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Impact of SARS on healthcare utilization by disease categories: Implications for delivery of healthcare services

Tsung-Hsueh Lu [a,*], Yiing-Jenq Chou [b], Chien-Shian Liou [c]

[a] *Institute of Public Health, College of Medicine, National Cheng Kung University, No. 1, Dah Hsueh Road, Tainan 701, Taiwan*
[b] *Department of Social Medicine, College of Medicine, National Yang Ming University, Taipei, Taiwan*
[c] *Department of Health, Taipei, Taiwan*

Abstract

Objective: To assess the impact of the SARS epidemics in Taiwan on ambulatory care and inpatient utilization by disease categories and accreditation levels of hospital.

Methods: The National Health Insurance claims data of Taipei were analyzed. We calculated the changes in utilization between June 2002 and June 2003 to estimate the impact that SARS had on utilization.

Results: The top three disease categories with the most significant drop in utilization were gastroenteritis (−53%), acute bronchitis (−45%), and tonsillitis (−40%) in ambulatory care and acute bronchitis (−82%), gastroenteritis (−72%), and pneumonia (−64%) in inpatient care. On the other hand, the disease categories with the smallest reduction were allergic reactions (−4%), skin infections (−6%), and anxiety (−10%) in ambulatory care and respiratory failure (+40%), delivery (−2%), and fractures of lower limbs (−5%) in inpatient care.

Conclusions: Disease categories could be classified into three groups according to the extent of change in utilization during the SARS outbreaks. Diseases with a prominent reduction were respiratory diseases, minor problems, and elective procedures. Diseases with a moderate reduction were mainly chronic diseases. Diseases with a limited reduction were acute conditions, difficult mental disorders, or procedures that could not be postponed. The utilization of some diseases shifted significantly from medical centers to district hospitals or clinics.

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1. Introduction

One important factor that affects whether a patients seeks medical advice is that the relative benefits outweight the costs [1,2]. During the severe acute respiratory syndrome (SARS) epidemic (from February to July 2003), one of the costs of going to the doctor (especially doctors in hospitals) was the risk of being infected or stigmatized with SARS. Studies have revealed that a large decrease in healthcare utilization occurred during the SARS epidemics [3–8]. Nonetheless, little is known about whether this reduction in

* Corresponding author. Tel.: +886 6 2353535x5567;
fax: +886 6 2359033.

E-mail address: robertlu@mail.ncku.edu.tw (T.-H. Lu).

utilization was the same of different across different disease categories.

For some diseases, patients perceived that the benefits of going to the doctor outweighed the costs and therefore the utilization did not reduce significantly during the SARS epidemics. On the other hand, for some diseases with significant reduction in utilization, patients might have perceived that the costs of going to the doctor outweighted the benefits. The SARS epidemics provided us with an opportunity to examine patients' perceptions of "necessary" utilization, according to certain disease categories. The aim of this study was to assess if there were variations in outpatient and inpatient utilization by disease categories and levels of hospital accreditation during the SARS epidemic, using National Health Insurance (NHI) claims data.

2. Methods

2.1. Data

The analysis of claims data was confined to Taipei only. Taipei is the capital of Taiwan with a population of 2.6 million people. It was the most seriously affected region during the SARS epidemics in Taiwan. All claims directed to the Taipei branch of Bureau of NHI between June 2002 and 2003 regarding ambulatory care and inpatients were included in this study. To protect the privacy of individual patients, only the aggregate figures were provided by the Bureau of NHI. Variables in the tabulated aggregate figures included service type (outpatient versus inpatient), month of utilization, diagnosis, and accreditation level (academic medical centers, regional hospitals, district hospitals and clinics).

