466)	12,000 (235)	62,974 (1231)
	NSTEMI	73,113 (1430)	18,900 (370)	54,213 (1060)
	STEMI without thrombolysis	74,648 (1460)	18,900 (370)	55,748 (1090)
	STEMI with thrombolysis	80,962 (1583)	18,900 (370)	62,62 (1213)
Medical + PCI	UA with PCI	349,769 (6839)	30,300 (592)	319,469 (6247)
	NSTEMI with PCI	346,529 (6776)	39,750 (777)	306,779 (5998)
	STEMI with PCI	346,529 (6776)	39,750 (777)	306,779 (5998)
	STEMI with thrombolysis + PCI	351,958 (6882)	39,750 (777)	312,208 (6105)

DISCUSSION

The study determined the ACS hospitalization cost in the Philippines. The local cost analysis study on ACS hospitalization in 2009 used the latest ACS guideline recommendations from the American College of Cardiology[14] that time as its basis. In contrast, the present study used a care pathway derived from consultations with local cardiologists as the framework for the cost analysis. Unlike the previous study that included only the cost of medical management, the present study included the cost of invasive interventions.

Variations in the costs are due to differences in the type of ACS, type of treatment given, and type (private vs public) and location (urban vs suburban) of the hospital. Although initial ER assessment and treatment are the same for all types of ACS, the subsequent treatment based on the particular ACS influences the cost, for example, primary PCI for STEMI. The variation in cost may be attributed to differences in the ability to pay as reflected in type of accommodation, which in turn influences PFs (physicians usually charge lower PFs for those in the ward as compared with those in private room). The type rather than location of the hospital has a bigger contribution to the variation especially for PCI. This is demonstrated in catheterization laboratory charges and cost of stent, which in turn may be due to the scenario whereby the stent may be acquired directly from the supplier in some hospitals. As for the PF, there are two PF charges for the base and worst scenario, whereas for the best case scenario, there is only one. This is because in many instances two cardiologists are providing care to the patient, the AP (general cardiologist) and the interventional cardiologist (for the invasive procedure). The interventional cardiologist may also be the AP in some cases (used as best case), resulting in lower PFs.

The study methodology had several strengths. These are as follows: (*a*) the use of hospital care pathway tailored to local clinical practice where a structured predefined plan was followed in its generation, (*b*) cost derived from primary data collection, (*c*) access to "at cost" value for some items, (*d*) access to clinicians of different subspecialties and practicing in

different institutions and localities, and (*e*) access to data from different hospitals.

The current class I recommendations from guidelines were reflected in the ACS pathway, for example, primary PCI for STEMI;[7] however, economic constraints hinder compliance with these recommendations. With up to the eighth decile of the Filipino population falling below the average family income of ₱267,000.00 (US $5221) in 2015[17] and possible lowest cost of STEMI hospitalization with PCI approximately ₱265,000 (US $5185), most of which will be borne out-of-pocket by the patient, a good number of patients with STEMI will refuse revascularization. Many of the interventional cardiologists who attended the meeting approximate that only 1 of 5 patients would immediately consent to primary PCI for STEMI. The same situation holds true for those who come in for either NSTEMI or UA. These patients may have some capacity to pay, but their resources are not enough to afford the more expensive but more efficacious interventions, hence choosing the less costly but less efficacious option. This demonstrates inequity in terms of access to health care delivery in the country.

The results of the study showed the marked discrepancy between the estimated ACS hospitalization cost and the Philhealth case rates for UA, STEMI or NSTEMI, and PCI. The study results could be used to influence policy makers to review and eventually revise the current Philhealth ACS and coronary intervention case rates.

On the other hand, some of the study results for medical treatment plus PCI approximate the mean hospitalization costs (given the same interventions) for STEMI, NSTEMI, and UA of some Asian countries despite differences in the delivery of health care and study methods. These countries are as follows: (1) China: US $7790, $7450, and $6585; (2) Singapore: US $6978, $4910, and $3394; (3) Republic of Korea: US $4300, $4621, and $3552; and (4) Thailand: US $4427, $3321, and $2008.[27]

LIMITATIONS

The study was limited by the use of charges instead of actual costs in many of the resources used. Moreover, the use of charges was a source of variability especially among private hospitals as each hospital may have different markups. Another limitation was the representativeness of the sample. Access to other cardiologists in the country, especially those in the provinces, was not possible during the conduct of the study because of distance and time constraints; thus, the cardiologists included may not be representative of all the cardiologists in the country.

CONCLUSIONS

The ACS hospitalization cost in the Philippines was determined using as framework an ACS hospital care pathway derived after consultations with local cardiologists.

There is variation in the ACS hospitalization cost, depending on the management strategy used and the type of hospital where a patient is confined (private vs public hospital). Medical treatment plus reperfusion with PCI increases the cost four to five times when compared with medical treatment alone. The cost of hospitalization for ACS treated with PCI is at best approximately ₱265,000 (US $5182), but can increase up to approximately ₱425,000 (US $8310). With Philhealth's maximum coverage for ACS with PCI at ₱39,750 (US $777), this would translate to a huge out-of-pocket expense, which very few can afford.

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