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Implementation and Outcome of Taiwan Diagnosis-Related Group (DRG) Payment System

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Implementation and Outcome of Taiwan Diagnosis-Related Group (DRG) Payment System

by

Jhih-Jhong Wu

Georgia State University

**Capstone Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the Requirements for the Degree**

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It is an amazing experience to work on research that is so interdisciplinary. As a primary health worker in Taiwan, I was eager to do something that could really help the people, health workers and the healthcare environment as a whole in my country.

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Implementation and Outcome of Taiwan Diagnosis-Related Group (DRG) Payments System

by

Jhih-Jhong,Wu

Approved:

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Committee Chair

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Committee Member

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Abstract

The diagnosis-related groups (DRGs) payment system was established in the 1960s. Details of DRG-based payment system vary by country. The Diagnosis-Related Group payments system in Taiwan (Tw-DRG) was established in 2009 in order to contain medical costs and enhance medical efficiency under a universal coverage, single-payment insurance system: National Health Insurance (NHI). This capstone reviews the study literature about the history of DRGs payment system establishment, processes of medical reform, as well as the implementation and outcomes of Tw-DRGS. According to the studies reviewed there were changes of medical behaviors after the implementation of Tw-DRGs which included an increase of medical efficiency and an slightly declining intensity of care which are indicated by the number of order for medication, diagnosis and treatment during hospitalization. No significant change was found in patient health outcomes. The financial impacts on different levels of hospitals, departments or specific clinical items varied. Generally, the profitability was negatively impacted. Another potential problem noted concerns the disease severity and explanatory power of Tw-DRGs. Higher illness severity was related to more medical resource utilization. Due to the lower explanatory power of Tw-DRGs, there exists a lack of accounting for illness severity could lead to cost shifting or patient dumping.

Introduction

The Diagnosis-Related Group payments system in Taiwan (Tw-DRG) was established in 2009, with the intention of cost containment and enhancement of medical efficiency within a single-payment, universal coverage insurance system. The purpose of this capstone is to review existing literature in order to establish the outcomes of implement ting the Tw-DRG.

The organization is as follows: first, a literature review details the history of DRGs payment system establishment in the U.S. and other countries. The second section details the processes of medical reform and implementation of DRGs in Taiwan. The third section discusses the outcomes of Tw-DRGs implementation by reviewing recent studies in Taiwan and compares the results to studies of DRGs-based payment system in other countries.

There are many differences between DRG-based payments according to country. Taiwan has a national health insurance system (NHI) that is a single payer system. Learning about the outcomes of DRGs implementation in Taiwan could influence future healthcare reform in the United States and other countries.

Background Information

Establishment and implementation of DRGs in the United States

Robert B. Fetter, PhD of the School of Management, and John D. Thompson, MPH of the School of Public Health, first established the diagnosis-related groups (DRGs) payment system in the1960s at Yale University. DRGs were established: (1) to control the rising cost of the Medicare program; (2) to bolster hospital management; (3) to improve work efficiency; (4) to reduce unnecessary length of stay (LOS); (5) to promote usage efficiency of medical resources (manpower and equipment) cost. These changes would ideally put an emphasis on physicians' team work in order to prevent unnecessary tests and services, increase health care efficiency, avoiding excessive treatment behavior, premised on maintaining quality of medical services (Chang, 1984).

Fetter and Thompson used AUTOGRP computer programs to analyze patient information from 18 Connecticut hospitals. Collecting data from approximately 500,000 cases, the team then grouped diagnoses of similar patients, based on statistical analyses of clinical conditions and decisions made by doctors. This was the first step in forming the major diagnostic categories (MDCs) which were to collapse the numbers of diagnostic codes into meaningful, but broad, sub-groups, with 83 MDCs in the original DRGs version. Then, they analyzed the diagnostic group data on factors such as meaningfulness of diagnostic decisions making, medical spending homogeneity and variability. They also took into

consideration factors such as LOS, age, sex, surgical situation, treatment complications, et al.

Adjusting for analyzing through these factors, Fetter and Thompson's classification system of

Diagnosis-Related Groups (DRGs) emerged as patient classification system to relate types of

cases with costs incurred by medical facilities.

U.S. Medical costs skyrocketed in the 1980s, states and the medical industry were eager

to devise new payment methods for effectively controlling runaway growth (Cheng, et al.,

2012; W. C. Hsiao, et al., 1986). During the same period New Jersey replaced the Standard

Hospital Accounting and Rate Evaluation (SHARE) system with a DRG-based prospective

all-payer system for inpatient reimbursement (W C Hsiao, et al., 1986; May, 1984). Hospitals

were phased into this system over three years. Prices were fixed in advance for services based

on diagnosis and historic average treatment costs for patients discharged within this system.

Actual medical resource costs were not factored in to the equation. The popularity of DRGs

grew rapidly for two reasons: first, state officials wanted to switch reimbursement from per

diem to case-mix-based payment approach. Second, the Health Care Financing

Administration (HCFA) supported state-managed payment experiments to explore

administrative feasibility of implementing diagnosis-related predetermined reimbursement

(W.C. Hsiao, et al., 1986).

DRGs payment system proved useful as a convenient cost management tool in order to

manage economical growth throughout diagnosis and to utilize a clinical situation

classification system. The public expected the medical and healthcare payment industry to control rising medical costs. In order to address this concern, the federal government made reference to the New Jersey DRG system implementation experience and formally implemented DRGs into Medicare in 1983 (Stern & Epsterin,1985).

The Center for Medicare and Medicaid Services (CMS) established Diagnosis-Related Groups in the Center for Medicare and Medicaid Services CMS-DRGs as the new Medicare Prospective Payment System (PPS). All medical facilities participating in Medicare were covered by the CMS-DRGs with the exception of rehabilitation, psychiatric care, children's hospitals, long term care facilities, and substance abuse treatment units (Yan, 2011). However, there were controversies about the CMS-DRGs. First, CMS-DRGs failed to reflect the disease severity and medical resource utilization situation (Freeman et al, 1995；Averill et al, 1998). Second, the first version of CMS-DRGs was designed mainly for the aged and disabled populations rather than comprehensive coverage of all populations. There were difficulties implementing CMS-DRGs payment system in specific populations: e.g., newborns, substance abuse patients, or those suffering from AIDS (Yan, 2011).

