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The Mortality Risks of Pneumonia Patients with the Same Levels of Health Insurance Coverage in Thailand Before and After the Implementation of the Universal Care Project

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ABSTRACT

Objective: To compare the mortality risks of pneumonia patients with the same levels of health insurance coverage status before and after the implementation of the Universal Health Care Coverage Project (UC).

Methods: A retrospective cohort study was conducted. The sample was pneumonia patients admitted to hospitals owned by the Ministry of Public Health (MOPH) of Thailand during 2001-2002. Logistic regression analysis was used to determine whether mortality risks of pneumonia patients with the same levels of health insurance coverage status before and after the implementation of the UC were different after controlling for important variables.

Results: Of the 8,577,482 patients admitted to the Thai Ministry of Public Health Hospitals during 2001-2002, there were 112,205 and 115,386 patients diagnosed with a type of pneumonia in 2001 and 2002, respectively. After controlling for sex, age, marital status, hospital type and length of stay, patients admitted after the implementation of the UC who were insured or had UC with 30 baht co-payment coverage had no significant difference in mortality risks (OR = 1.08, P = 0.20; OR = 1.03, p = 0.62; respectively). In contrast, patients who were under the UC without co-payment had higher mortality risk after the implementation of the UC (OR = 1.12, P = 0.001).

Conclusion: Before and after the implementation of the UC project, pneumonia patients who had the same levels of health insurance coverage had differences mortality risks regarding to their health insurance coverage status. Whether the results reflected the impact of the UC project, unmeasured differences in quality of care, restricted access to care, or differences in co-morbidities remains to be determined.

Keywords: Health insurance; mortality risk; pneumonia; universal health care coverage project; Thailand

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In October 2001, the Thailand government implemented the Universal Health Care Coverage Project (UC) to ensure access to health care by the poor. After implementation, there have only been a few studies determining the effects of the UC.[1-3] There are studies indicating that universal health insurance coverage does not eliminate inequities to access in some types of care in Canada,[4-5] and may create a perverse incentive to limit necessary services, resulting in poor quality of care,[6] since budget allocation is based on capitation. Moolasarn et al[7] found that pneumonia patients in Thailand who had different health insurance status had different mortality risks. Therefore, we conducted a study of pneumonia cases in 808 Ministry of Public Health (MOPH) hospitals (716 districts, 67 general, and 25 regional hospitals) in Thailand in which we compared the mortality risk of patients with the same levels of health insurance coverage before and after the implementation of the UC project to determine its effects on patients.

MATERIALS AND METHODS

Subjects

The study sample was retrospectively retrieved from the diagnosis related group (DRG) database of the MOPH of Thailand. The database consisted of all patients admitted to all the MOPH hospitals during October 2000 - September

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TABLE 1. Demographic and clinical characteristics of study patients according to admitted years.

Characteristics	Admitted in 2001 (N = 108,260)	Admitted in 2002 (N = 110,345)
Demographic variables		
Age (yr) (Mean, SD)	20.86 (29.28)	27.05 (31.31)
Gender, number (%)		
Male	60,601 (54.2)	61,224 (53.4)
Female	51,145 (45.8)	53,528 (46.6)
Marital status, number (%)		
Yes	27,580 (25.1)	35,410 (32.4)
No	82,322 (74.9)	74,025 (67.6)
Hospital types, number (%)		
District (≤ 90 beds)	57,358 (51.1)	68,116 (59.0)
General (91-999 beds)	30,968 (27.6)	26,630 (23.1)
Regional (≥ 1,000 beds)	23,879 (21.3)	20,639 (17.9)
LOS (Mean, SD)	6.07 (6.53)	6.35 (7.26)
Health insurance status, number (%)		
UC without co-payment	74,265 (74.5)	70,549 (66.2)
UC with 30 baht co-payment	16,427 (16.5)	18,179 (17.1)
Insured	8,994 (9.0)	17,818 (16.7)
Death, number (%)	4,149 (3.8)	4,907 (4.4)

p-values (Chi-square tests) for hospital type, gender, marital status, and death were all <0 .001. p-values for LOS and age (t-test) were <0 .001.

2002 (fiscal years 2001 and 2002). The database was created to serve the purpose of management of the Thai health care system based on the DRG method. Data from 8,577,482 in-patients admitted to MOPH hospitals was available in the database, of which 111,746 and 114,752 subjects were diagnosed with pneumonia based on the ICD-10 (International Classification of Disease, tenth revision),[8] during the fiscal years 2001 and 2002, respectively. Only the data of subjects diagnosed with pneumonia, ICD-10 codes of J10.0, J11.0, J12.0 - 12.9, and J13 - J18.9 were included in the study. Due to missing values for some variables, sample size varied with each analysis. Data of pilot hospitals that implemented the project since April (6 hospitals) and June 2001 (15 hospitals) were not included in the analysis for the fiscal year 2001.

