Journal of the National Institute of Public Health 2014 Vol.63 No.6 p.532－537

Topic： Application of DPC data for evidence-based health policy

＜Note＞

Estimation of per-case hospitalization charges from Diagnosis-Procedure-Combination (DPC) data and an international comparison of hospital prices

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Abstract

Objectives: OECD launched a project to compare price levels of hospital charges internationally using purchasing-power-parity (PPP). The comparison is made for seven disease categories from internal medicine, 21 surgical procedures and four day-surgeries using per-case charges covering admission to discharge. The results of a pilot study in 16 countries are already published. To obtain Japan's data, the per-case hospital charges of said categories and procedures were estimated and compared with the results of the pilot study.

Methods: The per-case hospital charges were estimated from the "survey on the effects of the introduction of DPC (diagnosis-procedure-combination) reimbursement" by applying log-normal distributions to the 25th, 50th, 75th and 90th percentiles of length-of-stay (LOS). Surgical procedures and anesthesia are reimbursed on a fee-for-service basis and surgical charges were added to the estimated hospital charges.

Results: Comparison was made in terms of seven disease categories from internal medicine and 17 surgical procedures. Japan was ranked as most expensive for cholelithiasis (top among 15 countries) and least expensive for PTCA (percutaneous transluminal coronary angioplasty) (11^{th} among 17 countries). Japan was ranked above the middle in 17 out of 24 categories/procedures.

Conclusions: Japan's hospitals were rather expensive among OECD countries due mainly to the excessively long LOS. Japan's LOS was longest in 19 out of 24 categories/procedures. Japan was ranked 4^{th} among 11 countries even for its shortest LOS of angina).

keywords: hospital charges, diagnosis-procedure-combination (DPC), length-of-stay, log-normal distribution

(accepted for publication, 3rd November 2014)

I. Objectives

OECD is conducting the "Hospital Purchasing-Power-Parity (PPP) survey" to develop the internationally comparable price indices of hospitalization. Hospitalization charges are all-inclusive charges including room and board, medication and laboratory, surgery and anesthesia covering the entire length of stay from hospitalization to discharge. They are difficult to measure particularly in countries with wide variety of length of stay. Japan's length of stay is the longest among OECD countries and estimation of hospitalization per-case charges is a methodological challenge.

We attempted to estimate the hospitalization charges using Diagnosis-Procedure-Combination (DPC) data by applying a statistical model of log-normal distribution and compared the estimated per-case hospital prices with 12 OECD countries from the pilot study.

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II. Data and Methods

1. OECD hospital survey

OECD launched an international comparative survey on hospital charges in 2008 and the results of the pilot study on 12 participating countries is published [1]. It collects the charges billed for certain "defined" hospitalization (case types). To achieve international comparability, the charges are compared using purchasing power parity or PPP, a common tool for comparing price levels across countries.

Case types include nine medical inpatient services (IM01-09) and 23 surgical inpatient services (IS02-24). Medical services are defined by primary diagnoses and surgical services are defined by surgical procedures.

2. Japan's DPC classification

DPC is a Japan's patient classification system for acute care hospitalization consisting of 2658 categories in 2010 fee schedule, of which 1875 DPCs were reimbursed on a per-diem basis (DPC per-diem payment system or DPC-PDPS). DPC-PDPS are selected from categories with sufficient sample size (N>=20) and patients classified into the rest of DPCs will be reimbursed on a traditional fee-for-service (FFS) basis.

PDPS bundles room and board, medication and injection, clinical procedures priced less than 20000 yen. It does not include surgery and anesthesia, which will be billed separately. PDPS is staged at three levels by the length of stay. There is a maximum on the LOS and prolonged hospitalization beyond the maximum LOS will be reimbursed on a traditional FFS.

There were a total of 7,528 acute somatic hospitals with 899,385 acute care beds as of October 2011 according to the Health Care Facilities Survey, of which 1,634 hospitals with 491,282 beds are assigned as DPC wards. There were a total of 8,777,507 discharges from DPC wards, of which 8,310,372 discharges (94.7%) were reimbursed on PDPS for one year between April 2011 and March 2012.