Variant DRGs were designed by diverse organizations: Refined-DRGs (R-DRGs) by Yale University in 1985, All Patient DRGs (AP-DRGs) with cooperation of the New York State Department of Health and 3M Health Information System in 1987, the All-Patient Refined (APR) DRGs by the New Jersey State government in 1988, International Refined

DRGs (IR-DRGs) by 3M Health Information in 2001, and Medicare Severity-Adjusted DRG

(MS-DRGs) by the Center for Medicare & Medicaid Service (CMS) in 2007 (Healthcare

Financial Management, 2008). Currently, Medicare utilizes the MS-DRGs version. It was

designed to improve the impact of disease severity on the medical resource utilization by

adding 207 new DRG coding items and re-dividing each DRG into three different grades of

disease severity: with major complication/comorbidity (MCC), with

complication/comorbidity (CC) and without either (MCC/CC) (Sipkoff, 2008).

DRGs implementation worldwide

Following the United States' example, many countries launched their own DRG-based medical payment systems. France modified the original version of DRGs to develop Groups Homogenes de Malades 1 (GHM1) which was implemented in 1986. In 1992, Australia implemented the Australian National DRGs (AN DRGs) based on their healthcare system. Other European countries like Hungary (1993), Italy (1995), Spain (1997), Denmark (2002), Germany (2003) and England (2003) implemented modified DRGs based payment system (Tseng, 2002). South Korea was the first country in Asia to use DRGs-based payment system to curb rising medical expenditures. Since 1997, Korean health institutions implemented 25 DRGs from selected groups of diseases or medical procedures such as caesarean section, appendectomy and tonsillectomy (Kwon, 2003). In 1998, Japan faced a rapidly aging population and a stagnant economy, in order to address the rising medical costs the Japanese government shifted conventional fee-for-service payment system into a modified case classification with 2,552 groups, the Diagnosis Procedure Combination (DPC) (Shinichi, et al., 2005). To date, over 20 countries have implemented DRG-based payment system in modified form around the world (Bureau of National Health Insurance, 2013; Shinichi, et al., 2005; Kwon, 2003).

Table 1 DRG version around the world

| COURTRY	DRG VERSION
Australia	AR-DRG
Austria	Leistungsbezogene Diagnosis-Fallgruppen(LDF)
Belgium	APR-DRG
Bulgaria	AP-DRG
Canada	CMG
Czech Republic	IR DRG
Denmark	DK-DRG & DAGs
Finland	Nord-DRG
France	GHM, EfP
Germany	G-DRG(AR-DRG)
United Kingdom	HRG
Greece	HCFA-DRG
Hungary	HDG
Iceland	DRG-O & Nord-DRG
Ireland	AR-DRG
Italy	APR-DRG
Japan	DPC
Netherlands	DBC
Norway	Nord-DRG
Poland	Catalogue of Health care products
Portugal	HCFA-DRG
Romania	HCFA-DRG, IR-DRG
Spain	HCFA-DRG
Sweden	Nord-DRG
U.S.	MS DRG

Sources: Forgione et al., 2004; Han, 2010

DRGs payment system in Taiwan

Medical reform and establishment of National Health Insurance

In April 1995 the government inaugurated the National Health Insurance (NHI) program to provide universal basic health services, and improve accessibility to medical care for all citizens. Everyone, excluding convicts, is obligated to pay premiums to the Bureau of National Health Insurance (BNHI) and obtain medical resources with comprehensive uniform benefits package from NHI, a single-payer social insurance program administered by the government.

Figure 1. National Health Insurance system in Taiwan
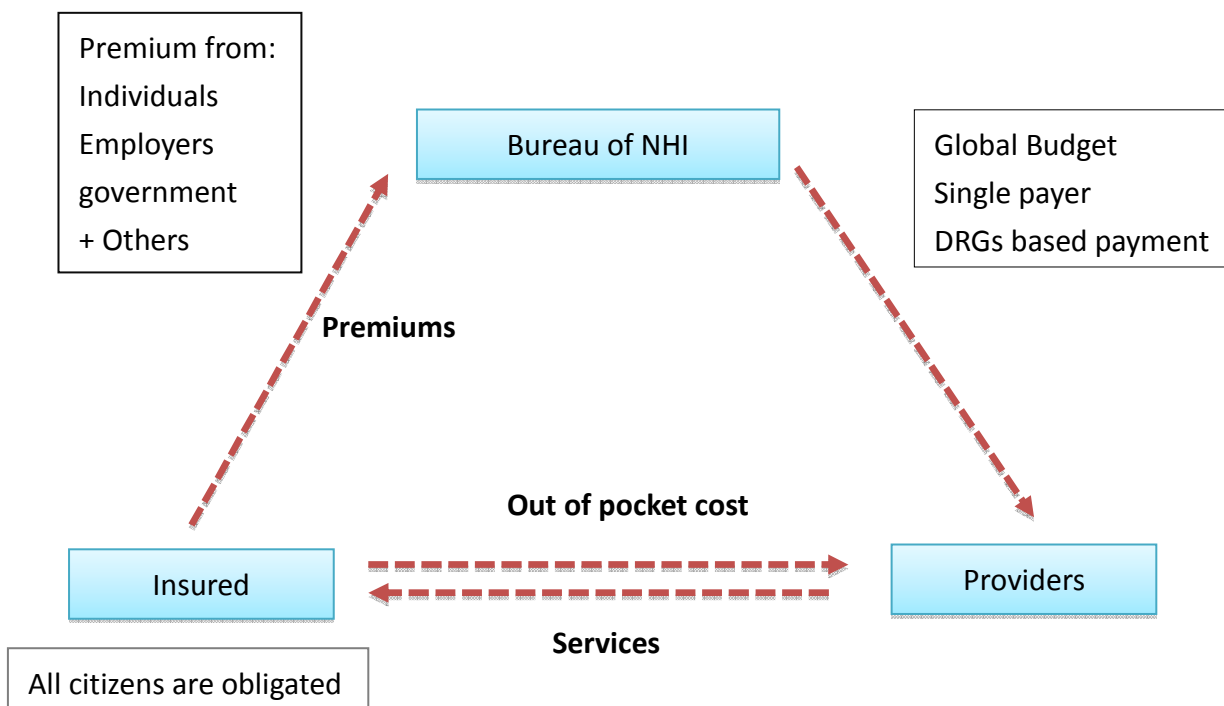
Adapted from Bureau of National Health Insurance 2013

