

Cost Analysis of Outpatient Services for Hypertension, Heart Attack, and Stroke among Older Adults in Community Hospitals in Thailand

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Abstract

The purpose of this study was to estimate the cost of outpatient care for older patients with a primary diagnosis of hypertension, heart attack, and stroke at community hospitals in Thailand. This cross-sectional study used cost information in 2014 from four community hospitals. The hospital cost information consisted of service data, hospital statistics, and financial reports. We used the International Classification of Diseases (ICD-10), the 10th revision coding system to identify hypertension, heart attack, and stroke. Traditional cost and the cost to charge ratio methods were used to estimate average cost per visit and cost per person-year. Inflation rate was used to report the average cost in 2021. Overall, the major costs were for labor (53%), followed by material (42%), and capital (6%). The unit cost per visit for older outpatients in 2014 was between 447-688 THB for hypertension (531-817 THB in 2021), 634-1,171 THB for heart attack (753-1,392 THB in 2021), and 611-1,238 THB for stroke (726-1,470 THB in 2021). Our cost analysis used actual cost data, which provided useful information for budgetary planning and management for outpatient care among older adults with a primary diagnosis of hypertension, heart attack, and stroke.

Keywords: cost analysis, hypertension, heart attack, stroke, community hospitals

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ต้นทุนการจัดบริการผู้ป่วยนอกโรคความดันโลหิตสูง โรคหัวใจ และโรคหลอดเลือดสมองในกลุ่มผู้สูงอายุของโรงพยาบาลชุมชน ประเทศไทย

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อประมาณการต้นทุนในการจัดบริการแก่ผู้ป่วยนอกกลุ่มผู้สูงอายุวินิจฉัยโรคหลักความดันโลหิตสูง โรคหัวใจ และโรคหลอดเลือดสมองในโรงพยาบาลชุมชน โดยวิเคราะห์ข้อมูลจากปี 2557 ของโรงพยาบาลชุมชนจำนวน 4 แห่ง รายละเอียดของข้อมูลต้นทุนโรงพยาบาลประกอบด้วยข้อมูลการจัดบริการ ข้อมูลสถิติการจัดบริการของโรงพยาบาล และรายงานทางการเงิน และใช้รหัสจำแนกโรคขององค์การอนามัยโลก ฉบับที่ 10 ในการค้นหาผู้รับบริการ โรคความดันโลหิตสูง โรคหัวใจและโรคหลอดเลือดสมอง การศึกษานี้ปรับใช้วิธีต้นทุนแบบแนวคิดดั้งเดิมและอัตราส่วนต้นทุนต่อรายได้ที่เรียกเก็บในการประมาณการต้นทุนเฉลี่ยต่อครั้งและต่อคนต่อปีและปรับด้วยข้อมูลอัตราเงินเฟ้อเพื่อแสดงต้นทุนในปี 2564 ผลการศึกษาพบว่า ต้นทุนค่าแรงเป็นต้นทุนที่สูงที่สุด รองมาคือ ต้นทุนค่าวัสดุและค่าเสื่อมราคา โดยต้นทุนการจัดบริการผู้ป่วยนอกกลุ่มผู้สูงอายุโรคความดันโลหิตสูง มีค่าเฉลี่ยอยู่ระหว่าง 447-688 บาทต่อครั้ง (หรือ 531-817 บาท ราคาในปี 2564), โรคหัวใจ 634-1,171 บาทต่อครั้ง (753-1,392 บาท ในปี 2564), และโรคหลอดเลือดสมอง 611-1,238 บาทต่อครั้ง (726-1,470 บาท ในปี 2564) ผลจากการศึกษาสามารถให้ข้อมูลที่เป็นประโยชน์สำหรับการวางแผนงบประมาณและการบริหารจัดการในการดูแลผู้สูงอายุที่เข้ามารับบริการผู้ป่วยนอกโรคความดันโลหิตสูง โรคหัวใจและโรคหลอดเลือดสมอง

คำสำคัญ: การวิเคราะห์ต้นทุน, ความดันโลหิตสูง, โรคหัวใจ, โรคหลอดเลือดสมอง, โรงพยาบาลชุมชน

Background and Rationale

The burden of noncommunicable diseases (NCDs) increases with age and is a serious public health concern.⁽¹⁾ NCDs accounted for 43% of the global disease burden worldwide in 1990 and increased to 64% by 2019.⁽²⁾ Nevertheless, the reduction trend in premature mortality due to NCDs⁽³⁾ causes an increment in years living with disability,⁽⁴⁾ suggesting that the prolonged life years as a result of the success in advanced medical technology⁽⁵⁻⁶⁾ may have inevitably extended the time that people have to deal with disability.

