Short communication

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The Diagnosis Procedure Combination based situation analysis of surgical intervention for pituitary tumor in Japan

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Abstract

There have been a number of literatures about the relationship between hospital volume and health outcomes. The previous literatures have indicated that for certain procedures and interventions, particularly complex surgery, there is a real possibility of improving outcomes by increasing activity volumes. The neurosurgery will be such a case. In the current study, we have investigated the relationship between volume and outcome (length of stay and charged cost) for surgical procedure of pituitary tumor.

We have used the Japanese case-mix data, so called DPC from April 1, 2011 to March 31, 2012. There were 12,767 total discharge cases of pituitary tumor from 816 DPC hospitals. Among them we have used 2,664 surgical cases from 383 DPC hospitals. Using this dataset we have investigated the degree of concentration and factors associated with choice of procedures.

Among the 383 facilities, all surgical cases were hypopituitarism or hyperpituitarism. Difference in sex was not clear and the age category 50-59 years old was the largest group. The upper 45 facilities treated 50% of surgical cases. For volume-outcome relationship, there were tendencies that higher case volume facilities had shorter ALOS (p=0.062, one-way analysis of variance) and smaller costs (p=0.087).

Our result suggest the existence of volume-outcome relationship for pituitary surgery and the necessity of concentration of cases for better cost effectiveness.

Key words: DPC, pituitary tumor, neurosurgery, volume outcome relationship

❖Introduction

As we have explained in the previous literature[1)], so called “Big data” is becoming available in the health sector in Japan. DPC (Diagnosis Procedure Combination) is such an example. DPC is the Japanese original casemix system. Although DPC is the summarized information of in-patient case, it has a very detailed cost and procedure data. Using this data, we are able to investigate the detail of procedures conducted during the hospitalization. In 2013, 1,750 acute care hospitals participate to the national DPC project. About 9 million discharge data is added to the official database of Ministry of Health, Labour and Welfare. Considering this situation, many clinical studies have been conducted under the collaboration of clinicians and our research team. This database has made it possible to investigate the clinical characteristics of “rare diseases”. For example, our research team has conducted the DPC based clinical studies about Tsutsugamushi disease (Japanese local disease caused by rickettsia)[2)], venomous snake bites[3)], severe adverse events after trastuzumab infusion[4)], malignant hyperthermia caused by anesthesia[5)], etc.

In 2008 MHLW launched its health reform plan

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that indicated the necessity of functional differentiation and collaboration among the medical facilities. The Regional Health Care Plan (RHCP) is a tool for this reorganization. Before introduction of DPC, it was relatively difficult to know the actual situation of acute in-hospital care, which made it difficult to establish a practical plan. The RHCP is required to precise the goal and action plan for at least 4 major diseases (cancer, ischemic heart disease, cerebro-vascular diseases, diabetes mellitus) and 5 programs (emergency care, disaster care, care for the remote area, perinatal care and pediatrics). One of the recent debates on the health service delivery system is how to reorganize the specialty acute in-patient services. The academic group of medical specialty has much interest for this topic. Corresponding to the demand from the Japanese Society of Pituitary Surgery, we have conducted a situation analysis about the pituitary surgery based on DPC dataset. In this article, we will explain its results.

❖Material and Methods

Data for this study were extracted from the Japanese inpatient administrative claims database, the DPC database 1). The database was originally instituted as part of a national project to develop a Japanese case-mix classification system, which has been ongoing since 2002. The annual number of cases in the database is approximately six million. The database contains: i) main diagnoses, pre-existing comorbidities at admission and complications after admission which are coded with ICD-10 codes; ii) surgical procedures coded with Japanese original codes (K-codes), operation time and the performed date; iii) discharge status (dead or alive); and iv) a list of drugs and blood products used and the dates of use. Study approval was obtained from the Institutional Review Boards and the Ethics Committee of The Tokyo Medical and Dental University. Given the anonymous nature of the data collection process, informed consent was not required.

The DPC data (April 1, 2011 to March 31, 2012) of 6,852,048 cases from 1,057 hospitals was used for the analysis. There were 12,767 total discharge cases of pituitary tumor from 816 DPC hospitals. Among them we have used 2,664 surgical cases from 383 DPC hospitals. In this analysis, we have investigated the degree of concentration and factors associated with choice of procedures.

Statistical analyses were conducted using IBM SPSS version 19.0 (IBM SPSS, Armonk, NY, USA)

❖Results

Table 1 showed the results of descriptive analysis of studied population. All surgical cases were hypopituitarism or hyperopituitarism. Differences in sex was not clear (female: 53.8%). The age category 50-59 years old was the largest group (24.5%), followed by 60-69 (21.2%) and 40-49 (16.6%). The most frequent surgery was Endoscopic endonasal Surgery for Pituitary Adenomas (62.5%) followed by Endonasal Surgery for Pituitary adenomas (31.3%) and Intracranial removal of Pituitary adenomas (6.2%). The prognosis was very good indicating that 98.8% was “cured”.

Table 2 showed the concentration rate of cases.

