Hospitalizations of Diabetes Ambulatory Care Sensitive Condition - Universal Coverage Scheme at a Referral Hospital in Bangkok, Thailand: Five-Year Cross-Sectional Study

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Background: *Universal coverage (UC) scheme covers most of the population in Thailand (76.3%) and diabetes (DM) was the most prevalent ambulatory disease in most health care centers. Rajavithi Hospital is designated as one of the top referral hospital in Bangkok.*

Objective: *To examine the trend of avoidable hospitalization related to diabetes in the UC patients who registered at Rajavithi Hospital.*

Material and Method: *This cross-sectional study collected data from electronic medical record from Rajavithi Hospital and the National Health Security Office (NHSO). DM and related diseases based on a list of diagnosis codes (ICD-10) were selected as an ambulatory care sensitive condition (ACSC) to reflect the avoidable hospitalization. Outpatient and inpatient data between 2007 and 2011 were studied. The ACSC rate was calculated by number of hospitalizations on DM and related conditions divided by number of the DM patients visited as ambulatory care.*

Results: *The ACSC rate in DM patients registered to Rajavithi Hospital was on average 25.85 per 1,000 (22.62 per 1,000 to Rajavithi Hospital, and 6.67 per 1,000 to non-Rajavithi hospital). Hospitalizations of DM related diseases were only observed at other hospitals. The median length of stay in Rajavithi Hospital was 5.0 (interquartile range 2.0-8.0) vs. 4.0 (IQR 2.0-6.0) days in other hospitals. The risk of DM hospitalization in male was 1.21 times higher than that of female (95% CI 1.03-1.42, p = 0.02). The risk of DM hospitalization in patients younger than 60 years old was 1.07 times of those 60 years and above (95% CI 0.95-1.21, p = 0.28).*

Conclusion: *The avoidable hospitalization for DM patients registered at Rajavithi Hospital was stable during the five years of the study. Future study on avoidable hospitalization should cover admissions to other hospitals and DM related conditions. Further studies should investigate the reasons of avoidable hospitalization.*

Keywords: *Ambulatory care sensitive condition (ACSC), Diabetes, Universal coverage scheme*

There are several factors that can cause hospitalization such as type of disease, underlying ill health, demographic, socioeconomic, geographic barrier, ambulatory care service provision, referral system, politics, and development[1-3]. The ambulatory care sensitive conditions (ACSC) are groups of diseases that require low hospitalization if ambulatory care is of good quality. The ACSC handbook in Thailand mention six diseases (epilepsy, chronic obstructive pulmonary disease (COPD), asthma, congestive heart failure and pulmonary edema, diabetes, and hypertension) that hospitalization can be avoided. These kind of diseases can be prevented by good quality of service, especially in primary care sector. Therefore, the ACSC is one of the indicators monitoring the adequacy, appropriateness, effectiveness, and quality of ambulatory care system[4], the better ambulatory care system, the lower avoidable hospitalizations.

The barriers to access for primary care that affect ACSC are regional (geographic barrier) and financial (socioeconomic factors)[5,6]. The rate of avoidable hospitalization such as diabetes varies by underlying ill health and population composition (age, gender, ethic variation)[3,7]. The number of chronic conditions can strongly increase the rate of

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hospitalization in the elderly[8]. Co-morbidity or related diseases can affect the hospitalization rate[9]. Among elderly of lower socioeconomic status, nearly three quarter of admissions have at least one chronic condition that might predispose them to a preventable hospitalization[10]. In Thailand, the hospitalization rate is also different by type of health benefit coverage[11]. The hospital admission for some chronic diseases is avoidable and the rate of admission from ACSC can be reduced if ambulatory service with good quality of care is available.