Study variables

The main variable of interest was mortality risk. Independent variables potentially associated with the main variable included gender, age, marital status, type of hospital, length of hospital stay (LOS), level of health insurance coverage, and admitted year.

The main variable, mortality, was defined as "dead" if the subjects' discharge type was either "dead autopsy" or "dead non-autopsy". Otherwise, the variable was defined as "alive", not including the referred patients. The marital status was defined as "married" if the subject was reported as married. The variable was defined as "single" if the subject was reported as "single", "separated", "divorced", "widowed", or "priest". The hospital variable was divided into 3 types: district hospital (less than 150 beds), general hospital (150 - less than 500 beds), and regional hospital (>500 beds).

The level of health insurance coverage was divided into 3 levels. Level 1 (UC without co-payment in 2002 or under the MOPH health coverage plan in 2001) consisted of subjects who received free medical services under the MOPH policies, such as subjects who were health volunteers, community leaders, elderly, children under 12 years old, disabled patients, priests, and veterans. This also consisted of subjects who were under the Thai government Low Income Scheme (LIS). The patients qualify for the LIS program if their income is less than 2,000 baht per year (about US$ 50). In general, the LIS program is quite similar to the Medicaid program in the United States. The patients at this level get completely free medical services. They get free medication if the medicine is listed in the national essential drug list. For medicines not listed in the national essential drug list, the patient receives them with some limitations based on an individual hospital's policy. In addition, they cannot go to a higher-level hospital directly without passing through the referral system, except in an emergency.

Level 2 (Fully or partially paid in 2001 or UC with 30 baht co-payment; about US$ 0.75, in 2002) consisted of subjects who paid off their medical cost fully. Some of these patients had private insurance and some did not. They could go to any hospital they wanted without any limitation to health care services in 2001. However, in 2002, if they were under UC with the 30 baht co-payment project, they would receive health care treatment and accessibility to care under the same conditions as the patients who were under the UC without co-payment.

Level 3 (Insured) consisted of subjects who had some types of government insurance, such as those who were under the Thai government Civil Servant Medical Benefit scheme, Social Security scheme, workmen's compensation scheme or traffic accident protection scheme. For this group of subjects, either the government or an insurance organization paid the hospital for all the health care service costs. They could go to any hospital they wanted without any limitations to health care services. However, the patients who were under the Social Security scheme had to go to a hospital selected by the company they worked for first. Then, if the hospital could not handle the case, the patient would be referred to a higher-level hospital.

TABLE 2. Number and percentage of discharge status in each category of patients according to admitted year.

Admitted year	Type of patient	Discharge status	
		Death (no./%)	Alive (no./%)
2001	UC without co-payment	2,140 (3.0)	69,681 (97.0)
	UC with 30 baht co-payment	835 (5.3)	14,924 (94.7)
	Insured	575 (6.6)	8,135 (93.4)
2002	UC without co-payment	2,167 (3.2)	65,411 (96.8)
	UC with 30 baht co-payment	1,060 (4.3)	16,182 (93.6)
	Insured	1,122 (6.6)	15,969 (93.4)

Statistical analysis

Data for each controlling variable were summarized using percentages for categorical variables and means with standard deviations for continuous variables. Characteristics of patients with different admitted years were compared using Chi-square for the categorical data. For continuous data, t-test or ANOVA analysis was used. Since the main variable

TABLE 3. Multiple variable logistic model of mortality risk for insured patients (N = 32,140).

Variable	OR (95% CI)	p
Gender	0.665 (0.591 - 0.749)	<0.001
Age	1.040 (1.037 - 1.043)	< 0.001
Marital status	1.152 (1.003 - 1.323)	0.045
Length of stay	1.016 (1.013 - 1.020)	<0.001
Hospital type		
General	3.656 (3.110 - 4.298)	<0.001
Regional	4.516 (3.801 - 5.366)	<0.001
Admitted year	1.082 (0.960 - 1.219)	0.200

Note: Male, district hospital, marital status defined as single, and admitted year of 2001 were set as comparison groups.

(mortality) is a binary variable, a logistic regression model was used to test the association of the variable with independent variables. Confidence intervals (CIs) for the estimated odds ratio (ORs) and significance tests from the null value were calculated. The α value was set at .05. All analyses were performed using SPSS for Windows.