Because prolonged hospital dependency of people living with NCDs could incur a heavy healthcare expenditure burden,⁽⁷⁾ shifting medically stable patients with NCDs to community health facilities may be a solution to address the scale of healthcare spending.⁽⁸⁻⁹⁾ For example, outpatient cardiac monitoring after ischemic strokes⁽¹⁰⁾ and outpatient stroke rehabilitation programs, were mentioned as some of the strategies to increase cost-effectiveness and reduce hospital financial burden while still ensuring that discharged patients receive an appropriate continuum of care.⁽⁹⁾

Therefore, understanding outpatient costs relevant to NCDs will support governments' long-term plan for budgetary planning and management.

In Thailand, NCDs contributed to more than 70% of all-cause deaths in 2009.⁽¹¹⁾ The most prevalent NCDs were hypertension, heart attack, and stroke.⁽¹⁾ Although there are three main insurance funds (i.e., the universal coverage scheme, the social security scheme, and the civil servant medical benefit scheme) providing subsidies for people seeking health services,^(12–14) the costs for subsequent medical care and rehabilitation for individuals with NCDs are likely to increase substantially due to the rapidly aging population.⁽¹⁵⁾ To date, however, little attention has been paid to understanding outpatient costs among older adults with NCDs in Thailand. The only study that investigated outpatient service usage among older adults with hypertension showed that the unit cost for hypertension outpatient care was 695 THB per visit in 2009.⁽¹⁶⁾ Nevertheless, the study may have underestimated the total cost because it has a relatively small sample size (54 outpatients with hypertension) and a short study period (12 weeks). Moreover, previous reports used expenditures in the past to project future costs.⁽¹⁷⁾ However, such a method provides a less accurate estimation compared to the cost accounting method.⁽¹⁸⁾ Hence, the cost of taking care of patients in outpatient settings in Thailand warrants further investigation. This study aimed to estimate healthcare costs for older adults with a primary diagnosis of hypertension, heart attack, or stroke in outpatient settings in Thailand. Data were obtained from four com-

munity hospitals at the district level to estimate the average cost and the cost per visit for each health condition.

Methodology

Data

This cross-sectional retrospective study used outpatient cost information in the fiscal year 2014. We focused on community hospitals (≤ 120 beds) because they were the main hospitals providing outpatient care after intensive inpatient care in Thailand.⁽¹⁹⁾ In 2018, we approached a total of six community hospitals. Of those, two community hospitals declined to participate in the study. The remaining four hospitals were included in the current study because they provided the required information (i.e., service data, hospital statistics, and financial reports using an accrual basis of accounting) to estimate outpatient costs. All data were obtained from the hospital database. Data from individuals aged 60 years or above with a diagnosis of hypertension, heart attack, and stroke were included in the analysis (Figure 1). The 10th revision of the International Classification of Diseases (ICD-10)⁽²⁰⁾ was used to ascertain their diagnosis including I10–I15 for hypertension, I20–I25 for heart attacks, and I60–I69 for strokes. The final sample size was 8,485 with 7,325 individuals having a primary diagnosis of hypertension, and it was 616 for individuals with a primary diagnosis of heart attack and 544 for individuals with a primary diagnosis of stroke.

