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Comparing Price Levels of Hospital Services Across Countries: Results of Pilot Study

Francette Koechlin,
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COMPARING PRICE LEVELS OF HOSPITAL SERVICES ACROSS COUNTRIES: RESULTS OF PILOT STUDY

Francette Koechlin, Luca Lorenzoni and Paul Schreyer

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ABSTRACT

Health services account for a large and increasing share of production and expenditure in OECD countries but there are also noticeable differences between countries in expenditure per capita. Whether such differences are due to more services consumed in some countries than in others or whether they reflect differences in the price of services is a question of significant policy relevance. Yet, cross-country comparisons of the price of health services are rare and fraught with measurement issues. This paper presents a new set of comparative prices for hospital services in a selection of OECD countries. The data is novel in that it reflects quasi-prices (negotiated or administrative prices or tariffs) of the output of hospital services. Traditionally, prices of outputs have been compared by comparing prices of inputs such as wage rates of medical personnel. The new methodology moves away from the input perspective towards an output perspective. This should allow productivity differences between countries to be captured and paves the way for more meaningful comparisons of the volume of health services provided to consumers in the different countries. One of the key findings of the pilot study is that the price level of hospital services in the United States is more than 60 % above that of the average price level of 12 countries included in the study. Price levels turn out to be significantly below average in Korea, Israel and Slovenia.

RÉSUMÉ

Les services de santé représentent une part importante et croissante de la production et des dépenses dans les pays de l'OCDE mais avec des différences notables entre pays dans les dépenses par habitant. Savoir si de telles différences sont dues aux quantités de services consommés dans tel ou tel pays ou reflètent des différences dans les prix des services est une question fondamentale pour mener une politique pertinente. Jusqu'à présent, les comparaisons entre pays du prix des services de santé sont rares et rendues difficiles par les problèmes de mesure. Cet article présente un ensemble de prix comparatifs pour les services hospitaliers dans une sélection de pays de l'OCDE. Ces données sont inédites car elles reflètent « les quasi-prix » (prix négociés ou réglementés ou tarifs) de la production de services hospitaliers. Traditionnellement, les prix de ces produits étaient comparés en utilisant les prix des « input » (approche par les coûts) tels que les taux de salaire du personnel médical. La nouvelle méthodologie s'écarte de cette approche pour tendre vers une approche « output ». Cela devrait permettre de saisir les différences de productivité entre les pays et d'ouvrir la voie à des comparaisons plus significatives du volume des services de santé fournis aux consommateurs dans les différents pays. Un des résultats clés de cette étude pilote est que le niveau de prix des services hospitaliers aux États -Unis est de plus de 60% supérieur au niveau de prix moyen des 12 pays inclus dans l'étude. En revanche, les niveaux de prix sont significativement plus bas en Corée, en Israël et en Slovénie.

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BACKGROUND

1. Health expenditures account for a sizeable and rising share of GDP in OECD economies. When expenditures go up, policy-makers and citizens are interested to find out whether a rise in expenditures signals that people consume more health services or whether health services have become more expensive. The same question is of interest in comparisons between countries: are higher per-capita health expenditures in country A compared to country B the result of higher prices or more health services in country A compared to country B? To answer this question, information on the relative prices of health services are required. In international comparisons, the relative prices for a particular product or product group are called *Purchasing Power Parities* (PPPs). The main objective of the study at hand is to present a methodology for the measurement of PPPs for the product 'hospital services', a large sub-item of the broader product 'health services'.

2. The work presented in this paper is the result of a joint effort between the OECD National Accounts Division and the OECD Health Division. Work with countries was conducted through an OECD Task Force of experts which met on four separate occasions between June 2007 and October 2009. The results presented here are only a first step towards a more systematic monitoring of prices and volumes of health services across OECD countries.

INTRODUCTION

3. PPPs are regularly measured for all components of GDP[1]. Despite a long tradition of work in the area, the task remains challenging. Three main problems have to be addressed in the measurement of PPPs. The first issue is to identify products that are comparable across countries: while simple in some cases (a particular type of a washing machine) this can be complicated in many other cases because products are not identical, because there are differences in quality or because products simply do not exist in all countries. The second issue is to ensure representativeness of products: whatever price is compared, it has to be the price of a product that is widely and typically purchased in each country. The third issue arises when there is a product, but no meaningful market price for comparison. Issues one and two arise in the comparison of all prices, issue three arises in the comparison of products that are produced and delivered outside markets. In many countries, health services count among these products.

4. When goods or services are supplied by a non-market producer such as the government, the prices charged to consumers are significantly below the price that a market producer would charge. In some cases, the price may even be zero. It would make no sense to compare such prices charged to patients or consumers across countries as they reflect administrative decisions and not the value of products. It has therefore been customary in PPP compilations to compare costs of producing non-market goods and services.

5. Note, however, that there are two possibilities for comparing costs, one based on *inputs* and one based on *outputs*. The input-based method, traditionally applied in PPP comparisons of non-market products, consists of comparing the prices of inputs in the production process of non-market services. In the case of health services, an input-based method would, for example, compare the wage rate of a surgeon in different countries. In other words, the price comparison is approximated through a comparison of wages or values per unit of inputs. Apart from the fact that it is notoriously difficult to compare wages across countries (even for the same type of occupation, qualifications may be different, it is hard to control for experience and seniority payments etc.) the main drawback of this methodology is that it ignores any productivity differences between countries (Fujisawa et al 2008). In other words, if health services are

1. For a full description of the methods used, the reader is referred to Eurostat-OECD (2006).

provided more efficiently in one country compared to another, this would go unnoticed in a PPP comparison that is based on the price of inputs.

6. The second option for comparing costs is based on *outputs*. Here, PPPs are measured by comparing the costs per unit of output, in the case of medical services this is typically the *cost per treatment*. In the health domain, costs per unit of output are not readily observable but there is an alternative source of information that provides valuations of outputs: in many OECD countries, health services are managed through reimbursement schemes where health providers and health administrations or insurance companies either negotiate reimbursements per treatment or where the government administers reimbursements per treatment. Reimbursement values per treatment or per episode of illness can be used to emulate the role that prices play for other goods and services. In what follows, we shall label negotiated or administered rates as '***quasi-prices'*** to signal that they are not necessarily the result of market transactions and that they are not prices that apply to transactions between producers and consumers of health services. The comparison of quasi-prices per unit of treatment is an output-based approach, and in principle is capable of reflecting productivity differences between countries[2]. It is thus conceptually preferable to input-based approaches. The present document reports on the empirical results for output-based PPPs in one important category of health services, inpatient hospital services.