2.2. Grouping of disease categories

Three diagnoses were listed in ambulatory care claims and five diagnoses were listed in inpatient claims. ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification) codes were used for both ambulatory care and inpatient claims [9]. To group the visits by disease categories, Clinical Classification Software (CCS) was used. The CCS grouping scheme, which was composed of 260

mutually exclusive disease categories, was developed by the Agency for Healthcare Research and Quality (AHRQ) for the Healthcare Cost and Utilization Project (HCUP). CCS categories are revised regularly in response to ICD-9-CM annual changes, and the entire CCS can be downloaded for free from the Internet [10]. CCS has proven to be a good classification scheme for casemix adjustment [11] and for utilization studies [12]. One special feature of the CCS grouping scheme is that diseases with a similar etiology across organ system chapters are combined [13].

For inpatient claims, licenced nosologists coded the main diagnoses and sub-diagnoses from each hospital. We used the main diagnoses to attribute each inpatient utilization into one of the CCS categories. Identifying the main diagnoses in NHI ambulatory care claims is not required in Taiwan because it is too difficult to identify a single diagnosis for each visit, especially with elderly individuals who suffer from multiple comorbidities. Therefore, we took into account all three diagnoses listed in ambulatory care claims.

2.3. Analysis

There are 260 disease categories in the CCS grouping scheme. We confined our analysis to the 25 disease categories that are utilized the most. This correlated to more than 90,000 ambulatory care visits per month and more than 600 inpatient admissions per month. We used the number of utilizations in 2002 as a reference to calculate the percentage of change between 2002 and 2003 by disease categories, and therefore the impact of the SARS epidemic.

3. Results

3.1. Changes in ambulatory care utilization according to disease categories

Five disease categories were noted to change the most significantly across the study period (from −35% to −53%). Three of the categories were respiratory diseases (i.e., acute bronchitis, tonsillitis, and upper respiratory infections) and the other two were digestive diseases (i.e., gastroenteritis and other gastrointestinal disorders). The pattern was very similar at different accreditation levels. Nonetheless, the reduction was

Table 1
Percentage of change (%) between June 2002 and June 2003 in outpatient utilization during SARS epidemics by disease categories based on National Health Insurance claims data, Taipei

CCS[a]	Diagnosis	Total (%)	Medical centers (%)	Regional hospitals (%)	District hospitals (%)	Clinics (%)
154	Non-infectious gastroenteritis	−53[b]	−74[b]	−67[b]	−65[b]	−46[b]
125	Acute bronchitis	−45[b]	−76[b]	−71[b]	−47[b]	−39[b]
124	Acute and chronic tonsillitis	−40[b]	−63[b]	−60[b]	−60[b]	−37[b]
126	Other upper respiratory infections	−40[b]	−66[b]	−64[b]	−59[b]	−37[b]
141	Other disorders of stomach and duodenum	−35[b]	−47	−45	−32	−22[b]
139	Gastroduodenal ulcer (except hemorrhage)	−33	−47	−41	−24	−10
99	Hypertension	−33	−57	−38	−17	−7
134	Other upper respiratory disease	−32	−61	−55[b]	−36[b]	−11
101	Coronary atherosclerosis and other heart disease	−28	−36	−35	−7[c]	−5
155	Other gastrointestinal disorders	−26	−45	−39	−15	−17
203	Osteoarthritis	−26	−42	−38	−20	+2
140	Gastritis and duodenitis	−26	−65	−48	−26	−14
49	Diabetes mellitus without complication	−24	−34[c]	−38	−12[c]	+7
205	Back problems	−21	−47	−42	−25	−3
93	Conditions associated with dizziness or vertigo	−19	−46	−38	−28	+3
168	Inflammatory diseases of female pelvic organs	−19	−60	−44	−30	−6
98	Essential hypertension	−17	−28[c]	−29[c]	−13[c]	+7
90	Inflammation, infection of eye	−17	−55	−48	−24	−5
53	Disorders of lipid metabolism	−17	−24[c]	−30[c]	−13[c]	+12[c]
211	Other connective tissue disease	−13	−48	−35	−18	+11[c]
200	Other skin disorders	−10[c]	−66[b]	−46	−32	+7
72	Anxiety and personality disorders	−10[c]	−30[c]	−20[c]	+1[c]	+32[c]
197	Skin and subcutaneous tissue infections	−9[c]	−46	−27[c]	−14	+1
259	Residual codes, unclassified	−6[c]	−29[c]	−27[c]	0[c]	+22[c]
253	Allergic reactions	−4[c]	−41	−39	−21	+10[c]

[a] Detail ICD-9-CM codes of each Clinical Classification Software (CCS) were accessible from http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp.