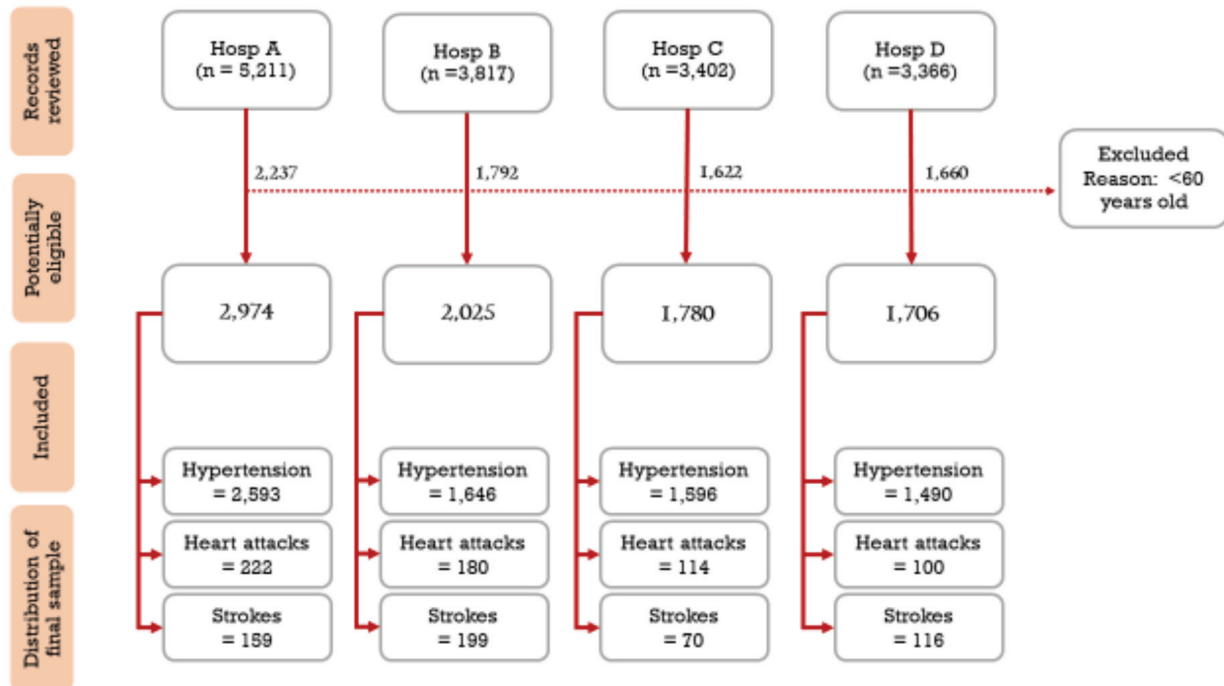


Figure 1 A flowchart of participants' selection process

Cost analysis

To estimate the cost of outpatient services more accurately, we used data on charges and operational costs for outpatient services to calculate the costs-to-charge ratio. To obtain charges for outpatient services, we audited each charge for outpatient service. These charges were categorized into different charge groups, such as observation room, medicine, medical supplies, blood bank, laboratory, X-ray, detailed physiological tests (e.g., electroencephalogram, exercise stress test, echocardiography), surgery and anesthetic, doctor and nurse fees, dental services, rehabilitation, and alternative medicine (e.g., acupuncture). The operational costs for outpatient services included

labor costs, material costs, and capital costs following the Ministry of Finance's guideline of the useful life of the asset (years).⁽²¹⁾ Labor costs included salary, compensation, bonus, and fringe benefits such as insurance paid by hospitals. Material costs were used to provide care and support the hospital's management (e.g. medicine, material supplies, utilities, maintenance, and other fees). Capital cost was the purchase price of the asset divided by the useful life of the asset (years), considering annual depreciation and amortization using the straight-line depreciation method.

Data analysis

Following the methods used by the Ministry

of Public Health in Thailand,⁽²²⁾ we calculated the total hospital operational costs, the average cost for outpatient services, the unit cost per outpatient visit, and the average cost per person-year. The procedure consisted of the following steps: 1) auditing hospital financial and accounting information, 2) dividing hospital departments into supporting cost centers (e.g. administrative office, financial and accounting, information technology) and service cost centers (e.g. laboratory, outpatient clinics), 3) determining direct cost (i.e. labor cost, material cost, and capital cost) in supporting cost center and service cost center, 4) obtaining total cost by allocating cost from supporting cost center to service cost center using allocation criteria (i.e. number of patients, use of services, medical supplies expenditure, number of staff), 5) summing total charge by charge groups, 6) summing total cost of each service cost center, 7) matching each charge group with service cost center based on the cost of each charge (i.e. cost of medicine was total cost from pharmacy department which included labor cost, material cost, capital cost and indirect cost from supporting cost center), 8) calculating cost to charge ratio by dividing the total cost by total charge of each group, 9) calculating the cost of subcategories in a medical bill by multiplying each charge by each of cost to charge ratio, 10) calculating the

unit cost of outpatient per visit of each disease by dividing the total cost by total number of visits, 11) calculating average cost per person-year by dividing the total cost of each disease by total number of outpatients. All costs were based on THB in 2014. The unit cost per visit in 2014 was adjusted by the inflation rate from 2015 to 2021⁽²³⁾ to report the 2021 unit cost.