Data of DPC-PDPS (1825 DPCs, N=8,310,372) are available over the Ministry of Health, Labour & Welfare website [2] and includes the following:

1) the number of discharges in each DPC broken down by:
   (1) sex
   (2) age groups (in eight categories: 0-2, 3-5, 6-15, 16-20, 21-40, 41-60, 61-79 and 80 or over)
   (3) prognoses at discharge (in eight categories: cured, alleviated, improved, no change, exacerbated, death due to the most resource-intensive diagnosis, death due to other diagnoses, and others)
   (4) the most resource-intensive diagnosis classified by ICD10
   (5) types of surgery provided if any (in Japan's local surgery code called Kcode)
2) distribution of length of stay (LOS)
   (1) minimum, maximum, arithmetic mean, coefficient of variance
   (2) 25th, 50th, 75th, 90th percentiles

A simplest way of calculating charges for a hospitalization would be to break the arithmetic mean of LOS into three stages and multiply with per-diem reimbursement prices. For example, a DPC 010010xx010xx (Brain tumor with no surgery) will be reimbursed 2878 points for the first 10 days, 2127 points between 11^{th} and 21^{st} days and 1808 points for the LOS over 22^{nd} day. There was a total of 7469 cases and the arithmetic mean of LOS was 23.58 days. Then, the charge of a hospitalization can be calculated by 2878 points × 11 days + 2127 points × 10 days + 1808 points × 2.58 days = 57592.64 points.

Historically, Japan's health insurance system fixed the point charge at 10 yen. However, in DPC, each hospital is assigned different level of point charge ranging from the lowest of 8.922 yen to the highest of 13.556 yen. The eventual price ranges from the lowest of 513,841 yen to the highest of 780,726 yen for exactly the same case.

However, such a simple calculation is likely to overestimate the charges because the LOS is not normally distributed. The distribution of LOS is known to be skewed to right because a small number of patients stay exorbitantly long (The maximum LOS of this DPC was 220 days).

In this study, we applied log-normal distribution to better estimate per-case charges.

3. Method

Log-normal distribution functions were estimated for each of DPCs (N=1875) using the 25th, 50th,75th and 90th percentiles LOS (X). Log-normal functions are determined by geometric mean (GM, arithmetic mean of LN(X)) and geometric standardized deviation (GSD, standard deviation of LN(X)). GM and GSD were estimated using Excel Solver to minimize the sum of squares of the differences between the observed percentile LOS and estimated percentile LOS.

Let the observed 25th, 50th, 75th and 90th percentiles LOS be expressed as $LOS_{0.25}$, $LOS_{0.5}$, $LOS_{0.75}$ and $LOS_{0.9}$ respectively. Further, the estimated percentile LOS using an Excel function, LOGINV, is expressed as LOGINV(0.25, GM, GSD), LOGINV(0.5, GM, GSD), LOGINV(0.75, GM, GSD) and LOGINV(0.9, GM, GSD) respectively (LOGINV is an Excel function to give X value of a log-normal distribution of given GM, GSD and cumulative probability, p and is expressed as X= LOGINV(p, GM, GSD)):

GM and GSD were estimated to minimize the following

sum of squares

$$\sum_{i=0.25}^{0.9}(\mathrm{LOS}_i - \mathrm{LOGINV}(i, \mathrm{GM}, \mathrm{GSD}))^2$$

i) probability of hospitalization on the *X*th day

Once GM and GSD were estimated, the probability of a patient being hospitalized for ***a length of X days*** is expressed by a probability function of the estimated log-normal distribution and the probability of a patient being hospitalized for ***a length of one to X days*** is expressed by a cumulative probability function of log-normal distribution. Then, the probability of a patient hospitalized on the ***Xth*** day is expressed as ***1-cumulative*** probability(X-1) because patients whose LOS is X-1 days or less are discharged before the ***Xth*** day. Using an Excel function, it is expressed as:

1-LOGNORMDIST(X-1,GM,GSM)

ii) estimation of per-case charges

Let the per-diem price of DPC on the X_{th} day be H_x then the total price of a hospitalization of a given DPC is (max is the maximum LOS of each DPC):

$$\sum_{x=1}^{max}(Hx * (1 - LOGNORMDIST(X-1, GM, GSD))$$

iii) estimation of average point charges

Reimbursement rate of DPC is expressed in points and must be multiplied with point charge to translate it into yen amount. Historically, Japan's health insurance system has fixed a point at 10 yen. However, in DPC system, each hospital is assigned a different point charge. The average point charge was estimated by weighted average of entire hospitals (N=1,634) using the number of DPC cases as weight.

iv) estimation of surgical charges

DPC does not include surgery and anesthesia and they are reimbursed separately on a fee-for-service basis (point charge is set at 10yen). Surgical fees were estimated separately from DPC database. The DPC database included the number of cases for which surgeries are performed by Japan's local surgical coding (KCODE).