There are three major public health benefit schemes in Thailand, the Civil Servant Medical Benefit Scheme (CSMBS, covers 8% of total population), the Social Security Scheme (SSS, 15.7% of total population), and the Universal Health Coverage scheme (UC, 76.3% of total population)[4]. The UC covered 3.7 million hospital admissions (77% of all admissions) in the 2010 fiscal year. While admissions under the UC occurred in all age groups, the older tended to be admitted more often than the younger[11]. Diabetes mellitus (DM) is a common disease in Thailand[4] and counted as one of the ACSC. The ACSC handbook in Thailand mentions six groups of important chronic diseases, i.e., epilepsy, COPD, asthma, congestive heart failure and pulmonary edema, diabetes, and hypertension[12]. The ACSC rate, when studied at the population-based, can be used as an indication of competency of heath service quality. However, the present study was to examine the ambulatory diabetic patients as the quality of ambulatory DM clinic. Rajavithi Hospital is a tertiary care, public hospital with 1,250 beds. It provides service to UC patients. Diabetes was in the top five ranking disease for ambulatory clinic between fiscal year 2007 and 2011. The present study aimed to examine the ACSC rate in diabetes during five years. Additionally, because DM is a cause of other chronic diseases, the scope of the study included admissions from other related diseases and admissions at other hospitals where patients were also attended.

Objective

The objective of the present study was to examine the trend of avoidable hospitalizations related to diabetes in the UC scheme patients at Rajavithi Hospital.

Material and Method

The present study was a 5-years cross-sectional study. Data was collected from electronic database of medical records at Rajavithi Hospital and the National Health Security Office (NHSO) between the fiscal year 2007 and 2011 (October 2006 to September 2011).

The first step was to recruit DM ambulatory patients based on diagnosis codes (by ICD-10) as principal diagnoses of E10.0, E10.1, E10.6, E10.9, E11.0, E11.1, E11.6, E11.9, E13.0, E13.1, E13.6, E13.9, E14.0, E14.1, E14.6, E14.9[12]. The second step was to look for recruited patients who were hospitalized with the same principal diagnosis codes as listed above, with related diseases of DM as principal diagnosis, and with DM as secondary diagnosis in the same case. The diagnosis codes of related diseases of DM were listed based on in-depth interviews with two endocrinologists at Rajavithi Hospital and finalized by an expert in coding at the Thai Case-mix Center (with a 30-year experience internal medicine specialist) (Table 1).

Only UC ambulatory cases with principal diagnosis of DM between 2007 and 2011 were recruited to the present study. The selection was aimed only UC patients who registered at Rajavithi Hospital. The UC patients who were referred from other hospitals were excluded. From the recruited cases, all hospitalizations with DM and related diseases of DM as described in Table 1 were defined as avoidable hospitalizations. The encrypted personal identification number made the tracking of hospitalizations at other hospitals possible through the NHSO inpatient databases. The characteristics of non-Rajavithi hospitals were classified as community hospital, general hospital,

Table 1. The diagnosis codes (ICD-10) of diseases related to diabetes[13]

The disease	ICD-10
Diseases related to diabetes	E16.1, E74.8,
	G81, G82.2, G95.11,
	H34 (34.0, 34.1, 34.2, 34.8, 34.9),
	I21-25, I25.5, I49, I50, I63, I56 (I56.1,56.2,56.3,56.8, 56.9), I66 (I66.0, 66.1, 66.2, 66.3, 66.4, 66.8, 66.9),
	I67.1, I67.2, I70.1, I70.2, I 71.0-71.9, I72, I74, I75, I95.1,
	K30, K55 (K55.0, 55.1, 55.2, 55.8, 55.9),
	N12, N18.9, N28, N28.9, O24

regional hospital, university hospital (UHOSNET), and other hospitals.

Outcome measures and data analysis

The outcome measurement was hospitalization rate. The occurrence of hospitalization was a dependent variable and demographic factors (age, gender) were independent variables.

The hospitalizations were also expressed as length of stay (LOS), comorbidities (classified by ICD-10 codes), distribution of admission at different age and sex, and type of hospitals.

Data analysis for the ACSC were calculated as followed. The numerator was the number of admitted patients with the principal diagnosis for the indicated conditions or related conditions in each fiscal year. The denominator was the number of ambulatory patients with principal diagnosis of DM in respective fiscal year.

Data were transformed to a cross-sectional data. Descriptive statistics were expressed as number, percentage, median, inter-quartile range (IQR), and relative risk (RR with 95% confidence interval, CI). The statistical program used was Stata version 11. The present study was approved by the Ethics Committee of Rajavithi Hospital as well as at Naresuan University.

Results

Between the fiscal year 2007 and 2011, 20,490 ambulatory diabetic patients of the UC scheme attended Rajavithi Hospital. Forty-nine percent (9,903) of them registered to Rajavithi Hospital as primary care provider, whereas 51.0% (10,587) registered to other hospitals as main contractor.