Figure 1 shows BNHI collecting premiums from the insured population. According to original NHI programs, premiums are calculated based on an insured person's regular salary

(Bureau of National Health Insurance, 2013). There is no compulsory referral gatekeeper mechanism. Insured people seek medical service with nearly complete freedom of choice (Bureau of National Health Insurance, 2013; Cheng et al., 2012). BNHI also pays fees to health care facilities based on fee-for-service plans according to 'resource-based points of value' (Chang, 2013). Periodically, the BHNI and medical service providers negotiate the value of each point in the local environment with consideration of local difference. Still, due to extending of coverage, elevating prices, new technology and aging population, revenues of NHI have lagged behind expenses since 1997, the third year after NHI has been launched (Lin, et al, 2006; Tseng, 2012).

By 2009, it was estimated that over 90% of all health care facilities, including medical centers, local hospitals and clinics (the majority of medical treatment, procedures, and even certain preventive services) were covered by NHI (Cheng et al., 2012). To control escalating medical costs, which had become a heavy financial burden on the government, the BNHI introduced strategies like case-payment scheme (Cheng et al., 2012); a Pharmaceutical Benefit Scheme (PBS) (Chang, 2013; Chi-Liang et al., 2008); a copayment increase (Cheng et al., 2012) and global budget program (Cheng et al., 2009; Chen et al., 2007). The global budget program was achieved by reducing unnecessary treatment caused by traditional fee-for-service programs.

However, one study demonstrated that over 90% medical facilities increased care

intensity as a way to enhance revenues under the global budget program of NHI (Cheng,

2009). By 2010, the overall national financial shortfall of NHI had reached NT$101.5 billion.

If nothing changed, it was expected there would be a financial gap of NT$222.2 billion in

2012. These financial gaps led BNHI to decide to implement DRGs payment system in the

NHI program comprehensively (Bureau of National Health Insurance, 2012).

Implementing Tw-DRGs payment system

Since the NHI began in 1995, BNHI implemented a special case-payment scheme,

which reimbursed fixed amount predetermined money for every surgical procedure

performed in-patient: e.g., Caesarean Section, Appendectomy. Coverage under this scheme

had been expanded yearly to cover forty-nine hospitalized and four out-patient services

(Inguinal Herniorrhaphy, Disposal of Pneumonia and Pleurisy, Disposal of Anal Fistula, and

Adnexal Surgery) in 2009 (Tseng, 2012). This could be seen as a prototype of later NHI

payment change, but it drew criticism due to a lack of adjustment mechanism for a patient's

age, sex, and complication/comorbidity (Cheng et al., 2012). From 1998-2002, BNHI

gradually promoted a macro-control medical cost policy in dental reimbursement with several

orientations: global budget payment system, case-payment, and pay-for-performance (Tseng,

2012).

The idea of devising a Taiwanese version of Diagnosis Related Groups (Tw-DRGs) had

been discussed since 2000 (Bureau of National Health Insurance, 2013). BNHI used the 18th

version of the U.S. DRG as foundation, provided by the Center for Medicare and Medicaid

Services (Former Health Care Financing Administration) and negotiated with various medical

experts to design a classification framework reflecting local health care needs (Tseng, 2012).

Figure 2 Tw-DRGs Schematic classifications for In-patient cases
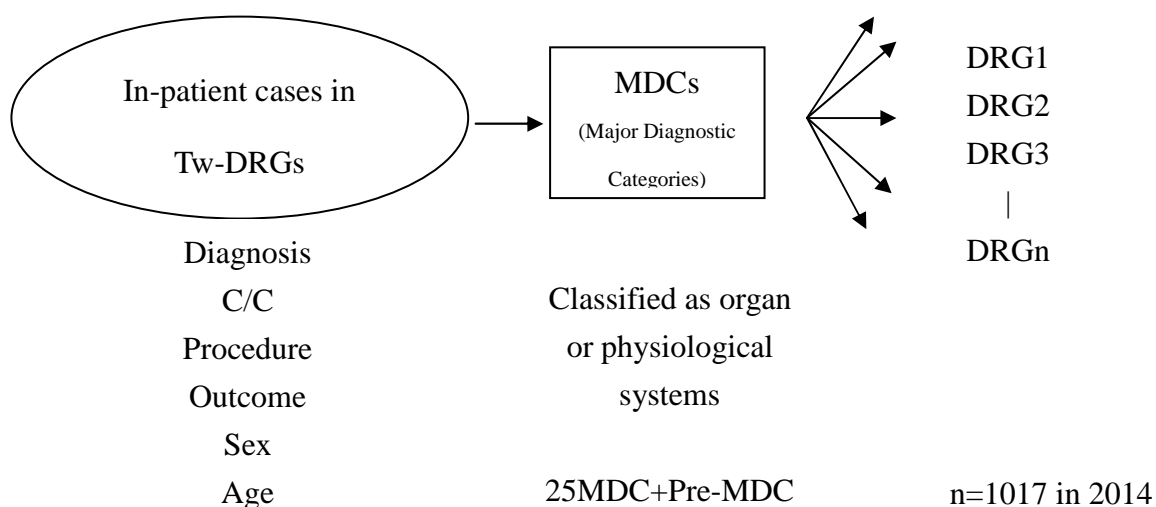
Source: Bureau of National Health Insurance, 2013

As figure 2 shows, each case is categorized based on principal diagnosis, primary

medical procedure, complications, gender, age, and health outcome upon patient discharge

under Tw-DRG program. Medical facilities get roughly the same predetermined

reimbursement point value. BNHI used International Classification of Disease, Ninth

Revision Clinical Modification (ICD-9-CM) and Major Diagnostic Categories (MDC) as

diagnosis coding.