7. Before moving on to the methodology employed, another concept has to be introduced, the concept of ***comparative price levels***. Comparative price levels reflect what people naturally do when comparing prices of a particular product across countries: they convert the price of a product in country A, expressed in country A currency into country B's currency by applying a market exchange rate. The resulting price (now expressed in units of country B's currency) is then compared with the actual price of the product in country B. If the converted price of country A's product exceeds the actual price of country B's product, country A would be seen as 'more expensive' than country B. Comparative price levels emulate this calculation by dividing PPPs (the ratio of the price observed in country A over the price observed in country B) by the market exchange rate between the two countries. If the resulting ratio exceeds unity, country A has a price level that is higher than the price level in country B. A different way of describing comparative price levels is that they indicate – for a given category or aggregate – the number of units of the common currency needed to buy the same volume of the category or aggregate. Note, however, that by construction, comparative price levels are dependent on market exchange rates. As the latter can change quickly and by a wide margin, comparative price levels have to be interpreted with caution and with reference to a particular point in time.

8. The principle of comparative price levels will be applied to the results of the present comparison by dividing hospital PPPs by the corresponding exchange rates. Our results are obtained in a multilateral, not a bilateral setting which complicates computations but the basic interpretation of comparative price levels remains unchanged.

9. The pilot study has focused on hospital services due to the proportion of total health costs that are consumed by hospitals and to the fact that market prices are not readily observable. Future developmental work might extend the output-based approach to focus on outpatient hospital-based services and non-acute hospital services (that is rehabilitation and long-term care services).

10. This paper starts with a description of the methodology used for the measurement of inpatient hospital PPPs. It then goes on to review some of the measurement challenges that arose during the implementation of the method. Results are presented and discussed and some lessons drawn for future work in the area.

2. An extensive discussion of the measurement of output-based health and education services is provided in OECD (2010).

METHODOLOGY

11. The approach towards estimating output-based hospital PPPs has two main features: (i) hospital output is defined in terms of ***case types*** and (ii) ***quasi-prices*** are used to value this output. The two features are considered in turn.

The products: case types

12. Case types refer to classes of hospital services that are similar from a clinical perspective. For instance, 'heart failure' constitutes one case type. Each case type is further specified so as to compare similar occurrences of diseases. In the case of heart failure, the indication is given that 'no operating room procedure is performed'. This leads to greater homogeneity of case types also in terms of their consumption of resources.

13. It was mentioned earlier that a basic principle for price comparisons is that items should be comparable and representative. 'Representativeness' already suggests that a list of items is not exhaustive in that it covers all hospital activities. Indeed, exhaustiveness is not required if the selected case types are considered representative for a broad set of activities.

14. The following criteria were used to identify representative and comparable case types. They should:

- represent common procedures or diagnoses;
- account for a significant percentage of hospital expenditures;
- represent procedures which are likely to be the principal procedure within one hospitalisation (for surgical case types); and
- represent well-identified conditions (for medical case types).

15. Annex 1 contains the list of representative case types which were the object of this study. The selection is based on a list of inpatient case vignettes (Huber, 2007), on a proposal by the Expert group on procedures under the Hospital Data Project (Smedby, 2007), and on the list which is currently used at the OECD for Health Data collection (OECD, 2007). These tables also contain the International Classification of Disease (ICD) codes and rules used to select cases. If a country uses different coding systems, the initial tables were taken as a reference, and the national classification was mapped to the international classification. Table 1 reports a review of the coding and classification systems used across pilot countries.

16. Products are also categorized as "medical" and "surgical", the former being those cases for which no operating room procedure was reported to be performed. As the clinical practice might be different among countries and a procedure might be classified as "medical" in one country and "surgical" in a different country, the approach foresees the use of either the United States Agency for Health Care and Quality procedure classes[3] or the local Diagnosis Related Groups (DRG) classification taxonomy to cluster cases into surgical and medical.

3. The tool uses four classes: Minor Diagnostic - Non-operating room procedures that are diagnostic; Minor Therapeutic - Non-operating room procedures that are therapeutic; Major Diagnostic - All procedures considered valid operating room procedures by the Diagnosis Related Group (DRG) grouper and that are performed for diagnostic reasons; Major Therapeutic - All procedures considered valid operating room

17. The present study was initially conceived to cover both inpatient and outpatient treatments[4] and representative case types were defined for both types of treatment. In particular, 8 inpatient medical (IM), 21 inpatient surgical (IS), and 11 outpatient surgical (OS) case types were identified[5]. However, in the first two phases of the project reported here, the results for outpatient case types turned out to be implausible and more work has to be done in terms of the definition of case types and in terms of assessing the comparability of the price data collected. As a consequence, this paper only reports results for inpatient case types.

18. We note in passing that the explicit distinction between inpatient and outpatient case types implies that inpatient and outpatient services are considered different products. While plausible in some ways, this also means that our methodology is not able to capture price differences that are due to the fact that an inpatient treatment has been substituted by an outpatient treatment or vice versa. At this point it is not possible to quantify the extent of this possible bias.

The valuation: quasi-prices

19. It is rare that case types can be directly valued through free-standing costing studies and clinical trials with concurrent economic evaluation. A more promising avenue is to use secondary data sets available through health administrations and national insurance funds for purposes of reimbursement and health financing. For the present study, these data sets constitute the main source of information to price representative baskets of products.

20. The administrative data sets provide quasi-prices, the valuation used for case types. The term ‘quasi-prices’ comprises both negotiated prices and administered prices. The former are established through independent negotiations between purchasers/third party payers and providers, and are not necessarily directly tied to the cost of care. Among the countries participating in the present study, seven reported the use of negotiated prices, while seven indicated the use of administered prices. It is difficult to assess whether this generates a bias of any kind.