Hospitalization rate (ACSC rate)

Of all ambulatory patients, there were 224 admissions (206 persons) to Rajavithi Hospital and 66 admissions (50 persons) to other hospitals by DM and other related conditions. Hospitalization rate due to diabetes was 25.45 per 1,000 (person based) and 0.40 per 1,000 due to diabetes related diseases (a 2% increase on a person base). The overall average hospitalization rate (person base) was 25.85 per 1,000 per year over five years. This rate could increase to 29.28 per 1,000 per year if calculated on a spell basis (a 13% increase on a spell base, see Table 2).

Length of stay

The median LOS of hospitalizations to Rajavithi Hospital was 5.0 days (interquartile range 2.0-8.0) compared to 4.0 days (IQR 2.0-6.0) of

Table 2. The hospitalization rate of diabetes (DM) and related diseases in patients registered to Rajavithi Hospital

DM admission (1) Year	Rajavithi Hospital		Other hospitals		Total		Number of OP in Rajavithi	Rate/ 1,000 patient
	Admissions	Patients	Admissions	Patients	Admissions	Patients		
2007	28	27	10	6	38	33	1,408	23.44
2008	47	45	23	15	70	60	1,903	31.53
2009	49	45	15	11	64	56	2,247	24.92
2010	57	52	6	6	63	58	2,163	26.81
2011	43	37	8	8	51	45	2,182	20.62
Total	224	206	62	46	286	252	9,903	25.45
DM related admission (2)								
2007	-	-	1	1	1	1	1,408	0.71
2008	-	-	2	2	2	2	1,903	1.05
2009	-	-	1	1	1	1	2,247	0.45
2010	-	-	-	-	-	-	2,163	
2011	-	-	-	-	-	-	2,182	
Total	-	-	4	4	4	4	9,903	0.40
All DM admission (1+2)								
2007	28	27	11	7	39	34	1,408	24.15
2008	47	45	25	17	72	62	1,903	32.58
2009	49	45	16	12	65	57	2,247	25.37
2010	57	52	6	6	63	58	2,163	26.81
2011	43	37	8	8	51	45	2,182	20.62
Total	224	206	66	50	290	256	9,903	25.85

OP = outpatient

hospitalizations to other hospitals on DM and related diseases (Table 3).

Gender

The hospitalization rates for male and female in all DM admissions were 31.05 and 23.35 per 1,000 respectively. The risk of hospitalization in male was 1.21 times of female (95% CI 1.03-1.42, *p* = 0.02).

Age group

The hospitalization rate in diabetic children patients was the highest (418.74 per 1,000) then in age 15 to 29 years (85.28 per 1,000), and the lowest in age 45 to 59 (15.92 per 1,000), see Fig. 1. The risk of hospitalization of those under 60 years (including children) was 1.07 times of those who were 60 years and above (95% CI = 0.95-1.21, *p* = 0.28).

Co-morbidity

For DM admissions of Rajavithi Hospital, 85.71% (192 of 224) were admitted with co-morbidity or related diseases for secondary diagnosis (sdx). Patients with three co-morbidities could be found in 15 to 29 years whereas in 45 to 59 years with five co-morbidities. The result had shown also the admissions with one case of nine co-morbidities in 60 to 74 years.

Other hospital admissions, patients with one or two co-morbidities were mostly found in 0 to 14 years and 45 to 59 years. Five co-morbidities were found in cases of 45 to 59 years to 60 to 74 years.

Classification by ICD-10

The common diagnosis codes in diabetes admissions were type 2 diabetes without complication (E11.9), type 2 diabetes with hyperosmolarity (E11.0), diabetes mellitus with ketoacidosis (E10.1), and type 2 diabetes with hyperosmolarity with coma (E11.1).
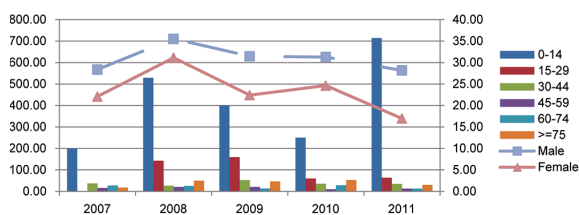

Fig. 1 The hospitalization rate (per 1,000) classified by age group, gender.