Table 1 Basic characteristics of studied cases (April 1, 2011 to March 31, 2012; 383 hospitals)

	N	%
Sex		
Male	1,231	46.2
Female	1,433	53.8
Pathology		
Hypopituitarism	257	9.6
Hyperopituitarism	2,407	90.4
Outcome		
Cured	2,632	98.8
Worsen	2	0.1
Dead	15	0.6
Others	15	0.6
Age category		
0-9	22	0.8
10-19	136	5.1
20-29	245	9.2
30-39	385	14.5
40-49	441	16.6
50-59	653	24.5
60-69	564	21.2
70-79	202	7.6
80-	16	0.6
Procedure type		
Endonasal Surgery for Pituitary Adenomas	834	31.3
Endoscopic Endonasal Surgery for Pituitary Adenomas	1,665	62.5
Intracranial removal of Pituitary Adenimas	165	6.2
Total	2,664	100.0

Table 2 Concentration rate of surgical cases of pituitary tumore in Japan (April 1, 2011 to March 31, 2012; 383 hospitals)

Hospital	Number of cases	Number of cases (%)	Accumulated (%)
1	126	4.7%	4.7%
2	87	3.3%	8.0%
3	66	2.5%	10.5%
4	58	2.2%	12.7%
5	53	2.0%	14.6%
6	45	1.7%	16.3%
7	45	1.7%	18.0%
8	44	1.7%	19.7%
9	41	1.5%	21.2%
10	37	1.4%	22.6%
11	36	1.4%	23.9%
12	29	1.1%	25.0%
13	27	1.0%	26.1%
14	27	1.0%	27.1%
15	27	1.0%	28.1%
16	27	1.0%	29.1%
17	27	1.0%	30.1%
18	26	1.0%	31.1%
19	26	1.0%	32.1%
20	26	1.0%	33.0%
21	25	0.9%	34.0%
22	24	0.9%	34.9%
23	23	0.9%	35.7%
24	23	0.9%	36.6%
25	23	0.9%	37.5%
26	22	0.8%	38.3%
27	22	0.8%	39.1%
28	21	0.8%	39.9%
29	20	0.8%	40.7%
30	20	0.8%	41.4%
31	20	0.8%	42.2%
32	19	0.7%	42.9%
33	19	0.7%	43.6%
34	17	0.6%	44.2%
35	17	0.6%	44.9%
36	16	0.6%	45.5%
37	16	0.6%	46.1%
38	15	0.6%	46.6%
39	15	0.6%	47.2%
40	15	0.6%	47.7%
41	15	0.6%	48.3%
42	15	0.6%	48.9%
43	14	0.5%	49.4%
44	14	0.5%	49.9%
45	14	0.5%	50.5%
383	2664	100.0%	100.0%

Table 3 Average length of stay and average charged cost stratified by case volumes (April 1, 2011 to March 31, 2012; 383 hospitals)

		Length of Stay			Charged cost		
Volume category	N	Mean	Standard deviation	Coefficient of variance	Mean	Standard deviation	Coefficient of variance
1-11 cases	1,109	25.6	94.6	369.6	219,866.9	186,946.1	85.0
12-23 cases	626	23.1	21.4	93.0	222,434.6	123,366.9	55.5
24-47 cases	539	20.6	21.5	104.0	217,922.6	95,377.9	43.8
48 cases -	390	16.0	8.2	51.2	199,666.3	83,265.9	41.7
Total	2,664	22.6	62.8	277.9	217,248.8	145,179.1	66.8
p value		0.062			0.087		

Among the 383 facilities, upper 45 facilities treated 50% of cases.

Table 3 showed the average length of stay (ALOS) and the average charged cost stratified by case volumes. There were tendencies that higher case volume facilities had shorter ALOS (p=0.062, one-way analysis of variance) and smaller costs (p=0.087).

❖Discussion

Several limitations must be considered when interpreting our results. First, we lacked the information about severity of cases. It will be possible that severity of case is related with the choice of procedures. Second, the current data does not include information about out-patient care, so we could not evaluate the cost of whole episode and long term outcome. Considering these limitations, we would like to discuss the implication of our research findings.

As in the case of intervention procedures for unruptured cerebral aneurysm[6], relatively large number of facilities (383 hospitals) conducted the surgical procedures of pituitary grand in Japan. The range of cases per facility varied from 1 to 126 and the upper 45 facilities conducted 50% of surgery. Although there are no statistically significant relationships between the case volume and performances (ALOS and charged cost), there are tendency that facilities with more cases show higher performance (shorter ALOS and fewer cost). There have been a number of literatures about the relationship between hospital volume and health outcomes. However, the direction of causality is still a matter for debate. The literature review carried out by the IRDES shows that for certain procedures and interventions, particularly complex surgery, there is a real possibility of improving outcomes by increasing activity volumes[7]. Our previous literatures have showed the volume outcome relationship for various clinical interventions[6),8)]. All these results have suggested that it would be better to concentrate the surgical cases into selected facilities in order to ameliorate the efficiency of care in the case of relatively rare pathologies.

In Japan we have 6.9 neurosurgeons per 100 thousands population. This figure is too large compared with other developed countries. Considering the number of neurosurgery cases in Japan, the average cases treated by each neurosurgeon will be rather small compared with other countries. In order to assure the quality of care and efficiency of health system, some degree of volume limitation for each specialty must be accepted. In Japan, the Regional Health Care Plan (RHCP) and tariff schedule are two important tools for regulation of service volume. The RHCP regulates the number of hospital beds in each health care region. Based on the Health care law, the prefectural governor can deny the payment for the hospitals that construct more beds than permitted by RHCP. The official tariff schedule précises the physical condition for reimbursement, i.e., number of physicians and nurses per bed, requirement of equipment, and ALOS. However, there is no regulation about the optical number of each specialist.

There is no legal difference between specialist and generalist in Japan. Japanese specialists' physicians association is self-regulated bodies and the government has not politically and economically involved in their decision making. They are considered as private agency under the umbrella of Japan Medical Associations (JMA). They certify specialists by their own method and there is no legal background except for anesthesiologist and psychiatrist that require national certification[9),10)].

Recently Ministry of Health, Labour and Welfare

(MHLW) and JMA have agreed to establish a special agency of certification of medical specialty. This will contribute to the discussion about the appropriate number and distribution of each specialist in Japan.

❖Literatures

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