21. For instance, negotiated prices could include profit margins (or losses if some services are cross-subsidised by others). Administered quasi-prices, on the other hand, are likely to be reflective of average costs per product (Castelli, 2007; Triplett, 2003; Schreyer, 2008). Depending on the country, negotiated or administered prices form the basis for valuation. In the case of administered quasi-prices that typically reflect average costs of service provision, it is important that the scope of costs reflected in the administered price is similar across countries. As a general principle, countries were asked to verify that the full set of costs was reflected. These comprise compensation of employees, depreciation of capital, intermediate inputs, and taxes on production. Both costs relating to health services directly as well as overhead costs should be reflected. The full list of cost items is presented in Annex 1 Table A.1.3.

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procedures by the DRG grouper and that are performed for therapeutic reasons (http://www.hcup-us.ahrq.gov/toolssoftware/procedure/procedure.jsp).

4. An inpatient is a patient who is formally admitted (or 'hospitalised') to an institution for treatment and/or care and stays for a minimum of one night or more than 24 hours in the hospital or other institution providing inpatient care. Contrary to that, an outpatient is not formally admitted to the hospital (or other facility for inpatient care). An outpatient is thus a person who goes to a health care facility for a consultation/treatment, and who leaves the facility within several hours of the start of the consultation/treatment without being “admitted” to the facility as a patient.

5. Four case types were deleted on the basis of the results of the first pilot study: Inguinal Hernia, Aortic resection, replacement or anastomosis, Evacuation of subdural haematoma and intracranial haemorrhage, Extirpation, excision and destruction of intracranial lesion. For those cases, either a low number of cases and/or a high coefficient of variation both within and among countries were reported.

22. A feature of several reimbursement schemes is a deliberate separation between administered prices and the absolute but not the relative cost information on which they are based. Instead of reporting quasi-prices in absolute terms (monetary units), information is converted into a system of weights. This works like a points system, whereby a benchmark treatment is assigned a score of (say) 100 points, with more points for more costly hospitalizations and with fewer points for less costly cases. National and, in some countries, local policy-makers then decide/negotiate how much to pay per point (i.e. base rate) and, if necessary, can adjust this monetary value periodically to control global expenditure. For the purpose of the study at hand, in certain countries quasi-prices where thus obtained by converting reimbursement points into monetary values.

23. Quasi-prices, whether negotiated or administered, can be observed *ex-ante*, at the beginning of the accounting period, and in principle, a pure (quasi-)price comparison could be carried out on the basis of ex-ante values alone. However, it is preferable to use ex-post information which comprises not only the administered or negotiated quasi-prices but also other elements that determine the final quasi-price actually paid. For example, there may be small variations between patients in terms of their length of stay as a function of age or co-morbidity. Ex-post information also covers the number of cases actually treated, and the number of atypical cases. The number of cases is useful to generate weights and exclusion of atypical cases increases comparability of results. Thus, this study is based on ex-post information about quasi-prices and number of treatments.

24. In the practice of health administration, countries use either a top-down or a bottom-up[6] approach to arrive at quasi-prices (Mogyorosy et al, 2005; Tan et al, 2009). Under the top-down approach, the total costs of the health service is calculated and then disaggregated to the level of department or to the units of services. Under the bottom-up approach, all relevant components are defined at the most detailed level. This approach records resource utilisation at the patient or individual service level, and aggregates data to measure resource utilisation and to calculate costs of specific services. Both top-down and bottom-up practices exist among the countries that participated in the pilot study, confirming that "a universally accepted costing methodology does not currently exist in the healthcare sector" (Busse, 2008). However, there is some evidence that top-down and bottom-up costs tend to generate comparable estimates for the cost of inpatient admission (Chapko et al., 2008; Tan et al., 2009). We conclude therefore that the different ways of pricing health services (top-down or bottom-up) does not seriously impede comparability.

Linking quasi-prices to case types

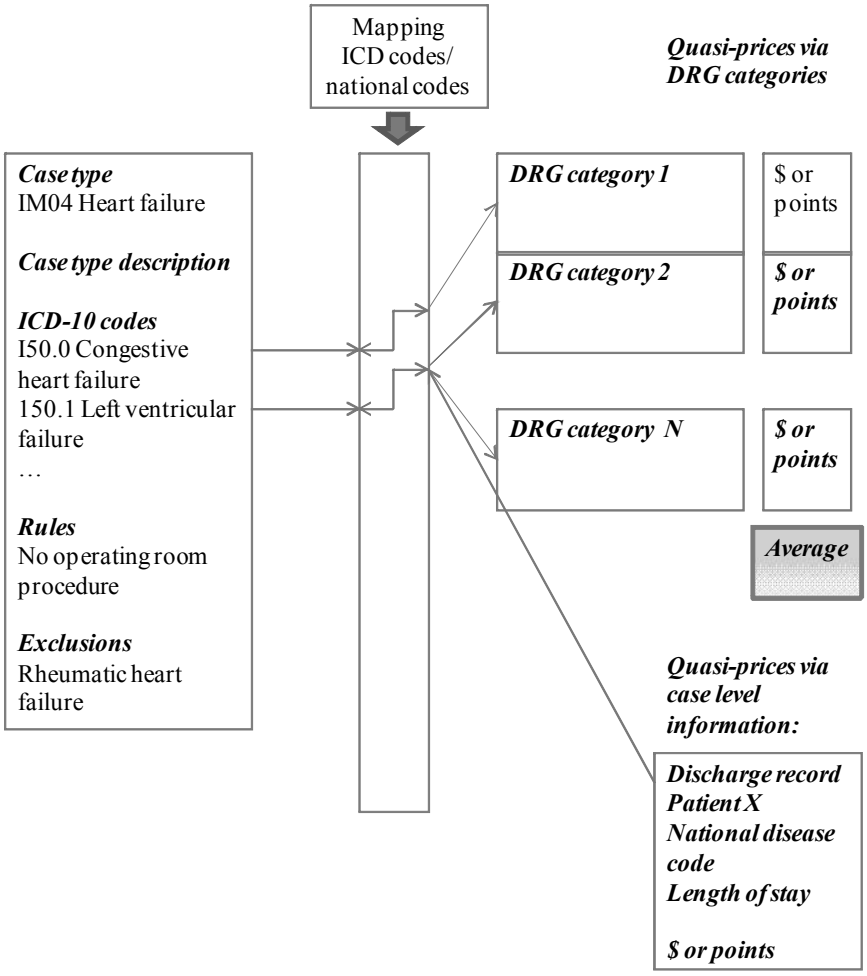
25. Depending on the country, there are two avenues for assigning a quasi-price to each of the case types in question. The two avenues are schematised in Graph 1 below. First, quasi-prices may be available at the level of individual patients, for instance when price or cost information is provided for each discharge from hospitals. In this case, the average quasi-price for each case type is simply estimated as the mean of the price of those discharges whose characteristics correspond to the codes and rules identified for each case type. As a general rule, the assignment of quasi-prices to case types at the patient level is the preferred method.