DM related diseases were chronic renal failure unspecified (N18.9) and dyspepsia (K30).

Distribution of admissions

The majority of UC admissions in DM patients at non-Rajavithi Hospital were admitted to Ministry of Public Health (MOPH) hospitals and the university hospital network (UHOSNET). The hospitalization rates in Rajavithi Hospital compared to non-Rajavithi Hospital were 22.62:6.67 per 1,000 (a 29% increase on average of five years, see Fig. 2) whereas median LOS was 5.0 days (IQR 2.0-8.0) and 4.0 days (IQR 2.0-6.0) respectively (Table 3).

Non-Rajavithi Hospital was classified to community hospital, general hospital, regional hospital, UHOSNET, and others. The highest hospitalization rate was community hospital, then general hospital and regional hospital (1.59:0.94:0.48 per 1,000 respectively). Median lengths of stay were 2.0 days (IQR 1.0-2.0), 3.0 days (IQR 2.0-4.0), and 3.5 days (IQR 3.0-4.0) respectively (Table 4).

Discussion

The present study showed that more than half of DM patients at the referral hospital in Bangkok were registered to other hospitals (51.0%, or 10,587 persons) rather than Rajavithi Hospital (49.0%, 9,903 persons)

Table 3. Median length of stay (LOS) at Rajavithi and other hospitals

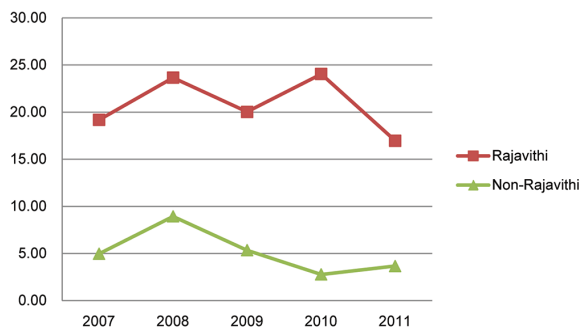| LOS Year	Rajavithi Hospital		Non-Rajavithi hospital						All hospitals	
	DM		DM		DM related		Total		DM and DM related	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR
2007	6	2-7	4	2-7	15	15-15	5	2-8	6	2-7
2008	6	3-8	6	2-7	5.5	5-6	6	2-7	5.5	3-8
2009	4	3-7	4	2-12	3	3-3	3.5	3.5-10.5	4	2.5-6.5
2010	5	1-8.5	4	3-6			4	3-6	5	1-8
2011	6	3-12	1.5	1-4			1.5	1-4	5	2-11
Total	5	2-8	4	2-6	5.5	4-10.5	4	2-6	5	2-7

IQR = interquartile range

Fig. 2 The hospitalization rate in Rajavithi and other hospitals.

Table 4. Median LOS by type of hospital

Type of hospital	Year	Median	IQR
Community	2007	2	2-2
	2008	2	2-2
	2009	3.5	1-6
	2010	6	6-6
	2011	1.5	1-3
	Total	2	1-3
General	2007	3	3-3
	2008	3.5	3-4
	2009	2	1-4
	2010	5	5-5
	Total	3	2-4
Regional	2008	5	5-5
	2009	4	4-4
	2010	3	3-3
	2011	1	1-1
	Total	3.5	3-4
UHOSNET	2008	4	4-6
	2009	4.5	2-7
	2010	3	3-3
	2011	4	4-4
	Total	4	2.5-6
Others	2007	7	5-8
	2008	7	6-12
	2009	5	3-6
	2010	4.5	1-8
	2011	2.5	1-4
	Total	7	3.5-9.5