[b] Five disease categories with the most significant changes.

[c] Five disease categories with the least significant changes.

more prominent in medical centers than in clinics (Table 1).

The pattern of disease categories with the least significant change in ambulatory care utilization was not as consistent according to accreditation level. The disease category that was most consistent across all levels of health facilities was anxiety. For some disease categories (e.g., connective tissue disease, skin disorders, skin infections and allergic reactions), a prominent decrease change was found only in medical centers, but an increase change was noted in clinics. There were 10 disease categories that actually increased in use in clinics. The changes in chronic diseases were moderate, with a reduction of 33% in hypertension, 22% in coronary heart diseases, 26% in osteoarthritis, 24% in diabetes mellitus and 17% in disorders of lipid metabolism (Table 1).

3.2. Changes in inpatient utilization according to disease categories

Generally, the reduction in utilization of healthcare services was greater for inpatients than in ambulatory care. Only two of the top five disease categories that demonstrated the greatest reduction in utilization (from −52% to −82%) were respiratory diseases (i.e., acute bronchitis and pneumonia). The other three categories were gastroenteritis, back problems and coronary heart disease. The pattern and the extent of change was very similar across different accreditation levels (Table 2).

Respiratory failure was the only disease category that demonstrated a consistent increase across all levels of hospitals. The pattern of changes across accreditation level were not very consistent for the other four disease categories with the least significant change in

Table 2
Percentage of change (%) between June 2002 and June 2003 in inpatient utilization during SARS epidemics by disease categories based on National Health Insurance claims data, Taipei

CCS[a]	Diagnosis	Total (%)	Medical centers (%)	Regional hospitals (%)	District hospitals (%)
125	Acute bronchitis	−82[b]	−85[b]	−85[b]	−70[b]
154	Non-infectious gastroenteritis	−72[b]	−72[b]	−76[b]	−62[b]
122	Pneumonia	−64[b]	−64[b]	−66[b]	−60[b]
205	Back problems	−61[b]	−67[b]	−62[b]	−49[b]
101	Coronary atherosclerosis and other heart disease	−52[b]	−56	−55[b]	−20
143	Abdominal hernia	−50	−56	−53	−22
127	Chronic obstructive pulmonary disease	−50	−45	−51	−53[b]
231	Other fractures	−49	−61	−47	−31
160	Calculus of urinary tract	−47	−47	−54	−24
197	Skin and subcutaneous tissue infections	−39	−43	−45	−22
50	Diabetes mellitus with complications	−39	−43	−41	−24
16	Cancer of liver and intrahepatic bile duct	−37	−42	−33	−15
149	Biliary tract disease	−35	−41	−33	−20
153	Gastrointestinal hemorrhage	−33	−38	−34	−24
233	Intracranial injury	−31	−38	−35	−17
159	Urinary tract infections	−28	−21	−35	−17
110	Cerebral infarction	−27	−30	−27	−14
69	Affective disorders	−21	−41	−19[c]	−3
189	Previous C-section	−13	−49	−33	−5
45	Maintenance chemotherapy, radiotherapy	−10	−17[c]	−1[c]	+48[c]
70	Schizophrenia and related disorders	−9[c]	−23[c]	−7[c]	−10
229	Fracture of upper limb	−9[c]	−4[c]	−22	+7[c]
230	Fracture of lower limb	−5[c]	−18[c]	−16[c]	+36[c]
196	Normal pregnancy and/or delivery	−2[c]	−62[b]	−22	−1[c]
131	Respiratory failure	+40[c]	+42[c]	+17[c]	+49[c]

[a] Detail ICD-9-CM codes of each Clinical Classification Software (CCS) could be download from http://www.ahrq.gov/data/hucup/ccs.html.
[b] Five disease categories with the most significant changes.
[c] Five disease categories with the least significant changes.

inpatient utilization. A moderate decrease (−17% and −18%) was found for maintenance chemotherapy or radiotherapy and fracture of lower limb in medical centers, but a significant increase change (+48% and +36%) was found in district hospitals. We also noted a prominent decrease (−62%) in delivery in medical centers, but no such decrease (−1%) in district hospitals (Table 2).