26. Second, quasi-prices may only be available at the level of categories of Diagnosis Related Groups (DRGs). DRGs are essentially a set of codes established on the basis of diagnoses, procedures, and patient characteristics such as age and sex. Every case of hospitalisation (the first method) can be matched to exactly one DRG but the converse is not normally true and one DRG often includes many cases of hospitalisation. DRGs are instrumental in the present exercise because each DRG is associated with a quasi-price or with an indication of costs or resource demands (referred to as "points" in the Graph below).

6. We prefer the labels 'top-down' and 'bottom-up' to 'gross costing' and 'micro-costing' which are also commonly used.

Unlike cases of hospitalisation which map relatively easily into the case types defined for our PPP comparison, the correspondence between case types and DRG-like categories is more complicated. As DRGs are based on national classifications, the match with case types is country-specific.

Graph 1.Two avenues to gather quasi-prices



27. For each country participating in the present study, the correspondence between each of the case types and the national DRGs was established through a qualitative evaluation of the taxonomy of the classification systems used by the individual country. This evaluation was the basis for attaching a value to products as follows:

- If the case type directly corresponds to a DRG category, the quasi-price attached to this DRG category becomes the value for the case type at hand.
- If the case type corresponds to more than one DRG, a weighted average of the quasi-prices of the target DRGs is used. The share of each target DRG in the total number of cases in the target DRGs forms the weights.
- If the case type is included in one DRG, and there are other diagnoses or procedures included in the same DRG, then the correspondence between case types and DRG-like categories is reviewed to decide whether the DRG is exclusive enough to be used in the study.

Coverage

28. Hospitals are included in the sample of the study if an average quasi-price by category or by patient was available. For hospitals in the sample, we included only acute care separations, that is, we excluded atypical and long stay cases. Atypical cases are defined as cases for which the "standard" profile of care is not followed because of death, sign-out, or transfer to other facilities. Long stay cases are cases with a number of days of stay higher than a set number of standard deviations from the mean for the specific case type.

Quality adjustment

29. Comparisons of prices or quasi-prices should take account of differences in quality of the service provided. There are two dimensions here: the quality of the medical service itself and the quality of ancillary services provided during a stay at the hospital (type of food, number of persons per room etc.). No attempt was made in the study at hand to introduce an explicit quality adjustment to the price comparisons – this reflects conceptual and empirical difficulties in producing such adjustments. Nor is there an attempt to account for the appropriateness of treatments – this is an important issue from the point of view of patients and payers but out of scope of the present work.

30. However, the definition of products in the form of case types provides for a certain degree of quality adjustment: case type definitions are such that only the same or very similar medical service are compared, including in terms of the procedures used to put them in place. This corresponds to the well-established technique of matched-model comparisons in price measurement over time. An in-depth discussion of quality adjustment issues in comparing health services can be found in Schreyer (2010).

PILOT STUDIES

31. Pilot studies were conducted in two rounds to test the feasibility of the above methodology. The first round pilot study was carried out between April and November 2008 in six countries: Australia, Canada, France, Korea, Norway and the United States. Fourteen countries took part in the second round: Australia, Canada, Finland, France, Germany, Israel[7], Italy, Korea, the Netherlands, Portugal, Slovenia, Sweden, the United Kingdom and the United States. The study was carried out between April and September 2009 and the results presented below reflect the outcome of the second round of pilot studies.

32. The OECD worked in collaboration with the Australian Institute of Health and Welfare, the Australian Government Department of Health and Ageing, the Canadian Institute for Health Information, the National Institute for Health and Welfare (Finland), the *Agence Technique de l'Information sur l'Hospitalisation* and the *Institut National de la Statistique et des Études Économiques* (France), the German Federal Statistical Office, the Ministry of Health (Israel), the Ministry of Health (Italy), the Yonsei University and the Health Insurance Review and Assessment Services (Korea), Statistics Netherlands, the Norwegian Directorate of Health and Statistics Norway, the *Instituto Nacional de Estatistica* (Portugal), Statistics Slovenia, Statistics Sweden and the National Board of Health and Welfare (Sweden), the Office of National Statistics (United Kingdom), and the Agency for Healthcare Research and Quality (United States).

7 The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Box 1. A note regarding the United States

Several specificities of the method used for the calculation of quasi-prices by product for the United States are worth noting.

Hospital costs: The pilot study uses estimates from the Nationwide Inpatient Sample (NIS), a database of hospital inpatient stays that represents the largest all-payer inpatient care database that is publicly available in the United States. It contains data from 5 to 8 million hospital stays from about 1,000 hospitals sampled to approximate a 20-percent stratified sample of U.S. community hospitals. The NIS records provide total charges. Then a file of hospital-wide, all payer, inpatient cost/charge ratios available from the Centers for Medicare and Medicaid services was applied to estimate costs.

Physician costs: Physician services are billed separately in the United States and had to be estimated separately. The average cost of separately billed physician services is calculated from the Marketscan[8] database. This database captures person-specific clinical utilization, expenditures, and enrollment across inpatient, outpatient, prescription drug, and carve-out services from approximately 45 large employers, health plans, and government and public organizations. The MarketScan Databases link paid claims and encounter data to detailed patient information across sites and types of providers, and over time. For inpatient cases, the Agency for Healthcare Research and Quality estimated the percentage add-ons in each DRG for physician services.

Length of stay outliers: It was not possible to exclude outliers in terms of the length of stay from the population under study. Therefore the median cost (instead of mean) by product was used to limit the impact of not excluding outliers. For the mean-to-median adjustment, the ratio of the mean cost to the median cost by category available from the Healthcare Cost and Utilization Project website was used. No adjustment was made to the physician cost component as this is not likely to be related to the length of stay.