Table 2 shows the MDC schematic classifications for in-patient cases.

Table 2. Major Diagnostic Categories (MDC) in Tw-DRG

MDC	Diseases and disorders of the nervous system
MDC2	Diseases and disorders of the eye
MDC3	Diseases and disorders of the ear, nose, mouth and throat
MDC4	Diseases and disorders of the respiratory system
MDC5	Diseases and disorders of the circulatory system
MDC6	Diseases and disorders of the digestive system
MDC7	Diseases and disorders of the hepatobiliary system and pancreas
MDC8	Diseases and disorders of the musculoskeletal system and the connective tissue
MDC9	Diseases and disorders of the skin, subcutaneous tissue and breast
MDC10	Endocrine, nutritional and metabolic diseases and disorders
MDC11	Diseases and disorders of the kidney and urinary tract
MDC12	Diseases and disorders of the male reproductive system
MDC13	Diseases and disorders of the female reproductive system
MDC14	Pregnancy and the childbirth
MDC15	Newborns and other neonates with conditions originating in the perinatal period
MDC16	Diseases and disorders of the blood and blood forming organs and immunological disorders
MDC17	Myeloproliferative diseases and disorders, and poorly differentiated neoplasms
MDC18	Infectious and parasitic diseases
MDC19	Excluded from Tw-DRG
MDC20	Excluded from Tw-DRG
MDC21	Injuries, poisonings and toxic effects of drugs
MDC22	Burns
MDC23	Factors influencing health status and other contracts with health
MDC24	Multiple significant trauma
Pre-MDC	Heart Transplant
	Liver Transplant
	Bone Marrow Transplant
	Tracheostomy
	Lung Transplant
	Pancreatic Transplant

Source: Bureau of National Health Insurance, 2014

Figure 3 Example of Tw-DRGs payment classification system
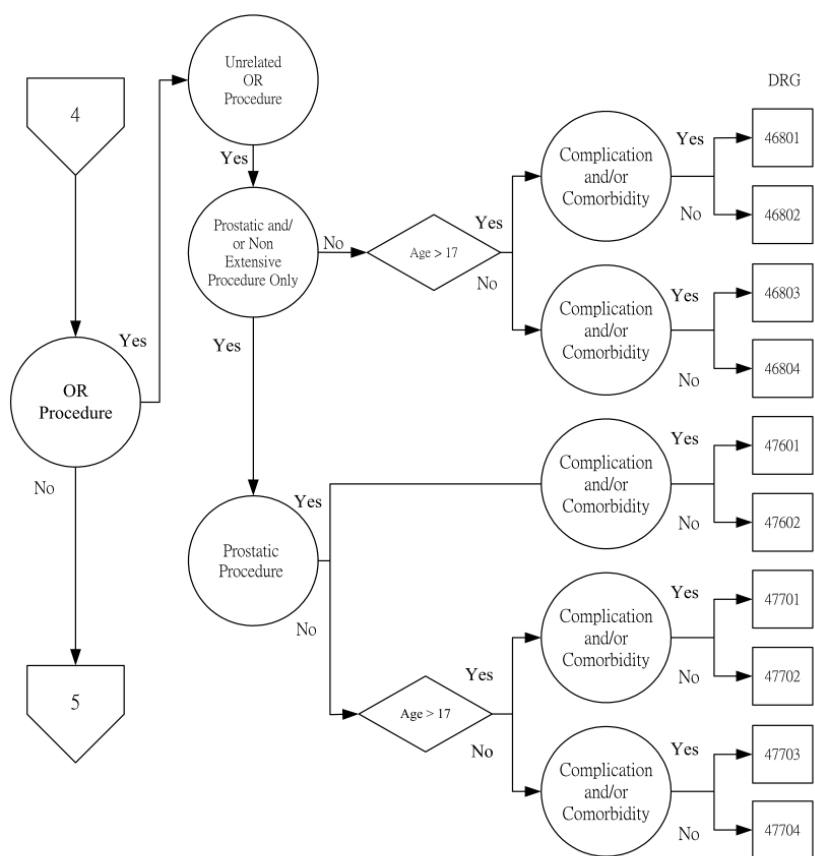
Adapted from Bureau of National Health Insurance, 2013

BNHI believe this system gives medical facilities greater incentive to raise health care

service efficiency, reduce medical resource expenditure and equalize medical resource

distribution (Bureau of National Health Insurance, 2013). At a practical level, BNHI updated

the fee-charging standards for requesting data from the Insurer of National Health Insurance,

and standard of filing fees for The National Health Insurance Certificate. Beginning in

January 2010, BNHI gradually and comprehensively implemented Tw-DRGs, with a total of

1,029 diagnosis-related groups phased in over five years (Bureau of National Health

Insurance, 2013). Table 3 lists the situations that were uncovered by Tw-DRGs.