For example, appendectomy is defined by the following ICD-9-CM coding:

47.01 Laparoscopic appendectomy
47.09 Other appendectomy
47.11 Laparoscopic incidental appendectomy
47.19 Other incidental appendectomy

The above ICD-9-CM coding is translated into the following Japan's KCODE

K718-01 Appendectomy without peripheral abscess
K718-02 Appendectomy with peripheral abscess
K718-21 Laparoscopic appendectomy without peripheral abscess
K718-22 Laparoscopic appendectomy with peripheral abscess

The above KCODEs are performed in a total of 48,598 cases spreading over 38 DPCs, of which DPC "060150xx02xx0x" accounts for 38,605 cases (79.4%) followed by "060150xx02xx1x" with 8,440 cases (17.4%). The first six digits denote the most resource-intensive diagnosis: "060150", "appendicitis" and the last but one digit from right: '0' and '1', denotes the absence/presence of secondary diagnoses. The total cases of these two DPCs were 39,211 and 8,790 respectively. Although appendectomy is by far the most common procedures performed on patients with appendicitis, some of them are performed with different surgical procedures such as surgeries for acute pan-peritonitis. Since OECD defines surgical cases based on types of surgical procedures, per-case price as well as average length of stay of 38 DPCs had to be collated using the number of appendectomy as weight (actually the least frequent 13 DPCs had only one appendectomy each).

III. Results

The average point charge was estimated as 10.96 yen per point. The total charges of DPC-PDPS cases (N = 8,310,372) was estimated to be 3.756 trillion yen or 451,981 yen per discharge (US$4520 when $1 = ￥100).

The results of the number of cases, average length of stay (ALOS) and hospitalization prices converted into US$ ($1=￥100) are presented in [Table1], [Table2] and [Table3] respectively incorporating the results from 12 OECD countries to allow international comparison. In [Table2] and [Table3], the ranking of Japan in OECD countries which provided data is also included.

As for ALOS, Japan is known as a country with the longest ALOS. True, Japan ranked as the 1st in 19 of 24 case types. It is noteworthy that Japan's ALOS is shorter than US in inguinal hernia repair. As for prices, Japan ranks in the upper half of OECD countries in most case types. It is noteworthy that Japan's hospital is more expensive than US in three internal medicine case types: cholelithiasis, heart failure and pneumonia. This may be explained by Japan's long ALOS.

IV. Discussion

Analyzing DPC data, we were able to provide internationally comparable prices of hospitalization of Japan. So far, Japan has not been used to capture the price of an entire hospitalization from admission to discharge.

Our findings revealed that Japan's hospitals occupy higher end of the price lists of OECD countries. Japan's

Table 1 The number of cases (2011 for Japan, 2007 for other countries)