Table 3 summarizes these above findings. The disease categories are classified into three groups

Table 3
Classification of disease categories according to the extent of reduction in utilization during this SARS epidemics in Taipei

Types of disease categories	Example
1. Prominent reduction in utilization	
1.1. Respiratory diseases	Acute bronchitis, upper respiratory infection
1.2. Minor problems	Gastrointestinal disorders, back pain
1.3. Elective procedures	Screening for suspected conditions
2. Moderate reduction in utilization	Chronic diseases such as diabetes mellitus, hypertension, lipid disorder, osteoarthritis
3. Limited reduction in utilization	
3.1. Acute conditions	Respiratory failure, fracture of extremities, allergic reactions, skin infection
3.2. Difficult mental disorders	Schizophrenia, anxiety
3.3. Procedures that could not be postponed	Maintenance chemotherapy or radiotherapy, delivery

according to the extent of change (i.e., prominent, moderate, and limited decrease) in utilization during the SARS outbreak period.

4. Discussion

Our findings indicate that the disease categories with prominent reductions in utilization were respiratory diseases (e.g., acute bronchitis or upper respiratory diseases), minor problems (e.g., gastroenteritis or back problems) and elective procedures (e.g., screening for suspected conditions). The disease categories with moderate reductions were mainly chronic diseases (e.g., diabetes mellitus, hypertension, lipid disorders, or osteoarthritis). The disease categories with limited changes were acute conditions (e.g., respiratory failure, fracture of extremities, or allergic reaction), difficult mental disorders (e.g., schizophrenia or anxiety), and procedures that could not be postponed (e.g., maintenance chemotherapy or delivery). Some disease categories (e.g., anxiety, skin disorders, allergic reactions, maintenance chemotherapy, fracture of lower limb, or delivery) had a significant shift in utilization from medical centers and regional hospitals to district hospitals or clinics.

4.1. Disease categories with prominent reductions

As expected, a wide array of respiratory diseases showed a significant change in utilization because SARS itself is also a respiratory disease. The risk of being infected or stigmatized with SARS was higher when going to the hospitals for respiratory problems, compared to other health problems. This reduction in utilization for respiratory diseases existed at all levels of health facilities.

Minor problems and elective procedures were the other disease categories showing significant decrease in utilization during the SARS outbreak period. Previous studies have indicated the phenomenon of "doctor shopping" and "over-consumption" of healthcare services in ambulatory care in Hong Kong and Taiwan, compared to the ecology of medical care in western countries [14–16]. It is very difficult to determine what kind of utilizations were "necessary" and which were "unnecessary". The percentage decrease in utilization during the outbreak of SARS gives us a possible proxy estimation of the "unnecessary" utilizations, at least from the perspective of patients themselves. A similar example was the reduction in the rates of elective caesarean section delivery during the ghost months (lunar July) in Taiwan [17].

4.2. Disease categories with moderate reductions

For patients with chronic diseases, it appears that there are opposing forces that determine whether to go or not to go to hospital. On the one hand, the characteristic stability chronic diseases makes patients with chronic diseases less likely to go to hospital. On the other hand, most patients with chronic diseases need regular medications. To solve this dilemma, many hospitals provided a medication mailing service for patients with chronic diseases. We therefore found a moderate decrease in utilization by patients with chronic diseases.

It was highly possible that the continuity of regular medications or treatments for chronic diseases were interrupted during the SARS epidemics because the patients were fearful of going to hospitals. To the best of our knowledge, no study has yet assessed the impact of the SARS outbreak on health outcomes (instead of utilization of healthcare services) in chronic diseases. Indirect evidence of this negative impact is represented by the reduction in notification of tuberculosis in Hong Kong during the SARS epidemics. This resulted in delay of treatment and increased transmission of the disease [18].