33. As for the United Kingdom, work covered a review of institutional arrangements, available data sources and the methodology used in the U.K. The U.K Office of National Statistics (ONS) collected much of the required data but finally met a problem with the right mapping to and from the ICD classification. It was concluded that at this point results were not sufficiently comparable with other countries to be included in the set of hospital services price levels presented below. However, the ONS anticipates that it will be able to overcome the problem of mapping between classifications. Thus, with some further work, it will be possible to include figures for the U.K. in future rounds of calculation.

34. Table A.1.2 describes the main characteristics of the pilot studies by country in terms of sample, method of valuation, cost finding method, cost object, cost items exclusion, and number of products included in the analysis. This table allows a better understanding of the results of this exercise, in terms of limitations to comparability and possible uses of the estimates.

35. Regarding the sample, the number of hospitals and cases varies across countries. At one end, Korea, the Netherlands, Germany, Australia, Sweden, and Portugal cover almost the entire hospital population. At the lower end, Italy and France cover less than 10% of persons discharged from hospitals.

36. Long stay cases are defined as cases with the number of days of stay higher than 1.5 standard deviations from the case type-specific mean and these are excluded from the sample. Some countries used a different formula (e.g. Italy). For the United States it was not possible to exclude outliers and we used the median cost (instead of mean) by product to limit the impact of not excluding outliers in the population (see Box 1).

37. With respect to cost finding, a large number of the countries used a top-down approach. For France, Sweden, Korea and the Netherlands the approach used is similar to a bottom-up method. Most

8 MarketScan is a trademarked name held now by the Thomson-Reuters company.

countries used a full costing approach. Only for Norway consumption of fixed capital is not included in the estimates, while for Germany consumption of fixed capital and other costs which are not included in DRG-revenues are not included in the value reported. Hence for those two countries there is likely to be an underestimation of the values reported.

38. Seven countries used DRG-like categories as the reference for quasi-prices, while for Finland, France, Israel, Korea, the Netherlands, Sweden, and the United States data were available per hospital case.

39. The number of case types priced varies between countries according to the cost object used and to whether the DRG groups were exclusive enough to be included in the study. As to this latter point, the decision was made on an agreed threshold of at least 80 %[9] of cases within each DRG for which the selected diagnosis codes were assigned. Half of the countries reported the estimates for all products. Six countries reported only inpatient case type estimates, and covered – on average – almost two thirds of the products (54.2 % medical and 66.7 % surgical).

40. The availability of quasi-prices for outpatient surgical products proved to be limited in several countries. Moreover, for Australia and Portugal any cost data provided for the outpatient surgical case types are costs that have been sourced from and applied to inpatient data procedures only. These costs are not 'outpatient costs' so may not be indicative of the actual outpatient settings costs.

RESULTS OF THE PILOT STUDY FOR THE YEAR 2007

How results were compiled and how they should be interpreted

41. The key results of this study are the comparative price level indices for inpatient medical services, inpatient surgical services and total inpatient hospital services as shown in Table 1. Price levels are not reported for outpatient services as quasi-price availability and consistency were limited across pilot countries.

42. Before looking at the results, it is useful to link the methods for health PPPs to the general PPP methodology as explained in the introduction. The case types identified for health services take the role of products and quasi-prices play the role of market prices. Two types of products (inpatient medical services, inpatient surgical services) constitute the group of hospital services.

43. In PPP computations, it is generally difficult to obtain weights at the product level and therefore calculations are unweighted, that is each product within the group has the same weight when calculating average group prices. For products of hospital services (our case types) this practice is difficult to defend: the case types defined in our study are of quite distinct nature, each case type reflecting different degrees of severity and involving simple or complex technology, requiring intensive care or not. Moreover, as the cost and the frequency of each case type are different between countries and samples, it is preferable to use weights when case type information is aggregated into types and groups of products. The weights used in our calculation are defined as the total cost for the case type (quasi-price times number of cases) expressed as the percentage of the total cost for all case types. Quasi-prices and expenditure weights used in the calculation are reported in Annex 3.

9 The threshold was chosen by experts on the basis of their experience with analyzing casemix data.

Table 1 Comparative price levels for hospital services and GDP, 2007*

	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	Group
Inpatient Medical Services	122	125	91	140	158	60	37	90	65	112	173	100
Inpatient Surgical Services	124	113	99	114	132	65	66	81	56	116	163	100
Total Inpatient hospital services	123	113	98	121	140	62	57	85	59	114	164	100
GDP	104	101	118	112	103	120	73	83	79	121	90	100
Reference: per capita real GDP	115	118	108	99	95	82	81	69	81	113	142	100

** See Footnote 10, page 15*

44. Results were compiled for 12 countries[10]. They are expressed as indices, with the average for the group of countries set to equal 100. PPPs were computed so as to be invariant to the choice of the base country. Computation started with the United States as reference country, then comparative price levels (CPLs) were derived by dividing PPPs by market exchange rates, and the average of the group was calculated as the geometric mean of the CPLs of the different countries. This average was then set to equal 100 and each country's CPL expressed in relation to it. CPLs provide a measure of the difference in price levels between countries by indicating – for a given category or aggregate – the number of units of the common currency needed to buy the same volume of the category or aggregate. In our example, there is no common currency as such and results should be interpreted looking at the relativities between countries rather than looking at absolute levels. For example, the figures in Table 1 should be read as follows: in 2007, price levels for total inpatient hospital services in the United States stood at 163 % of the average price level of the group of countries and were therefore nearly 44 % (163 compared to 113) higher than in Canada.