Ethical considerations

No human research subjects or volunteers were used in this study. Using only the hospital's administrative database such as service data, hospital statistics, and financial information, which contains anonymous individual information. Therefore, it did not require the Institutional Review Board (IRB) review or ethical review committee.

Results

Characteristics of the participants

Across all hospitals, most participants with hypertension were female, but not for stroke and heart attack. One exception was heart attack in hospital A where there were more males than females. There were, in total, 27,779 outpatient visits including 24,625 visits for hypertension, 1,747 visits for heart attack, and 1,407 visits for stroke.

Table 1 Characteristics of participants in 2014

| Participant's characteristics | Hospital | | | |
|--|----------|-------|-------|-------|
| | A | B | C | D |
| Hypertension (n = 7,325) | | | | |
| Gender | | | | |
| Male | 989 | 690 | 572 | 652 |
| Female | 1,604 | 956 | 1,024 | 838 |
| Total utilization of older adults (per year) | | | | |
| Number of patients | 2,593 | 1,646 | 1,596 | 1,490 |
| Number of visits | 7,661 | 5,381 | 7,124 | 4,459 |
| Visits per person | 3 | 3 | 4 | 3 |
| Heart attack (n = 616) | | | | |
| Gender | | | | |
| Male | 99 | 108 | 88 | 56 |
| Female | 123 | 72 | 26 | 44 |
| Total utilization of older adults (per year) | | | | |
| Number of patients | 222 | 180 | 114 | 100 |
| Number of visits | 527 | 732 | 335 | 153 |
| Visits per person | 2 | 4 | 3 | 2 |
| Stroke (n = 544) | | | | |
| Gender | | | | |
| Male | 89 | 119 | 42 | 65 |
| Female | 70 | 80 | 27 | 51 |
| Total utilization of older adults (per year) | | | | |
| Number of patients | 159 | 254 | 70 | 116 |
| Number of visits | 347 | 683 | 202 | 175 |
| Visits per person | 2 | 3 | 3 | 2 |

The total hospital cost

In hospital A, C, and D, labor cost was the highest hospital expenditure, followed by material cost, and then capital cost. In hospital B, material cost was the highest cost, followed by labor cost and then capital cost.

Cost of hypertension

The average cost of outpatient visits for hypertension was 554 THB, ranging from 531 to 817 THB in 2014. After adjusting for the inflation rate from 2015 to 2021, then, the unit cost per outpatient visit would be 658 THB, ranging from 531 to 817 THB in 2021. The average cost per person-year ranged from 1,567 THB to 2,031 THB.

Table 2 Cost of outpatient with hypertension, heart attack, and stroke

| | Total outpatient cost (THB) | Total OPD visits | Unit cost per person-year (THB) | Unit cost per visit (THB) | |
|--------------------|--------------------------------|---------------------|---------------------------------------|---------------------------|--------|
| | | | | 2014 | 2021* |
| Hypertension | | | | | |
| Hospital A | 5,267,007 | 7,661 | 2,031 | 688 | 817 |
| Hospital B | 2,579,439 | 5,381 | 1,567 | 479 | 569 |
| Hospital C | 3,184,409 | 7,124 | 1,995 | 447 | 531 |
| Hospital D | 2,686,629 | 4,459 | 1,803 | 603 | 716 |
| Mean | 3,429,371 | 6,156 | 1,849 | 554 | 658 |
| Standard deviation | 1,253,124.55 | 1,492.48 | 213.05 | 111.35 | 132.28 |
| Heart attack | | | | | |
| Hospital A | 461,701 | 527 | 2,080 | 876 | 1,041 |
| Hospital B | 464,008 | 732 | 2,578 | 634 | 753 |
| Hospital C | 330,055 | 335 | 2,895 | 985 | 1,170 |
| Hospital D | 179,220 | 153 | 1,792 | 1,171 | 1,392 |
| Mean | 358,746 | 437 | 2,336 | 917 | 1,089 |
| Standard deviation | 135,071.18 | 249.12 | 494.17 | 224.49 | 266.68 |
| Stroke | | | | | |
| Hospital A | 212,163 | 347 | 1,334 | 611 | 726 |
| Hospital B | 713,347 | 683 | 3,585 | 1,044 | 1,241 |
| Hospital C | 198,597 | 202 | 2,837 | 983 | 1,168 |
| Hospital D | 216,597 | 175 | 1,867 | 1,238 | 1,470 |
| Mean | 335,176 | 352 | 2,406 | 969 | 1,151 |
| Standard deviation | 252,230.60 | 233.39 | 1,002.30 | 262.01 | 311.26 |