Table 3. Situation uncovered by Tw-DRGs

DISEASE	DIAGNOSIS CODES
Case of malignant tumors as principal diagnosis	140.XX-176.XX, 179.XX-208.XX, V58.0, V58.1, V67.1, V67.2
Psychiatric case	MDC19, MDC20
Case with diagnosis of AIDS	042
Case of coagulation disorders	286.0-286.3, 286.7
Other rare disease that has been announced by BNHI	
Case in clinical pilot project or study	
Case of hospitalization exceeding 30 day	

Source: Bureau of National Health Insurance, 2011

Outcome of DRG Implementation in Taiwan

Changes of Medical Behaviors and Health Outcome

Earlier studies evaluating how DRGs payment system affects intensity of care proved

less inconclusive in other countries. Some studies suggested the DRGs payment system

reduced the care intensity of medical service providers (Palmer, 1989; Long, 1987). However,

another study showed no significant change in this regard (Cutler 1995). Reducing intensity

of care and LOS could adversely affect patient outcome. One study found mortality slightly

higher after introducing DRGs (Culter, 1995). Another suggested no significant link (Kahn, et

al., 1990, Rogers, et al., 1990). The "intensity of care" or the "service intensity" is a concept

to describe the measurement of complexity, amount, content, or attendant risk of medical

services provided. There is variety of indication about the intensity of care, for example: the

numbers of order for medication, number for orders for treatment or diagnosis, number of

orders for special materials or devices, or the number of inpatient physician visits. (Cheng, et

al., 2012, John et al., 2009)

In Taiwan, one nationwide population-based study selected patients who underwent

coronary artery bypass graft (CABG) or percutaneous transluminal coronary angioplasty

(CTCA) in 2009-2010. The goal was to study the NHI claim database to find out if medical

behaviors and health outcome changed after the implementation of Tw-DRGs for diagnosis

listed in the cardiovascular surgical DRG category (Major Diagnosis Classification [MDC] 5,

Disease and Disorders of the Circulatory system). In this study, cases with CABG or CTCA

procedures incorporated in the Tw-DRG during or after 2010 were considered as the intervention group (10,824 subjects in the pre-DRG period and 10,824 subjects in the post-DRG period) and cases with the similar procedures which are paid by fee-for-service schemes were considered as comparison group (included 28,415 subjects in each of the pre- and post-DRG periods). They used LOS, numbers of medical orders as proxy for intensity of care, the likelihood of ER visits within three days after discharge, the mortality rate with 30 days after discharge, and the 30 days readmission rate as the index for health outcome. The result showed that there was a 10% decrease of LOS and slightly declining intensity of care after implementing Tw-DRGs. Additionally, no significant change of health outcome before or after was found (Cheng, et al., 2012).

Hsiu- Mei Lin studied 514 cases of total knee replacement in a Taiwan medical center from January 2009 through December 2010 in order to compare the outcome of the implementation of Tw-DRGs. She used the data of composition of hospitalization fee and implementation rate of 65% minimum requirement service items as an index of medical behavior; LOS, health insurance hospitalization medical fee, total hospitalization medical fee and Orthopedic outpatient fee after discharge as index of medical efficiency. Additionally, adding the factors of patient safety events, ER visits within 3 days of dismissal, and re-admission within 14 and 30 days after discharge as index of medical quality. She used Logistics Regression and Poisson regression to analyze the data after controlling variations

such as patient characteristics, OPD treatment situation, hospitalization medical behavior and

OPP for TKR material. The result showed that there were medical behavior change and an

increase of medical efficiency after the implementation of Tw-DRGs. There was significant

reduction of hospitalization total fee (2.69%), diagnosis fee, rehabilitation fee, treatment fee,

drug and pharmaceutical service fee. The reduction of the medicine fee was related to the

decrease in usage of antibiotics and an increase usage of local anesthesia compared with the

pre-TW-DRGs situation. OPD fee was increase after the patient discharge (1.43%). The rate

of LOS in less than 7 days increased (OR-2.44), whereas the hospitalization medical fee

reduced 1.023%, and the total hospitalization medical fee (including OPP) reduced by 2.69%.

There was no significant change of hospitalization patient safety events, or patients with

complications and comorbidity rate within the 30 days data after discharging (Lin, 2011).

Kuei-Miao Kuo analyzed a similar issue. She used data regarding patients who received

CABG surgery before the implementation of Tw-DRGs in 2009 (n=109) or after the

implementation in 2010 (n=86) from a "2005 sampling cohort database of 1,000,000

insured's" National Health Insurance Research Database (NHIRD). The results show there

are low levels and insignificant drops of LOS and medical expense after TW-DRG. The cost

shifting phenomena was not detected, and medical care quality did not change after

implementing the TW-DRGs system. However, the researcher herself claimed that one of the

major limitations of this research is the less than representative database "2005 sampling

cohort database of 1,000,000 insured's" (Kao, 2012). There were more than 6,000 cases per year of CABG in Taiwan (Bureau of National Health Insurance, 2010).

This behavioral change by medical service personnel could be explained by economic theory. Cutler claims that medical services tend to reduce resource utilization when faced with zero marginal revenue to yield more benefit.

Financial Impact

Financial influence of DRGs-based payment system proves complex. Chun-Jen Ting used relational database technology and decision trees to analyze the National Health Insurance database from 2000 to 2009, and simulate the impact of implementation of the Tw-DRGs on the pediatric surgery department income. The results showed that after implementation of the Tw-DRGs system, the income of pediatric surgery inpatient department will reduce by NTD$ 90,498,202 (5.3%). According to the analysis, there were only four diseases: hernia (2.4%), appendicitis (4.3%), pyloric obstruction (4.5%) and intussusception (22.8%) that would have increased earnings. Nine congenital malformation diseases reduced profit after the implementation of Tw-DRGs, and four diseases reduced by more than 30%, such as hypospadias (37.7%), bile duct cysts (30.8%), intestinal atresia and stenosis (30.1%) and biliary atresia (30.0%) (Tin, 2010).

Another study shows there was the financial impact varied by hospital. Even in the same hospital, departments feel dissimilar influence: e.g., those associated with acute and serious

disease had more negative financial impact after implementation (Hsueh, 2006). Wei-Ren

Long's research, which focused on a regional hospital, shows that implementation of DRGs

increased the amount of medical benefits while decreasing length of hospitalization and

examination fee. Long also compared financial situations between departments. Orthopedics

saw examination and radiation fees drop by remarkable amounts, surgical benefits got

appreciably higher. In Cardiology, radiation examination fees dipped sharply; while

Obstetrics & Gynecology recorded no significant changes (Long, 2011). Shu-chiao Chien

used the hospital management of 2009, data collected from S non-profit hospital located in

Southern Taiwan to simulate analysis of the financial change before and after the

implementation of TW-DRGs. The result showed the profitability of his philanthropic

hospital decreased 0.44%. The profit margin decreased 0.49%, operating margin in medical

treatment segment decreased 0.03% and the return on net assets (RONA) decreased 0.51%.