Code	Case	AUS	CAN	FIN	FRA	GER	ISR	ITA	KOR	NOR	POR	SLV	SWE	USA	JPN
IM01	Acute myocardial infarction	23339	17698	2013	1304	74481	5737	3840	15727		7701	1447	15015	297521	7246
IM02	Angina pectoris	37865	3258	1070	1892		4613	1642			3227	1834	9980	23417	187701
IM03	Cholelitiasis	16830	5076	648	3684	22351	9848	2477	6471	5295	6628	1657	4883	76382	22258
IM04	Heart failure	33361	29950	2210	19826	269216	37022	10081	8856	8998	14610	3106	19667	774790	169430
IM06	Malignant neoplasm of breast	2336	356	628	1665	53763	2960	311	28533	3130	1044	2656	1998	7534	34969
IM07	Malignant neoplasm of bronchus and lung	13014	3699	761	8255	152450	3193	2387	43279	8621	4163	1194	4416	79434	189905
IM09	Pneumonia	60288	35922	4333	19038	221028	27201	8827	170652	26056	38131	3918	22885	1046752	253890
IS02	Appendectomy	20439	24433	1786	6108	100634	7756	3010	69089	4760	11050	1839	8880	293502	48598
IS03	Caesarean section	55556	74972	3204	13467	198385	22905	41	113534	9671	27306	2790	17991	1451359	53053
IS04	Cholecystectomy	25044	19589	1233	7613	153563	5922	4646	20626	6383	15880	4216	7460	372598	103663
IS05	Colorectal resection	10595	21077	570	4043		3381	1428	4860		7350	1	5110	280959	91514
IS06	Coronaryartery bypass graft	4388	10733	439	2656	28494	2699	732	1899	2873	2630	528	3730	192107	14886
IS08	Discectomy	962	4853	1298	2945		924	2446	40052		2630	513	3999	123387	18535
IS09	Endarterectomy:vessels of head and neck	1819	2532	77	40		728	1289	111		503	124	892	113390	18535
IS12	Hipreplacement:total and partial	13810	26727	1748	8335	159220	2172	5484	29949		7707	3057	18296	384497	28748
IS13	Hysterectomy:abdominal and vaginal	14203	32999	1420	4301	82337	2801	333	24940		11017	1082	7228	508943	55976
IS14	Knee replacement	11699	36017	1260	2865	140812	1892	1869	21173		4655	1255	8987	585500	29544
IS16	Mastectomy	8567	7012	686	3239		725	414	6730	1316	2771	273	1917	68211	61965
IS17	Open prostatectomy	16226	7159	177	2467		1077	118	147		2657	269	2467	86974	17391
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	17276	17459	463	13267	10365	10362	6842	4268	10300	7579	1097	15254	660217	243024
IS20	Peripheral vascular bypass	4389	3282	320	803		1077	924	793		1138	66	583	61568	10995
IS22	Repair of inguinal hernia	17187	10633	887	7139		8087	1582	25288	2183	14333	3392	3917	32330	105190
IS23	Thyroidectomy	4162	8006	467	5175		1333	281	17231	1125	4677	200	2123	46917	22455
IS24	Transurethral resection of prostate (TURP)	9071	13342	575	2570	58588	1714	1916	2940	4103	2330	537	4869	68241	21645
	TOTAL	422426	416784	28273	142697	1725687	166129	62920	657148	94814	201717	37051	192547	7636530	1811116

Table 2 Hospitalization prices in US dollars (2011 for Japan, 2007 for other countries, $1＝\100)

Code	Case	AUS	CAN	FIN	FRA	GER	ISR	ITA	KOR	NOR	POR	SLV	SWE	USA	JPN	Japan's rank
IM03	Cholelitiasis	2521		2006	3955	2279	1602		1211	5536	2410	1976	2960	5969	6567	1th in 15
IM04	Heart failure	5100		3684	5215	3922	1656	6245	1475	7678	4606	2511	4263	5696	5812	3th in 16
IM09	Pneumonia	4817		3669	6584	3504	1727	4830	976	8201	3299	2487	4100	5893	5942	3th in 16
IS17	Open prostatectomy	7552	7797	7948	9405		3391		4698		5115	5296	10368	13025	8103	4th in 14
IM07	Malignant neoplasm of bronchus and lung	5097		3503	4495	3050	1764		1839	7607	3610	2655	6460	9086	5116	4th in 15
IS13	Hysterectomy:abdominal and vaginal	7135	5742	3989	6412	4163	2909		2984		2877	2889	7612	7313	6741	4th in 15
IS04	Cholecystectomy	5615	6350	4484	6927	3728	3185	5406	3683	11324	4078	2343	5844	10487	6904	4th in 17
IS08	Discectomy	14055	6909	5267	5518		6815		4464		6313	3781	8139	8007	6368	6th in 14
IS03	Caesarean section	7092	4820	4808	5820	3732	2002		1957	10593	1998	3113	6375	7449	5011	6th in 16
IS05	Colorectal resection	16653	14831	11846	17473		7335		7048		10120	7188	15404	17289	10892	7th in 14
IS16	Mastectomy	5525	5455	4761	6668		3305		3987	7093	3443	2960	5549	9297	4881	7th in 15
IM01	Acute myocardial infarction	4245		5163	5439	4626	3093	8287	1174		6238	3091	4540	7579	4307	8th in 15
IS12	Hipreplacement:total and partial	15918	11983	10834	11162	8899	7950		9022		10869	7628	11568	17406	9152	8th in 15
IS23	Thyroidectomy	6000	5050	4919	4854		2023		2785	7333	3636	2669	6126	7483	4257	8th in 15
IS06	Coronaryartery bypass graft	21698	22694	23468	23126	14067	15488		16577	32111	17133	12281	21218	34358	20219	8th in 16
IS24	Transurethral resection of prostate (TURP)	5239	4548	4183	4986	3733	2144	5474	2155	6041	2277	2404	4403	6625	4297	8th in 17
IM02	Angina pectoris	2074		3466	3007		1973				3299	1838	2256	3647	1702	9th in 12
IS20	Peripheral vascular bypass	19570	14296	18162	14790		9870		8371		10840	6781	14140	16657	8990	9th in 14
IS14	Knee replacement	14608	9910	9931	12424	10011	8272		9222		10319	7652	10348	14946	9301	9th in 15
IM06	Malignant neoplasm of breast	3254		3596	3425	2293	1621	7130	1331	6726	4643	1643	4393	6947	2858	9th in 16
IS09	Endarterectomy:vessels of head and neck	9458	8502	8494	11578		10136		6665		8153	4085	10192	8371	6368	10th in 14
IS22	Repair of inguinal hernia	3093	4489	2904	3327		1799	5026	1986	5107	2646	1287	4041	8917	2307	10th in 16
IS02	Appendectomy	5044	5004	3739	4558	2943	1726	5647	1594	5989	3502	2145	4961	7962	3175	10th in 17
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	7131	9277	5574	7027	3347	7814	10063	10254	7942	8001	3250	9296	14378	5767	11th in 17