Note * Adjusted by inflation rate from year 2015 to 2021

Cost of heart attack

The average cost of outpatient visits for heart attacks was 917 THB, ranging from 634 to 1,171 THB in 2014. After adjusting for the inflation rate from 2015 to 2021, the unit cost per outpatient visit was 1,089 THB, ranging from 753 to 1,392 THB in 2021. The average cost per person-year ranged from 1,792 THB to 2,895 THB.

Cost of stroke

The average cost of outpatient visits for stroke was 969 THB, ranging from 611 to 1,238 THB in 2014. After adjusting for the inflation rate from 2015 to 2021, then, the average unit cost per outpatient visit was 1,151 THB, ranging from 726 to 1,470 THB in 2021. The average cost per person-year was 2,406 THB, ranging from 1,334 THB to 3,585 THB.

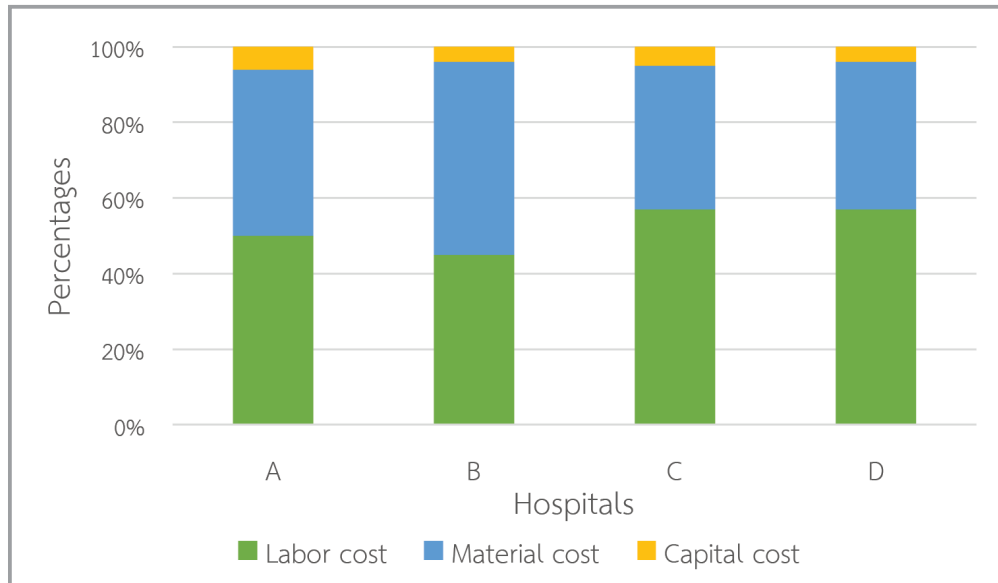


Figure 2 Healthcare cost structure by hospitals

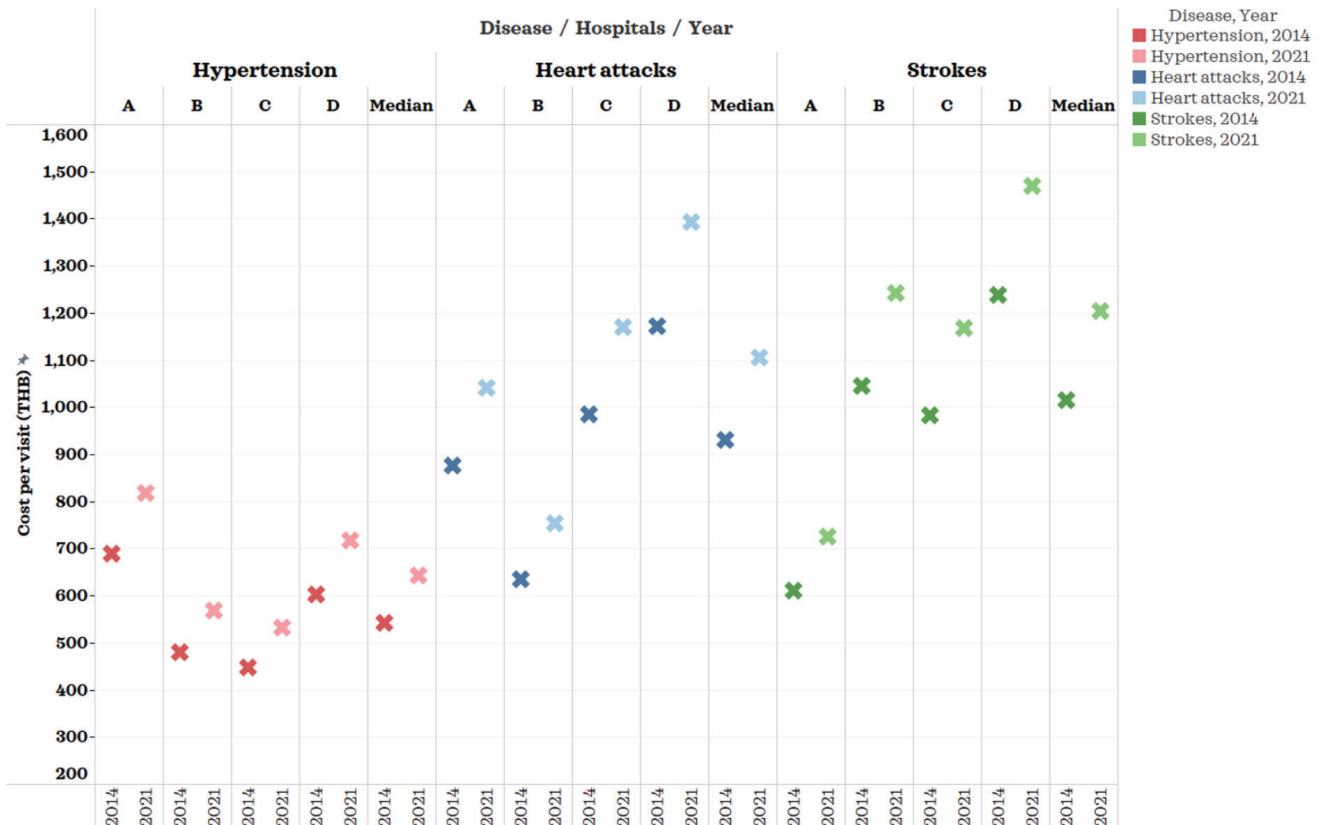


Figure 3 Distribution of unit cost per visit in 2014 and 2021 by hospitals and diseases

In 2021, the unit cost per visit for heart attack and stroke at four different hospitals showed a similar trend. The median cost per visit for stroke was approximately 1,200 THB, and for heart attack was around 1,100 THB. However, the unit cost per visit for hypertension was lower than that for heart attack and stroke, with a median cost per visit of less than 700 THB (Figure 3).

Discussion

This study aimed to estimate the cost of outpatient visits for community-dwelling older adults with a primary diagnosis of hypertension, heart attack, and stroke in Thailand. We found that labor costs were the main costs of the total hospital costs, followed by material costs and capital costs. In addition, the average cost per outpatient visit was 554 THB for hypertension, 917 THB for heart attack, and 969 THB for stroke.

Cost structure analysis

Most of the hospital costs were on labor costs (52%), then material (43%), and capital (5%). Labor cost was the cost that hospitals must bear regardless of the specific care activities provided because it related to the number of healthcare and hospital staff, job positions, and the time-motion of healthcare staff.⁽²⁴⁾ Controlling or minimizing labor costs could be a very challenging issue. One of the solutions is that the payment structure should be reviewed along with the healthcare staff workload to find the appropriate payment mechanism. Innovative technology such as smart

hospitals that could streamline healthcare services, in particular, providing electronic health recode (e.g. making appointments, taking vital signs, weight measurements, automated cashier) also had the potential to support staff and reduce labor costs.⁽²⁵⁾