RESULTS

There were 218,605 subjects diagnosed with pneumonia. The general characteristics of the subjects in each group are shown in Table 1. The number of subjects in each variable varies due to missing data. Mean ages and LOS were significantly different between the two groups. Subjects admitted in 2001 had a significantly lower mean age and length of stay compared to those patients admitted in 2002. Subjects in 2001 were less likely to be female than those admitted in 2002. In addition, there was a significant difference in marital status. Subjects admitted in 2001 were significantly more likely to be single than those admitted in 2002. The data indicates the majority of subjects admitted in 2002 were more likely admitted to a district hospital. There were higher numbers of subjects admitted in 2001 categorized as UC without co-payment than those admitted in 2002 (74.5% vs 66.2%; p<0.001). Subjects admitted in 2002 were more likely to die than patients admitted in 2001 (4.4% vs 3.8%; p<0.001). Table 2 shows numbers and percentages of discharge status of patients according to admitted years. The results indicated that the percentage of dead patients in 2002 were higher than those in 2001 for UC without co-payment (3.2 vs 3.0%). In contrast, the percentages of dead patients in 2002 and 2001 were the same for insured patients (6.6% vs 6.6%). However, the percentage of dead patients in 2002 were lower than those in 2001 for UC with co-payment patients (4.3% vs 5.3%).

Tables 3, 4, and 5 show the multi-variable logistic regression analysis results for insured, UC with 30 baht co-payment, and UC without co-payment patients, respectively. The results show that females had a lower mortality risk than males for every category of patients. In addition, the results of other variables were in the same direction as the insured, UC with 30 baht co-payment, and UC without 30 baht co-payment patients. Older subjects were significantly more likely to have a higher mortality risk than younger subjects (OR = 1.04, p<0.001; OR = 1.03, p<0.001; OR = 10.3, p<0.001; respectively). Married patients were more likely to have a higher mortality risk than subjects who were single (OR = 1.15, p=0.045; OR = 1.38, p<0.001; OR = 1.19, p<0.001; respectively). Patients who had a longer LOS were more likely to die than those who had a shorter LOS (OR = 1.02, p<0.001; OR = 1.01, p<0.001; OR = 1.02, p<0.001; respectively). Compared to subjects admitted to a district hospital, subjects who were admitted to a general (OR = 3.66, p<0.001; OR = 5.58, p<0.001; OR = 7.32, p<0.001; respectively) or regional hospital (OR = 4.52, p<0.001; OR = 5.58, p<0.001; OR = 9.39, p<0.001; respectively) had significantly higher mortality risks. After controlling for gender, age, LOS, and type of hospital, mortality risks of the insured patients and UC with 30 baht co-payment patients admitted in 2002 and in 2001 were not significantly different (OR = 1.08, p=0.20; OR = 1.03, p=0.62; respectively). In contrast, after controlling for gender, age, LOS, and type of hospital, the mortality risks of the UC without co-payment patients admitted in 2002 were significantly higher than those of patients admitted in 2001 (OR = 1.12, p=0.001).

DISCUSSION

Comparisons of treatment outcomes in terms of mortality risks for patients with the same levels of health insurance status before and after implementation of the UC project showed interesting results. For the insured patients and the patients under UC with 30 baht co-payment, their mortality risks, after controlling for age, gender, marital status, LOS, and type of hospital, were not different after the implementation of the UC project. This may imply that the UC project had no effect on treatment outcomes in these groups of patients. There are some possible explanations for the findings. For insured patients, the implementation of the UC has not made any difference to them since they still have the same level of health care and can access to any hospital without limitation. Therefore,

TABLE 4. Multiple variable logistic model of mortality risk for UC with 30 baht co-payment patients (N = 73,560).

Variable	OR (95% CI)	p
Gender	0.695 (0.627 - 0.771)	<0.001
Age	1.032 (1.030 - 1.034)	<0.001
Marital status	1.383 (1.223 - 1.563)	<0.001
Length of stay	1.013 (1.008 - 1.018)	<0.001
Hospital type		
General	5.583 (4.788 - 6.509)	<0.001
Regional	5.817 (5.003 - 6.764)	<0.001
Admitted year	1.026 (0.927 - 1.136)	0.620

Note: Male, district hospital, marital status defined as single, and admitted year of 2001 were set as comparison groups.

TABLE 5. Multiple variable logistic model of mortality risk for UC without co-payment patients (N = 136,242).