Table 3 Average length of stay (2011 for Japan, 2007 for other countries)

Code	Case	AUS	CAN	FIN	FRA	GER	ISR	ITA	KOR	NOR	POR	SLV	SWE	USA	JPN	Japan's rank
IS05	Colorectal resection	11.96	10.85	8.40	18.05		11.09	13.80	16.94		16.20	21.00	9.60	9.76	25.04	1st in 12
IS08	Discectomy	7.96	2.67	3.40	5.66		4.18	4.79	11.79		5.96	8.14	4.44	2.15	18.36	1st in 12
IS17	Open prostatectomy	4.79	3.51	5.94	9.33		7.31	5.11	13.99		9.12	11.67	4.32	2.42	17.05	1st in 12
IS20	Peripheral vascular bypass	7.27	9.94	8.79	16.97		11.85	9.73	17.87		21.18	14.82	7.72	7.19	24.23	1st in 12
IM01	Acute myocardial infarction	4.35	6.25	5.22	7.12	7.80	5.46	8.27	4.47		8.48	6.50	4.25	4.41	12.38	1st in 13
IS12	Hipreplacement:total and partial	9.40	6.99	5.96	12.89	14.00	8.78	10.85	20.36		12.35	12.23	7.22	4.67	28.83	1st in 13
IS13	Hysterectomy:abdominal and vaginal	4.02	3.01	2.15	6.41	7.00	5.59	5.05	7.30		5.93	9.00	4.00	2.57	12.72	1st in 13
IS14	Knee replacement	7.18	4.69	5.28	11.22	14.10	8.09	9.38	20.05		10.47	11.47	6.00	3.64	29.86	1st in 13
IS23	Thyroidectomy	2.30	1.90	1.74	3.75		3.89	3.58	6.69	3.60	3.92	3.64	1.86	1.88	10.05	1st in 13
IM03	Cholelitiasis	3.04	3.79	3.14	6.15	5.10	3.80	7.27	5.64	3.98	7.01	4.96	2.97	3.72	11.30	1st in 14
IM04	Heart failure	6.41	7.32	7.03	9.16	10.70	4.19	8.46	8.51	5.80	9.57	8.76	5.13	4.93	22.08	1st in 14
IM07	Malignant neoplasm of bronchus and lung	5.86	10.67	6.52	6.86	6.10	4.03	10.70	6.00	6.90	12.46	4.12	7.80	6.42	15.15	1st in 14
IM09	Pneumonia	5.68	5.83	6.12	9.73	9.30	4.41	9.59	6.77	6.64	10.63	7.43	4.61	4.88	13.21	1st in 14
IS02	Appendectomy	2.97	3.16	2.29	5.15	4.90	3.26	4.45	5.85	2.92	4.91	4.94	2.40	2.74	7.83	1st in 14
IS03	Caesarean section	4.84	3.29	4.73	7.67	7.20	5.08	6.90	6.65	6.00	4.61	8.30	3.95	3.60	13.48	1st in 14
IS04	Cholecystectomy	2.83	4.11	2.83	7.12	6.70	3.23	5.44	7.93	4.20	6.20	4.62	2.42	4.57	14.97	1st in 14
IS06	Coronaryartery bypass graft	9.38	10.05	9.06	15.00	11.70	10.65	13.05	15.45	9.05	12.81	14.66	7.33	9.36	29.68	1st in 14
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	3.32	3.94	2.99	5.13	4.00	3.70	5.58	9.39	2.45	6.01	4.79	2.54	2.70	10.28	1st in 14
IS24	Transurethral resection of prostate (TURP)	3.58	2.93	3.40	6.83	7.70	4.35	5.06	7.30	3.83	6.85	8.03	2.66	3.04	10.72	1st in 14
IS09	Endarterectomy:vessels of head and neck	5.15	3.12	3.77	9.59		5.06	4.52	20.42		8.27	8.18	3.91	2.55	18.36	2nd in 12
IS16	Mastectomy	2.92	2.04	2.43	6.82		4.06	4.64	11.48	4.36	6.97	9.82	2.36	2.21	10.11	2nd in 13
IS22	Repair of inguinal hernia	1.35	2.73	1.80	3.46		1.82	3.97	5.71	2.35	2.82	2.90	1.66	7.23	6.84	2nd in 13
IM06	Malignant neoplasm of breast	3.65	10.65	4.41	4.68	4.00	3.78	10.16	4.21	4.83	8.16	1.96	5.93	5.85	8.61	3rd in 14
IM02	Angina pectoris	2.32	2.68	4.05	4.07		3.03	4.48			1.76	3.14	1.96	1.94	3.80	4st in 11