Even after reactive policy changes such as improving diagnosis coding, standardizing

treatment disposals, improving hospitalization management, and substituting medicine or

special materials were implemented. These changes were considered as ways to increase the

beneficial effects (Chien, 2010).

Disease Severity and Explanatory power

As previously described, Tw-DRGs system was originally based on CMS-DRGs V18.0.

Horn et al. discussed how the most controversial issue of CMS-DRGs is inaccurate reflection

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of illness severity (Horn et al, 1985). CMS-DRGs' lower explanatory power was due to a lack

of accounting for illness severity, which is associated with resource cost to medical service

providers (Tseng et al., 2006; Rossnagel et al., 2005; Yoneda et al., 2005).

One cross-sectional study in Taiwan probes illness severity's effect on study population

with a diagnosis of cerebrovascular disorders under the Tw-DRGs payment system. The

research used patient medical records and data collected form the National Health Insurance

Research Original Claim Data in 2007: Inpatient expenditures by admissions (NO. SN9602)

and Registry for contracted medical facilities (NO. AN9601). The dependent variables are

defined as medical expenditure and LOS, and the independent variable is the illness severity

(with or with complication/comorbidity). The diagnostic groups (DRG 014), gender and the

age are control variables. There are two main results in this study. First, higher illness

severity means more medical resource utilization of DRG 014. Second, the study shows

explanatory power of medical expenditure in MS-DRGs higher than that in Tw-DRGs under

similar clinical situation. Explanatory power is measured by coefficient of determination (R^2)

of medical expenditures and LOS between each DRGs version. The explanatory power of the

medical expenditure in MS-DRGs is 17.02%, which is higher than that in Tw-DRGs

(10.68%). The explanatory power of MS-DRGs about LOS is 7.71%, which is also higher

than those in Tw-DRGs (5.10%). Table 4 shows the difference between CMS-DRGs and

MS-DRGs. (Yan, 2011)

Table 4. Comparison between CMS-DRGs and MS-DRGs

	CMS-DRG	MS-DRG
Adaptive Object	Medicare	Medicare
Developers	Health Care Financing Administration	Health Care Financing Administration
Development Time	Since 1983	Since 2007
Reference Version	Nil	CMS-DRGs
DRGs quantity	526	745
Complication/comorbidity	Two levels classification With CC Without CC	Three levels classification without CC/MCC with CC With MCC

Source: Han, 2010; Wynn (2008); Quinn (2008); Healthcare Financial Management (2008)

If the DRGs-based payment system fails to reflect medical resource utilization accurately, negative effects can ensue: e.g., cost shifting (Feldstein, 1999; Menke, 1990), DRG Creep (O'Malley et al., 2005), and patient dumping (Rose, 1989).

Conclusion and Suggestions

This capstone has reviewed the development and the major evolution of DRGs-based payment system, the establishment of Tw-DRGs in Taiwan, and recent studies. Taiwan has a single-payer health care system. All people participate in NHI by paying premiums to the Bureau of National Health Insurance and obtain medical resources with comprehensive and uniform benefits package.

According to the studies collected therein, scientific evidence shows that there were changes of medical behaviors such as slightly declining intensity of care, and an increase of medical efficiency after the implementation of Tw-DRGs. No significant patients' health outcome change was found. Implementation of Tw-DRGs exerted variant financial impact on different hospitals and departments. However, the profitability was negatively impacted among the study hospitals. Departments associated with acute and serious disease felt worse financial impact after implementation. The disease severity and explanatory power of Tw-DRGs could be another potential problem. Higher illness severity is related to more medical resource utilization, but the lower explanatory power of Tw-DRGs because of lack of accounting for illness severity could have negative effects such as cost shifting or patient dumping.

For hospital or healthcare providers, some ideas that could have positive effects include improving diagnosis coding, standardizing treatment disposals, or improving hospitalization

management to maintain the profitability and medical quality at the same time. Adequately

increasing the medical efficiency is the key. On the other hand, BNHI should consider

modifying Tw-DRGs by increasing explanatory power to augment financial efficiency, in

order to fit the disease severity. Additionally, taking into account other factors that could

affect the medical financing system such as culture, medical worker quantity and quality is

vital. Although published research does not document the DRG creeps phenomenon

(deliberately up-coding methods to enhance reimbursement). This phenomenon is still

discussed widely by multimedia, forums and conferences. It is suggested that future studies

should focus on the result of this phenomenon.

References

Averill, R. F., Muldoon, J. H., Vertrees J. C., Goldfield, N, I., Mullin, R. L., Fineran, E. C.,

Zhang, M. Z., Steinbeck, B., & Grant, T. (1998). The Evolution of Case Mix Measurement

Using Diagnosis-Related Groups (DRGs). 3M Health Information Systems: Case Mix

Classification and Diagnosis and Procedure Coding Research Reports, pp. 5-98.

Bureau of National Health Insurance. (July 2013) National Health Insurance in Taiwan

2012-2013. Retrieved from

Bureau of National Health Insurance. (2013, July). Multiple payment systems. Retrieved

from http://www.nhi.gov.tw/webdata/webdata.aspx?menu=17&menu_ id=659&

webdata_id=4025&WD_ID=897

Bureau of National Health Insurance. (2013, July). Tw-DRGs 支付方案問答輯-管理面、支

付通則、分類架構(Payment methods Q&A: management, payment and structure issues).