Community hospital = hospital under Ministry of Health with less than 150 beds
General hospital = hospital under Ministry of Health with between 150-500 beds
Regional hospital = hospital under Ministry of Health with more than 500 beds
UHOSNET = hospital under Ministry of Education, provide service with high cost, high severity, and sophisticated diseases (University Hospital Network)
Others = private hospitals and hospitals outside Ministry of Public Health

as main contractor of the UC scheme. The registration systems at the study period allowed utilization of outpatient service at the main and supra-contractor, therefore, the outpatient utilization rates among patients who primarily registered to Rajavithi Hospital was 2.4 times higher than those who registered to the other hospitals (8.8 vs. 3.6 visits/person/year as the result of proximity of registered population for follow-up visits)[1]. On the contrary, the hospitalization rate of DM patients registered to other hospitals were 3.8 times than those registered to Rajavithi Hospital (98.59 vs. 25.85 per 1,000)[6]. The avoidable hospitalization rate for Rajavithi main registration was nearly stable over five years, similar to the admissions at other hospitals. The admission rate in male was slightly higher than in female (but not significant different). The hospitalization rate in age 0-14 years was the highest while the rate among age 49 to 59 was the lowest. So this was similar to the previous study among Medicare beneficiaries, which suggested the need for improved outpatient care provider service to reduce the impact of co-morbidity on unnecessary hospitalization[9]. The patients who have co-morbidity or related diseases will have more admissions when compared to those who have no related disease, the same as the previous studies[6]. And also the study of Medicare fee-for-service beneficiaries in the United State showed that patients with four or more chronic conditions were 99 times more likely than a beneficiary without any chronic conditions to experienced unnecessary admissions[8].

Diabetes is chronic disease that can cause more related disease if the patients do not comply with quality of care or lack of patient education, so the present study included the admissions of DM related disease. The admission of chronic renal failure (N18.9) had increased between fiscal year 2007 and 2011. It is notable that most cases with DM related diseases (e.g., chronic renal failure and dyspepsia) were admitted at other hospitals rather than at Rajavithi Hospital because the limited capacity of inpatient service at the referral hospital.

LOS in DM admission at Rajavithi Hospital was 1.25 times longer than at other hospitals in DM and related conditions (5 [IQR 2-8] vs. 4 [IQR 2-6] days). The admissions at other hospitals for the UC patients were still at government hospital under MOPH. LOS in the MOPH hospital was closely equal to the UHOSNET hospital (2 to 4 vs. 4 days by median). This was the same as the other study that community hospitals were the main health providers for

hospitalization of the adult population in all schemes in Thailand[11]. This can be explained that lower level hospitals provide service for common health problems with lower severity and less complicated treatment.

The present study was done in only single site, so it could not represent the trend of DM hospitalization by ACSC indicator in order to monitor the quality of ambulatory care service. This was a cross sectional study that underestimated the rate of ACSC. The study of hospitalization by ACSC at the tertiary hospital suggests that we should follow the admissions that occurred at other hospitals in order to reflect the real ACSC rate, or the real quality of service provided at that hospital (as there could be a 21% increase of ACSC). In addition, if the study selected ACSC condition that mostly resulted in chronic conditions, then, it is important to consider including related conditions to the selected condition. It is expected that the present study can be used for ACSC study as the indicators were in the context of tertiary hospital in urban area.

Diabetes is chronic disease that can be provided ambulatory service in all level of hospitals such as community, general, and regional hospital. The understanding of health system and capacity of providing efficiency health service can improve this problem.

Conclusion

The trend of avoidable hospitalization by ACSC in diabetes condition was stable in UC patients registered to Rajavithi Hospital as main contractor. Further study should investigate reasons to improve quality of ambulatory care to reduce ACSC and to promote continuity of service for those who prefer to seek service at another hospital. Therefore, they should be admitted at their main contractor hospital.

What is already known on this topic?

Diabetes hospitalization rate can be used as an indicator to assess quality of ambulatory care. Underlying ill health was associated with increased rates of potentially avoidable hospitalization. The hospitalizations in older age and multiple co-morbid patients were high.

What this study adds?

This study added that hospitalization data from other hospitals could contribute to a 29% increase in estimating ACSC rate. The number of admissions could contribute to a 13% increase in estimating ACSC

rate. However, diabetes related condition data could contribute to only a 2% increase.

Potential conflicts of interest

None.