length of stay is still long and it is considered to be a major reason why Japan's hospitals are more expensive than OECD standards. These results suggest that Japan's hospitals need more efficiency through shortening the length of stay.

There are some limitations to this study. The data year was 2011 while the data of other countries were of 2007. This was inevitable because DPC participating hospitals were not as many as they are today. Also in that year, only six months data were collected. For the first time in FY2011, data covering an entire year were collected from 1,634 DPC participating hospitals. The sheer sample size of 8,310,372 discharges is only second to the US and almost comparable to Germany according to [Table1] making it sufficiently large to enable international comparison.

Another limitation is that prices are converted into US$ under the current exchange rate ($1=￥100) and is amenable to the fluctuation of exchange rate. OECD advocates using PPP for international comparison incorporating consumer prices. Unfortunately, we did not attempt to calculate PPP in this study.

And, most importantly, DPC data do not cover the entire Japan's acute admissions. Only acute care hospitals fulfilling certain requirements (such as the number of medical and nursing staff per bed) are permitted to use PDC PDPS. Still, nearly half of acute care admissions occur in non-DPC hospitals, one cannot generalize the findings from DPC data to the entire country.

Despite the above limitations, our estimates of per-case hospital charges are pioneering in nature and will bring about various implications for not only international comparison but also for domestic health policy development.

Acknowledgement

The content of this article was presented at the 9th Annual Meeting of Japan Health Economics Association (JHEA) on 6th September 2014 (Tokyo).

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DPCデータを用いた入院費用の推計と，OECD加盟国との価格比較

抄録

目的：OECDは病院費用を疾患別に国際比較するプロジェクトを開始した．９内科疾患，23外科手術，４日帰り手術について入院から退院までの総費用を推計し，購買力平価（PPP）で比較するもので，2010年に16か国で実施されたパイロット調査の結果が公表済であり，2013年より本調査が開始された．DPC調査を用いて，わが国急性期病院の疾患別入院費用を推計し，パイロット調査されたOECD加盟国の価格と比較する．

方法：2011年度DPC導入の影響調査結果より在院日数の25，50，75，90%タイル値に対数正規分布を適用し，1875DPC毎の入院から退院までの包括点数の平均を算出した（一点単価は医療機関別係数に病院毎の症例数を加重平均した10.96円）．内科疾患については医療資源投入病名（ICD10）よりOECD指標の対象疾患を抽出しDPC平均点数を症例数で加重平均した．外科系疾患については実施された手術（K）コード数で加重平均し手術と麻酔点数を加えた．得られた疾患別，手術別入院費用を米ドル換算してパイロットスタディ参加国と比較した（パイロットスタディでは物価補正したPPPは算出されず）．

結果：７内科疾患と17外科手術を比較できた．わが国順位が最も高かったのは胆石症で15か国中１位，最も低いのはPTCAで17か国中11位であった．24疾患・手術中17でわが国は中位より上であった．

結論：公表されている（算術）平均在院日数で算出したらわが国は突出した高額だったため，対数正規分布を適用し幾何平均を用いたが，それでもわが国入院費用はOECD加盟国中高額の部類であった．その最大要因はわが国の在院日数の長さであり，24疾患・手術中19でトップであった（最も短かったのは狭心症で11か国中４位）．

キーワード：病院費用，DPC（診断群分類），在院日数，対数正規分布

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