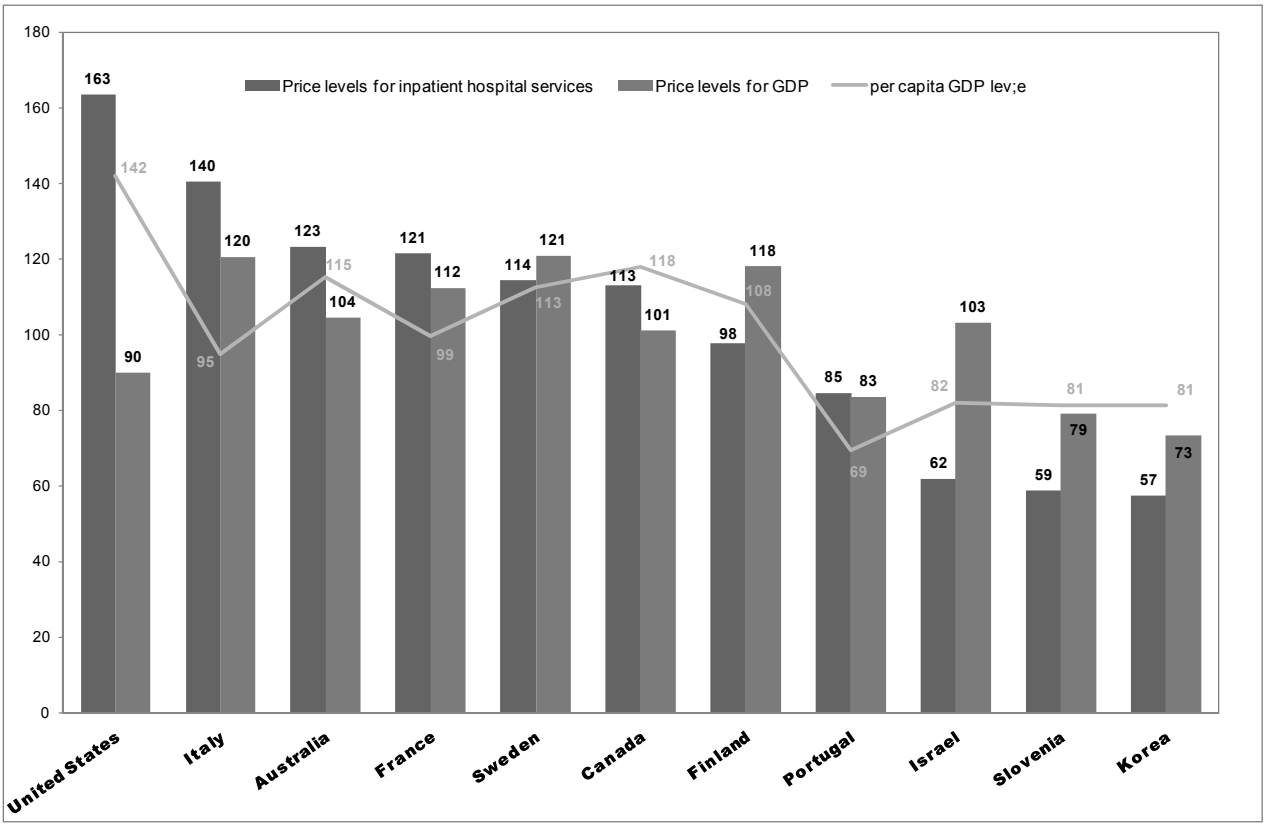
Significant spread of quasi-prices across countries and correlation with income levels

45. Comparative price levels depend on exchange rates and may be subject to large variations in line with exchange rate swings. A comparison between the CPLs for hospital services and the overall CPL yields an indication about the relative costs of each country's hospital services in comparison with other products, independent of market exchange rates. Graph 2 provides such a comparison and complements it with each country's real income per person, measured as GDP per capita.

46. As can be seen from Table 1 and Graph 2, comparative price levels for hospital services (total inpatient) range from 57 (Korea) to 164 (United States). Italy, Australia, France, Sweden, and Finland have relatively high price levels – and constitute a group of countries that also features high price levels for GDP as a whole. The lowest price levels are observed in countries with relatively low income and price levels like Portugal, Slovenia and Korea. Particularly low hospital services price levels compared to GDP price levels were found for Israel. The most striking figures are for the United States where hospital price levels are extremely high (164) when compared to the GDP price level (90). Thus, in the United States, the relative price of hospital services over all goods and services is significantly higher than in other countries in the sample.

10 Norway and Germany were excluded as consumption of fixed capital was not included in the quasi-price estimates (see paragraph 37 above). Results for the Netherlands are not shown here to account for the fact that the Dutch correspondents have not been able to complete the full verification of the data submitted. However, the group average includes the Netherlands.

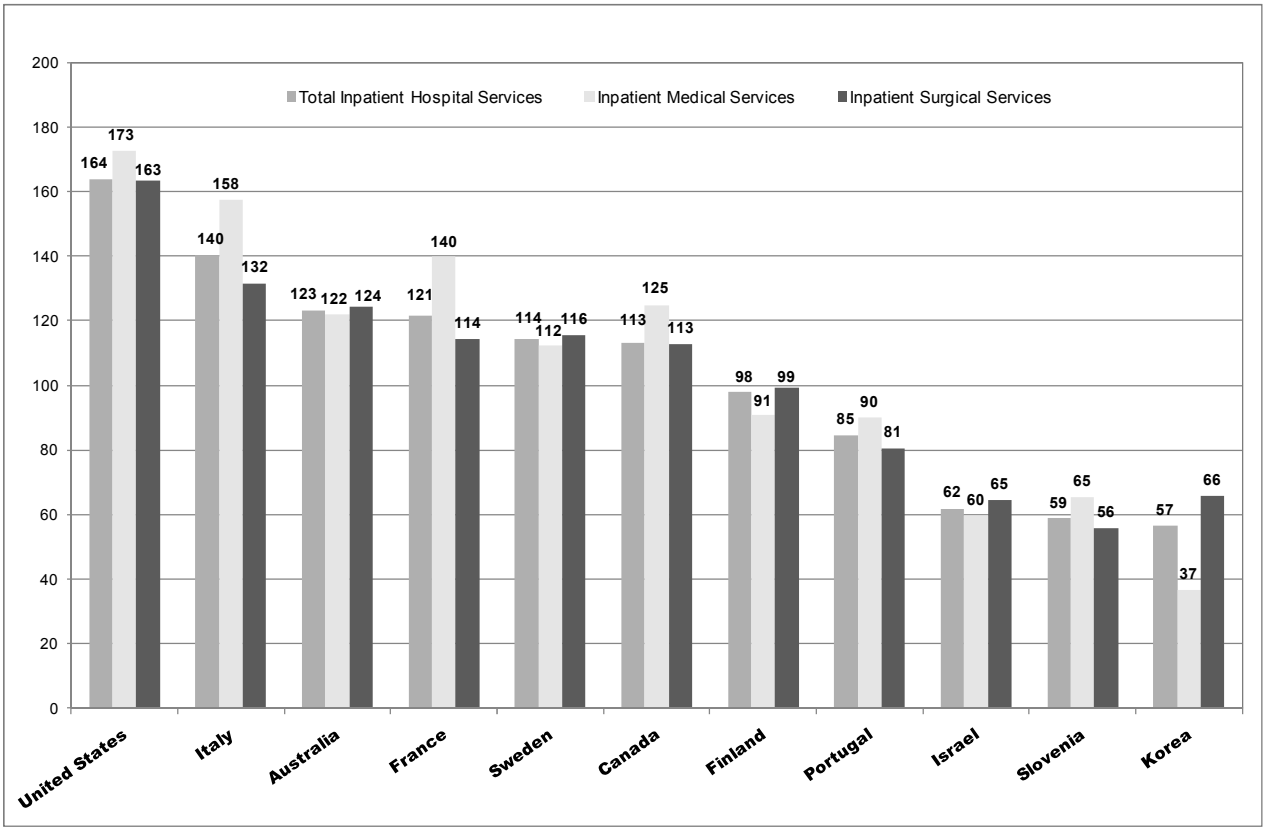
Graph 2. Comparative price levels for total hospital services and GDP, 2007