4.3. Disease categories with limited reductions

For many acute conditions, necessary procedures or difficult mental disorders, the benefits of going to the hospitals were certainly outweighed by the risk of being infected or stigmatized with SARS. Furthermore, there is little evidence that examines whether the quality of care of these patients with perceived "necessary" diseases were adversely affected during the SARS epidemics. To avoid infection with SARS, healthcare workers would see patients less frequently were reluctant to partake in aggressive treatments, such as suction of sputum or using mechanical ventilation. An indirect indication of the poor quality of care was the increased number of admissions due to respiratory failure in all levels of health facilities. Further studies

are needed to examine the hospital mortality of these "necessary" diseases.

4.4. Shift of utilization across accreditation levels

Our findings suggest that patients with conditions from certain disease categories originally went to medical centers for treatment, but opted for clinics during the SARS epidemics. Previous studies have already demonstrated the shift from medical centers or regional hospitals to district hospitals or clinics for childbirth during the SARS outbreaks [7]. Our study added more disease categories with shifts in utilization across accreditation levels such as connective tissue disease, skin disorders, anxiety, allergic reactions in ambulatory care and maintenance chemotherapy or radiotherapy, and fracture of lower limbs.

Patients perceived that it was "necessary" to seek healthcare for these diseases. The second question bothering patients was whether to go to medical centers or to go to nearby clinics. The decision of where to go was based on the patients' perceived capability of providers, and the sophistication of the equipment required by various levels of healthcare facilities in treating these specific diseases. It has long been criticized that the demand on outpatient services in medical centers and regional hospitals in Taiwan is too high [16]. The degree of shift in utilization behaviour from medical centers to clinics during the SARS epidemics might also provide a surrogate measure of this problem.

4.5. Limitation of this study

The first limitation of this study is that changes in specific CCS categories may be due to coexisting CCS categories in the ambulatory care claims. We thought this might not result in serious biases because of the compensatory effects of coexisting CCS categories. Secondly, because the ICD-9-CM codes in outpatient claims were given by physicians, there might be human errors in coding. Additionally, given that we used the utilization data from 2002 as a reference, it was unlikely that coding errors would differ within 1 year. Thirdly, because we confined our analysis to the 25 most utilized CCS categories, we therefore lost information on changes in utilization amongst many of the other less common CCS categories. Fourthly, a further analyses

including age and sex would provide more useful information still on the patients' perception of necessary and unnecessary healthcare utilization. Fifthly, there were variations in severity of disease within the same category.

4.6. Implications for delivery of healthcare services

Like a natural experiment, the impact of the SARS outbreaks provided us with an opportunity to examine patients' perception of their "necessity" of healthcare-seeking behaviour for various kind of diseases. As indicated by Sharpe and Faden, the evaluative nature of the concept of appropriateness in patient care could be distinguished by individual patient, clinical, and societal points of view [19]. In this study, we touched somewhat on the patients' aggregate expressions of the value of necessity of going to see a doctor. However, we do not know whether these changes in healthcare utilization will result in short-term or even long-term adverse effects on health outcomes, from clinical and epidemiological points of view.

With respect to the problem of high utilization of ambulatory care services in medical centers in Taiwan, policy makers of healthcare services and delivery should take into consideration these shifts in utilization from medical centers to clinics for certain diseases categories during the SARS epidemics. To persuade patients to shift from seeking healthcare in medical centers to clinics, we should first improve the quality of healthcare provided in those clinics. To set up a coordinated system integrating medical centers and clinics is of paramount importance in solving this problem.

The third implication address the preparedness of the healthcare delivery system to confront a pandemic infectious outbreak. Preparedness should not focus solely on the response to treatment of infectious diseases, but also on ensuring access to high quality health care for non-infectious diseases. For example, to maintain medical treatment of various chronic diseases, the NHI allowed hospitals to mail medications to patients at home. Special attention should be paid to maintaining quality of care for acute conditions or severe diseases in the hospital during these epidemics.

Acknowledgements

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