Retrieved from http://www.nhi.gov.tw/Resource/webdata/14697_2_Tw-DRGs%E6% 94%

AF%E4%BB%98%E6%96%B9%E6%A1%88%E5%95%8F%E7%AD%94%E8%BC%AF-

%E7%AE%A1%E7%90%86%E9%9D%A2%E3%80%81%E6%94%AF%E4%BB%98%E9

%80%9A%E5%89%87%E3%80%81%E5%88%86%E9%A1%9E%E6%9E%B6%E6%A7%

8B(102.12.17).pdf

Bureau of National Health Insurance. (2013, July). Tw-DRG 支付分類表(Tw-DRG

payment classification). Retrieved from http://www.nhi.gov.tw/Resource/webdata/ 14762_2_

Tw-DRGs%E5%88%86%E9%A1%9E%E8%A1%A8(102.1.28%20%E8%A1%9B%E7%BD
%B2%E5%81%A5%E4%BF%9D%E5%AD%97%E7%AC%AC1022660027A%E8%99%9
F%E5%85%AC%E5%91%8A)(10201%E9%81%A9%E7%94%A8).pdf

Bureau of National Health Insurance. (2013, July). Tw-DRG 支付分類表(Tw-DRG

payment classification). Retrieved fromhttp://www.nhi.gov.tw/Resource/webdata/ 14762_2_

Tw-DRGs%E5%88%86%E9%A1%9E%E8%A1%A8(102.1.28%20%E8%A1%9B%E7%BD
%B2%E5%81%A5%E4%BF%9D%E5%AD%97%E7%AC%AC1022660027A%E8%99%9
F%E5%85%AC%E5%91%8A)(10201%E9%81%A9%E7%94%A8).pdf

Chang Chin-wen, (1984). Why the United States using the DRG reserve price system?

Hospital. 17, pp. 24-27.

Chang, K. C., & Tseng, M. C.(2003). Costs of acute care of first-ever ischemic stroke in

Taiwan. *Stroke*, 34, pp. 219-21.

Chen FJ, Laditka JN, Laditka SB, Xirasagar S., (2007). Provider's response to global

budgeting in Taiwan: what were the initial effects? *Health Service Management Research*.

20, pp.113-20.

Cheng SH, Cheng CC, Chang WL, (2009). Hospital response to a global budget program

under universal health insurance in Taiwan. *Health Policy*. 92, pp. 158-64.

Chen-Wei CHANG, (2006). 醫院實施 Tw-DRG 對醫療費用與醫療品質之影響(The Effect

of Implementing Hospital Tw-DRG on Quality and Expenses of Healthcare).

Shu-chiao Chien, (2010). *The Implementation of Tw-DRG system and its Response Strategies and Financial Influence - the Case of Philanthropic Hospital in Taiwan(財團法人醫院實施Tw-DRG 制度之因應策略與財務績效關係).* **1st ed. Taiwan: National Chung Cheng University.**

Chun-Jen Ting, (2010). The impact of implantation of Tw-DRGs on the income of pediatric surgery(Tw-DRGs 制度實施對小兒外科收益之衝擊).Taiwan: Yuan Pei University of Science and Technology.

David M. Cutler (1993), "The Incidence of Adverse Medical Outcomes Under Prospective Payments" in ***NBER Working Papers 4300***, National Bureau of Economic Research, Inc.

Feldstein, P. (1999). "Market for Hospital Services" in ***Health Care Economics***. New York: Delmar publishers.

Forthman, M. T., Dove, H. G., Forthman, C. L., & Henderson, R. D. (2005). Beyond Severity of Illness: Evaluating Differences in Patient Intensity and Complexity for Valid Assessment of Medical Practice Pattern Variation. ***Managed Care Quarterly***, 13 (4), pp. 9-17.

Forgione, D. A., Vermeer, T. E., et al. (2004). The impact of DRG-based payment systems on quality of health care in OECD countries. ***Journal of Health Care Finance*** 31(1): 41-54.

Freeman, J. L. (1991). Refined DRGs: trials in Europe. ***Health Policy***, 17 (2), pp. 151-64.

Freeman, J. L., Fetter, R. B., Park, H., Schneider, K. C., Lichtenstein, J. L., Hughes, J. S., Bauman, W. A., Duncan, C. C., Freeman, DH. Jr., & Palmer, G. R.(1995). Diagnosis-Related Group refinement with diagnosis- and procedure-specific comorbidities

and complications. *Med Care*, 33 (8), pp. 806-27.

Han Kui, Xu Yixin, (2010). *Tw-DRGs Principle*. 1st ed. Taiwan: HOCHITW.

Healthcare Financial Management. (2008). New Techniques Needed to Manage Accuracy of

MS-DRGs, from http://findarticles.com/p/articles/mi_m3257/ is_ 6_62/ai_n28072702/

Healthcare Financial Management. (2008b). Bibliography for: "10 tips for survival

under MS-DRGs", from http://findarticles.com/p/articles/mi_m3257/is_9_62/ai_n31063102/

Horn, S., Sharkey, P., Chambers, A., & Horn, R. (1985). Severity of illness within DRGs:

Impact on prospective payment. *American Journal of Public Health*, 75 (10), pp. 1195-99.

Hsueh,kuei-hsia, (2006). 住院診斷關聯群支付制度對中型公立醫院財務短期衝擊的預估

-以某醫院為例(An Estimation of Short-Term Financial Impact of DRG Payment System

on a Middle-Size Public Hospital in Taiwan).

Hsing-Chu Chen, (2013). 診斷關聯群前瞻性支付制度對台灣醫院經營策略及績效評估

(The Impacts of DRG Prospective Payment System on Hospital Operation Strategies and

Performance in Taiwan).

Hsiu- Mei Lin, (2011). A Preliminary Study of the Effects of Tw-DRG on Total Knee

Replacement of A Medical Center(Tw-DRGs 支付制度實施成效初探-以某醫學中心全膝

關節置換病患為例)

John E. Wennberg,corresponding author Kristen Bronner, Jonathan S. Skinner, Elliott S.

Fisher, and David C. Goodman, (2009). Inpatient Care Intensity And Patients' Ratings Of

Their Hospital Experiences: What could explain the fact that Americans with chronic illnesses who receive less hospital care report better hospital experiences?. Health Aff (Millwood). 28 (1), pp.103-112

Kahn KL, Keeler EB, Sherwood MJ, Rogers WH, Draper D, Bentow SS, Reinisch EJ, Rubenstein LV, Kosecoff J, Brook RH., (1990). Comparing outcomes of care before and after implementation of the DRG-based prospective payment system. *JAMA*. 17 (15), pp. 1984-88.