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การศึกษาการเข้านอนโรงพยาบาลด้วยตัวชี้วัดที่ไม่เหมาะสมในโรคเบาหวานในโรงพยาบาลรับส่งต่อ กรุงเทพฯ, ประเทศไทย: การศึกษาภาคตัดขวางระยะเวลา 5 ปี

วีณา พร้อมประเสริฐ, นิลวรรณ อยู่ภักดี, ศุกสิทธิ์ พรรณารุโณทัย

ภูมิหลัง: ผู้ป่วยสิทธิประกันสุขภาพมีสัดส่วนสูงที่สุดในประชากรของประเทศไทย (76.3%) โรคเบาหวานเป็นโรคที่พบมากในคลินิกผู้ป่วยนอกในโรงพยาบาลส่วนใหญ่ โรงพยาบาลราชวิถีเป็นโรงพยาบาลรับส่งต่อขนาดใหญ่แห่งหนึ่งในกรุงเทพฯ การศึกษาครั้งนี้จึงมุ่งศึกษาอัตราการเข้านอนโรงพยาบาลด้วยตัวชี้วัดที่ไม่เหมาะสมในโรคเบาหวานและโรคที่เกี่ยวข้องในโรงพยาบาลแห่งนี้

วัตถุประสงค์: เพื่อศึกษาแนวโน้มอัตราการเข้านอนโรงพยาบาลด้วยตัวชี้วัดที่ไม่เหมาะสมในโรคเบาหวานและโรคที่เกี่ยวข้องในผู้ป่วยสิทธิประกันสุขภาพเฉพาะที่ลงทะเบียนที่โรงพยาบาลราชวิถี

วัสดุและวิธีการ: การศึกษาภาคตัดขวางระหว่างปีงบประมาณ พ.ศ. 2550-2554 ข้อมูลที่ใช้วิเคราะห์ได้จากข้อมูลอิเล็กทรอนิกส์ผู้ป่วยนอก โรงพยาบาลราชวิถี และข้อมูลอิเล็กทรอนิกส์ผู้ป่วยในของสำนักงานหลักประกันสุขภาพแห่งชาติ (สปสช.) การคัดเลือกข้อมูลการนอนโรงพยาบาลพิจารณาจากการวินิจฉัยหลักโดยใช้รหัส ICD-10 การคำนวณอัตราการเข้านอนโรงพยาบาลคือ จำนวนผู้ป่วยที่เข้านอนโรงพยาบาลด้วยโรคเบาหวานและโรคที่เกี่ยวข้อง/จำนวนผู้ป่วยนอกโรคเบาหวาน สิทธิประกันสุขภาพเฉพาะที่ลงทะเบียนที่โรงพยาบาลราชวิถี x 1,000

ผลการศึกษา: อัตราการเข้านอนโรงพยาบาลในผู้ป่วยเบาหวานสิทธิประกันสุขภาพเฉพาะที่ลงทะเบียนที่โรงพยาบาลราชวิถีมีค่าเฉลี่ย 29.39 ต่อ 1,000 ประชากร ระยะเวลานอนโรงพยาบาลเฉลี่ยในโรงพยาบาลราชวิถี 7.3 วัน และในโรงพยาบาลอื่น ๆ มีค่าเฉลี่ย 4.7 วัน การเข้านอนโรงพยาบาลด้วยโรคที่เกี่ยวข้องกับเบาหวานพบเฉพาะในโรงพยาบาลอื่น ๆ อัตราการเข้านอนโรงพยาบาลจากโรคเบาหวานพบในช่วงอายุ 0-14 ปี สูงที่สุด และในเพศชายมีอัตราการเข้านอนโรงพยาบาลสูงกว่าในเพศหญิง (3.27 และ 25.60 ต่อ 1,000 ประชากร, p = 0.005)

สรุป: อัตราการเข้านอนโรงพยาบาลด้วยตัวชี้วัดที่ไม่เหมาะสมในโรคเบาหวานในผู้ป่วยสิทธิประกันสุขภาพเฉพาะที่ลงทะเบียนที่โรงพยาบาลราชวิถีมีค่าคงที่ในช่วงระยะเวลา 5 ปี การศึกษาอัตราการเข้านอนโรงพยาบาลด้วยตัวชี้วัดที่ไม่เหมาะสมควรติดตามผู้ป่วยกรณีการเข้านอนโรงพยาบาลด้วยโรคที่เกี่ยวข้องกับโรคสาเหตุหลักและการเข้านอนโรงพยาบาลที่อื่น ๆ ด้วยเพื่อศึกษาสาเหตุของการเข้านอนโรงพยาบาลด้วยตัวชี้วัดที่ไม่เหมาะสมต่อไป