Similar results for medical and surgical inpatient services

47. Price levels tend to be quite similar for inpatient surgical and inpatient medical services (see Graph 3). The rankings are nearly the same for the two categories with the striking exception of Korea. In the Korean case, the exceptionally long average stay for surgical interventions explains the large discrepancy between Korea's CPL for medical services as opposed to the CPL for surgical services. Despite the similar CPL for surgical services, data are more widely spread for inpatient medical services. It is worth noting that the value share (weight) of surgical services is much more important than the value share of medical services and largely explains the CPLs for total inpatient hospital services. In most cases, surgical cost represents more than 70 % of the total costs of hospital services (see table A3.6).

Graph 3. Comparative price levels by category, 2007



Consistency of results within categories

48. Whether hospital services are weighted or un-weighted in the computation process seems to have a limited impact on the overall CPLs of hospital services (Graph 4). Results also indicate consistency and a relatively low spread of price levels within categories: if the overall (average) hospital CPL is high in a country, this is also true for most of the individual case types. This is confirmed through a fairly low coefficient of variation (standard deviation expressed as a percentage of the arithmetic mean) of the CPLs (Table 2). The coefficient is country and category specific. It measures the variation of price levels among the case types for a particular country priced for a particular category. The lower the value, the more uniform are the country's price levels within the category. It provides a rough estimate of the reliability of CPL specific to the country for the category.

Graph 4. Comparative price levels with and without product weights, 2007

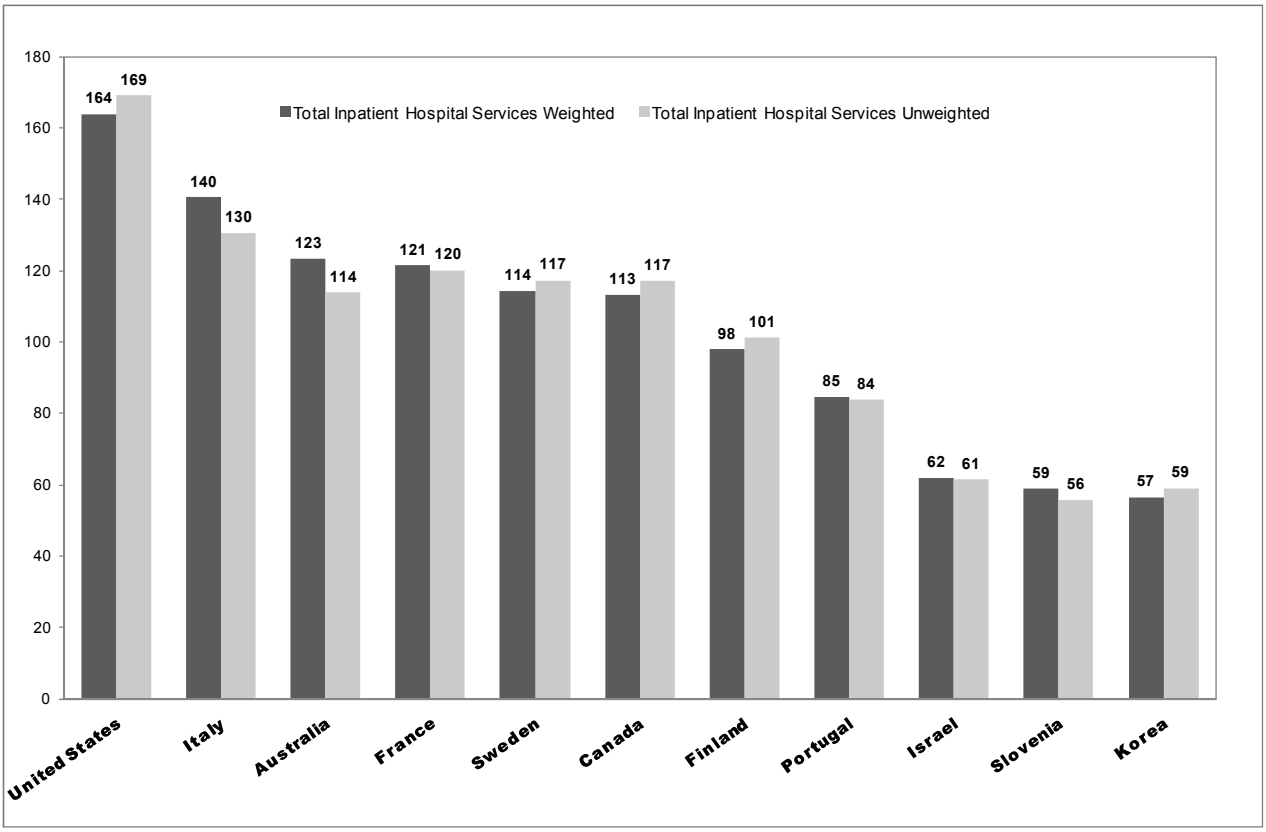


Table 2. Coefficients of variation of comparative price levels*

	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	Group
Inpatient Medical Services	19	0	21	20	15	25	20	26	11	16	16	19
Inpatient Surgical Services	26	15	29	14	22	29	28	23	21	15	24	27
Total Inpatient hospital services	26	15	28	16	26	28	36	27	20	16	22	25