Kuei-Miao Kuo, (2012). Impact of TW-DRGs Payment System on Medical Care Utilization, Provider's Behavior and Medical Care Quality Using Coronary Artery Bypass Graft Surgery as an Example 台灣診斷關聯群支付制度實施前後對醫療利用、醫療行為及醫療品質之影響—以冠狀動脈繞道手術為例. Taiwan: **National Taiwan University**.

Long MJ, Chesney JD, Ament RP, DesHarnais SI, Fleming ST, Kobrinski EJ, Marshall BS., (1987). The effect of PPS on hospital product and productivity. *Medical Care*. 25 (6), pp. 528-38.

Menke, T. (1990). Impacts of PPS on Medicar Part B expenditures and utillization for hospital episodes of care. *Inquiry*, 27, pp. 114-26.

Nai-Wen Chang, (2013). A Comparison of Health Care Reform in Taiwan, China, and the United States.

O'Malley, K. J., Cook, K. F., Price, M. D., Wildes, K. R., Hurdle, J. F., & Ashton, C. M.

(2005). Measuring diagnoses: ICD code accuracy. *Health Serv Res*, 40 (5), pp. 1620-39.

Palmer RM, Saywell RM Jr, Zollinger TW, Erner BK, LaBov AD, Freund DA, Garber JE, Misamore GW, Throop FB, (1989). The impact of the prospective payment system on the treatment of hip fractures in the elderly. *Arch Inter*

Quinn, K. (2008). New Directions In Medicaid Payment For Hospital Care. HEALTH AFFAIRS, 27(1), 269-80.

Reid, B., Palmer, G., & Aisbett, C. (2000). Performance of Australian DRGs. *Aust Health Rev*, 23 (2): pp. 20-31.

Rogers WH, Draper D, Kahn KL, Keeler EB, Rubenstein LV, Kosecoff J, Brook RH., (1990). Quality of care before and after implementation of the DRG-based prospective payment system. A summary of effects. *JAMA*. 264 (15), p. 19.

Rose, C. (1989). Patient dumping: the physician's dilemma. *Chest*, 95 (3), pp. 490-91.

Rossnagel, K., Nolte, C. H., Muller-Nordhorn, J., Jungehulsing, G. J., Selim, D., Bruggenjurgen, B., Villringer, A., & Willich, S.N. (2005). Medical resource use and costs of health care after acute stroke in Germany. *Eur J Neurol*, 12(11), pp. 862-68.

Sager, M. A., Easterling, D. V., Kindig, D. A., & Anderson, O. W. (1989). Changes in the location of death after passage of Medicare's prospective payment system: a national study. *New England Journal of Medicine*, 320 (7), pp. 433-39.

Shinichi Okamura, Ryota Kobayashi, Tetsuo Sakamaki, (2005). Case-mix payment in

Japanese medical care. *Health Policy*. 74, pp. 282-86

SH Cheng, CC Chen, SL Tsai, (2012). The impacts of DRG-based payments on health care

provider behaviors under a universal coverage system: A population-based study. *Health

Policy*. 107 (2012), pp. 202-08.

Shu-Hui Wang, (2010). 財團法人醫院實施 Tw-DRG 制度之因應策略與財務績效關係

(Implementation of Tw-DRG system, its Response Strategies and Financial Influence─the

Case of Philanthropic Hospital in Taiwan).

SOONMAN KWON, (2003). Payment system reform for health care providers in Korea.

HEALTH POLICY AND PLANNING. 18 (1), pp. 84-92.

Sipkoff (2008). New Reimbursement Benchmarks: Are You Ready for Them? Drug Topics.

152, 6 pg.

Stern RS, Epstein AM., (1985). Institutional responses to prospective payment based on

diagnosis-related groups Implications for cost, quality, and access. *New England Journal

of Medicine*. 312, pp. 621-27.

United States. Congress. Office of Technology Assessment. *Diagnosis Related Groups

(DRGs) and the Medicare Program: Implications for Medical Technology*. UNT Digital

Library.

http://digital.library.unt.edu/ark:/67531/metadc39505/. Accessed May 5, 2014.

W C Hsiao, H M Sapolsky, D L Dunn and S L Weiner Cite this article as: , (1986). Lessons

of the New Jersey DRG payment system W C Hsiao, H M Sapolsky, D L Dunn and S L

Weiner. *Health Affairs*. 5 (2), pp. 32-45

Wei-Yao Huang, (2011). 合併症及併發症對台灣版診斷關聯群解釋力之影響-以DRG127

為例(The Effect of Comorbidity and Complication on the Explanation of the Taiwan

Diagnosis Related Groups—Heart Failure and Shock DRG 127.)

Wun-Rong Yan , (2011). 疾病嚴重度對台灣特定性腦血管疾患住院診斷關聯群

之解釋力分析 (The Effect of Illness Severity on the Explanation of the Taiwan Diagnosis

Related Group-Specific Cerebrovascular Disorders DRG 014).

Wei-Ren Long, (2011). 診斷關聯制度實施對醫療行為之衝擊─以某區域醫院為例

(Impact of Medical Behavior When Implementing the DRG System─An Empirical Study

of Region Hospital).

Wynn, B. O. (2008). Comparative Performance of the MS-DRGS and RDRGS in

Explaining Variation in Cost for Medicare Hospital Discharges. RAND Corporation.

Yoneda, Y., Toshiyuki, U., Hiroshi, Y., Yasushi, K., Masayasu, T., & Etsuro, Mori. (2003).

Hospital-based study of the care and cost of acute ischemic stroke in Japan. *Stroke*, 34 (3),

718-24.

Yu-Ting Tseng, (2012). An Exploratory Study of Case Management Implementation under

the Tw-DRGs Payment System.