Variable	OR (95% CI)	p
Gender	0.764 (0.715 - 0.817)	<0.001
Age	1.036 (1.030 - 1.034)	<0.001
Marital status	1.194 (1.102 - 1.293)	<0.001
Length of stay	1.024 (1.021 - 1.026)	<0.001
Hospital type		
General	7.326 (6.691 - 8.020)	<0.001
Regional	9.386 (8.544 - 10.311)	<0.001
Admitted year (2002/2001)	1.116 (1.044 - 1.193)	0.001

Note: Male, district hospital, marital status defined as single, and admitted year of 2001 were set as comparison groups.

the findings were consistent with the practical situation.

For the UC with 30 baht co-payment patients, the findings were interesting. One of the purposes of the UC project was to increase accessibility to health care for these groups of patients since they did not have any insurance coverage from the government before the implementation of the UC project. Studies[9-15] have suggested that patients with a lower socioeconomic status or lacking health insurance were more likely to have a higher mortality rate or worse outcomes than privately insured or self-insured patients. Therefore, implementing the UC project was supposed to increase accessibility to care and create better treatment outcomes. However, the results show that their mortality risk after UC implementation was not significantly different from their mortality risk before the UC implementation which seemed to indicate that accessibility did not change. This conclusion may be wrong since this group of patients consisted of people with different levels of socioeconomic status. For patients who could pay for their medical care cost or had private insurance, they might not use their UC insurance privilege since the UC coverage did not allow them to access to higher levels of hospitals without passing through a referral system and did not allow physicians to prescribe medicines that are not listed in the national drug list. Therefore, only some types of patients, such as those who were quite poor, used the UC coverage privilege after the implementation. The mortality risks before and after implementation of UC for this group of patients may be incorrect since the sample may not be from the same group. Another explanation is that the UC project stopped an increase in mortality risk, if the mortality risk before implementation of the UC project increased every year. Further studies need to be done to determine the correct explanation.

In contrast, the mortality risk of patients with UC without co-payment increased after the implementation of the project. Theoretically, the mortality risk of this group of patients should be the same since their accessibility to care and quality of care were supposed to be the same. Possible explanations for this finding are as follows. First, since the MOPH allocated budgets to hospitals per capita for all types of UC patients, then, hospitals allocate a budget for UC without co-payment patients to those with the UC with 30 baht co-payment patients. Therefore, UC without co-payment patients might receive lower levels of care. Second, budget management in hospitals has been poor since hospital directors and committees have no experience. The budget for the UC project including treatment costs, labor costs and capital costs. This is the first year for this type of budget allocation. The quality of care might be lower than before implementation of UC. Third, since budget allocation is based on capitation, this may create an adverse incentive to limit necessary services resulting in poor quality of care.[6] Finally, mortality risk for UC without co-payment patients might usually increase every year and the UC implementation did not change anything. In other words, the findings indicate that the UC project did not change the mortality risk for the poor. Further studies are needed to determine the correct explanation.

It is unclear whether the mortality risk differences were due to unmeasured differences, such as quality of care, restricted or delayed access to care, differences in co-morbidities, or other factors not accounted for in this model. Further study regarding these factors is needed.

We recognize the need for caution in interpreting our findings because of the inherent limitations of a study of this type. First, the data was derived from a DRG database created from data from all MOPH hospitals in Thailand. Incompleteness or miscoding of diagnosis may have occurred. Second, we did not have data on treatment or procedures used. Third, we did not control for the severity of illness, treatment received, or co-morbidity due to a lack of information. Fourth, missing data occurred. Reasons for missing data were miscoding and incompleteness of filling the data. There was no specific reason for that missing data except for human error; therefore, missing data occurred at random and had no effects on the results. Finally, to generate a sufficiently large patient sample, we relied on an administrative database. Such databases have been criticized when used for research because of reliability concerns, especially with regard to inconsistent coding between institutes, case-mix adjustment, severity, and adequacy of follow-up.[16-17] However, the DRG database did not affect monetary reimbursement to MOPH hospitals since the Thai government paid all hospitals by the "capitation method". The findings in this study are consistent with those of previous studies using administrative data.[7-18] Therefore, we believe that the coding of diagnosis was not subject to much error; therefore, it did not affect the results.

Pneumonia was chosen to be a case of illness to compare treatment outcomes after the change of the health care system since "death" which is one of treatment outcomes of the illness is clearly measurable and data is available in the DRG database. It is not meant to measure the overall surrogate "success/failure" of the UC programme since there must be many other factors needed to measure the success/failure of the program.

In conclusion, the results indicate that the implementation of the UC affected mortality risks differently in pneumonia patients with differences in levels of health insurance coverage. The findings suggest that providing basic health insurance coverage, even though clearly necessary, may not be sufficient to ensure that access and quality of care are adequate to achieve the desired outcomes, especially for the poor.

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