Outpatient cost analysis

To reflect the unit cost in more recent value, we used the inflation rate from 2015 to 2021. In 2021, the unit cost of an outpatient with stroke was around 1,115 THB, followed by heart attack (approximately 1,089 THB), and hypertension (around 658 THB). The average cost per patient per year with stroke, heart attack, and hypertension was 2,406 THB, 2,336 THB, and 1,849 THB, respectively. The cost per patient-year of three main diseases was higher than allocated outpatient services per capita from the universal health coverage (UHC) (approximately 1,100 THB in 2014 and 1,300 THB per outpatient service in 2021).⁽¹⁷⁾ A report from the Institute of Medical Research and Technology Assessment under the Ministry of Public Health indicated that outpatient expenditure per person with strokes, heart attacks, and hypertension in 2008 was 1,629 THB, 1,109 THB, and 831 THB, accordingly.⁽²⁶⁾ The costs estimated by previous reports were lower than the present study. This could be because we used actual cost data from more recent years while previous reports used expenditure information.

Other similar findings were found in Nigeria.⁽²⁷⁾ Data from two hospitals in Nigeria showed that

the average annual cost per patient with hypertension was NGN (Nigerian Naira) 145,086.12 (about 11,748.34 THB) . The study from one community hospital using exploratory design in Thailand reported that the unit cost per outpatient with hypertension was 695 THB in 2007.⁽¹⁶⁾ Another study conducted in low- and middle-income countries, indicated that outpatient costs to treat hypertension were from \$38.00 to \$565.54 per patient-year (approximately from 1,177 to 17,515 THB).⁽²⁸⁾ Furthermore, research conducted in Ethiopia reported that the total cost of hypertension was US\$22.3 per month (approximately 690.31 THB).⁽²⁹⁾ It can be seen that many countries experience NCDs health issues and it will increase healthcare expenditure. Therefore, a proper strategy is urgently needed to decrease healthcare expenditure. Apart from hypertension, heart attack, and stroke become common among older adults due to aging.⁽³⁰⁾ Therefore, the outpatient cost of these diseases should be studied further.

Our analysis sheds light on the disparities in the cost per visit for different diseases, with stroke having a higher cost compared to heart attack and hypertension having the lowest cost. These findings can be compared to other data from these four hospitals to determine the differences among them. It is interesting to find out in detail what the factors contributing to the higher cost are and how related agencies take action to handle these issues. The unit cost and major cost of services should be taken into consideration in the planning of the provision of services, efficient treatment, and rehabilitation for patients at both

hospital level and national level. For the hospital level, information can be applied for financial and services management to decrease the hospital's long-term costs. In the case of the national level, information can be applied to formulate an appropriate strategy of health promotion, disease prevention, and rehabilitation for target groups to decrease the number of patients. Actual cost information can be used by three main insurance schemes in Thailand to set the appropriate reimbursement rate which covers total service cost for public hospitals. Furthermore, labor cost plays a vital role in total hospital costs and therefore ways to manage labor costs (e.g. increasing workforce efficiency) warrant more attention from stakeholders.

Limitations and future research

There were a few limitations. First, findings from the current cost analysis were based on a limited sample of four hospitals, not accurately representing community hospitals in Thailand. However, a sample of 8,485 older patients from four community hospitals served as a starting point for identifying the differences between hospitals and diseases. Besides, auditing accounting costs directly enhances the validity of our findings. Further research is recommended to enhance a more comprehensive understanding of the community hospital financial situation for non-communicable disease management for older adults, as well as to gather data from a large sample of community hospitals to improve the generalizability. Second, the present study was a retrospective study over a period of one year, the findings were limited

to this observation period, so the costs of future complications were unknown. To obtain the full episode of treatment, a prospective cohort study investigating the unit cost since patients get the initial treatment until the end of the remedy for each patient should be advised.

Conclusion

Hypertension, heart attack, and stroke have become serious health burdens in Thailand. The present study provides the cost for outpatient visits of older adults with a primary diagnosis of these diseases. The main findings are: 1) labor costs were the highest in the total cost; 2) cost of care for people with stroke was highest followed closely by heart attacks, then hypertension; and 3) the number of patients with hypertension was the highest of the three diseases. With the rapidly aging population, the costs of outpatient care are expected to soar. The workforce is a pressing issue that needs to be studied and organized to offer efficient service provision.

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