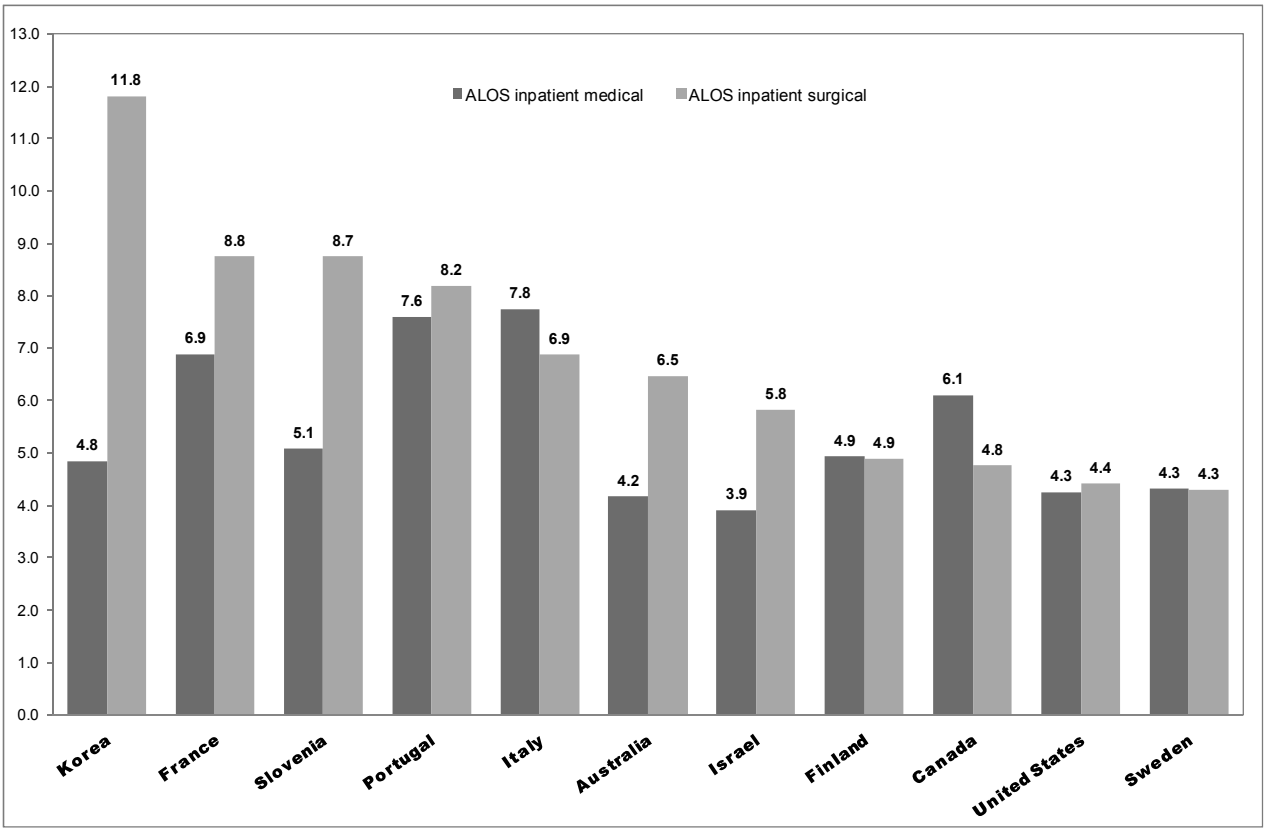
** See Footnote 10, page 15*

Large variations in costs per hospital day and average length of stay

49. The average length of the stay (ALOS) measured in days is lowest in Nordic countries (Finland and Sweden), in the United States and Australia, and highest in Korea for surgical services. The ALOS is also very high in Italy and Portugal (see Graph 5). On average, we observe a larger difference for surgical cases as compared to medical cases across countries.

50. The differences across countries reported by category are observed also at product level (see table A3.2). This means that the institution and the services offered by the institution and the clinical practice at country level are likely to be important factors in explaining the aggregate differences in the length of hospital stay.

Graph 5. Average length of stay by category (in days), 2007



51. Table 3 shows price levels calculated *per day* of a hospital stay. Thus, the results control for country differences in the average length of stay. For some countries, the resulting quasi-prices per day turn out to be quite different from the total price levels. Price levels for inpatient surgical services are much higher per day for countries like Australia, Canada, Finland, and Sweden (around 150) but much lower than the United States at 248. The OECD's 2009 *Health at a Glance* publication comments on the average length of stay in hospitals that it "… is often treated as an indicator of efficiency. All other things being equal, a shorter stay will reduce the cost per discharge and shift care from inpatient to less expensive post-acute settings. However, shorter stays tend to be more service-intensive and more costly per day. Too short a length of stay could also cause adverse effect on health outcomes, or reduce the comfort and recovery of the patient. If this leads to a rising readmission rate, costs per episode of illness may fall little." Note that the two explanations given can have very different implications for price comparisons. If shorter stays are caused by more services per day, then comparisons should be undertaken *without* controlling for the length of stay because a shorter stay signals greater efficiency. If, on the other hand there are reasons to believe that extra days of stay actually constitute a higher-quality treatment, or a larger volume of treatment, then controlling for the length of stay may be justified. No general statement can be made if the average length of stay differs because countries employ a different mix or sequence of inpatient and outpatient treatment. To address this issue, measures regarding a complete treatment would be required, an undertaking that runs into the difficulty of collecting data across institutions. The present study tried to deal with this question by defining case types that would typically be treated as inpatient everywhere. Overall, and weighing up the different arguments, it was decided to use Table 1 as the set of 'headline figures' that does not control for the length of stay.

Table 3. Comparative price levels per day, 2007*

	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	Group
Inpatient Medical	148	210	102	108	121	73	22	77	66	130	227	100
Inpatient Surgical	151	155	153	95	118	72	24	75	52	150	248	100
Total Inpatient hospital services	150	157	138	99	121	72	24	76	56	145	242	100

** See Footnote 10, page 15*

Results by case type

52. For a better understanding of the price differential between countries, it is necessary to review the results in detail. Table 4 reports an example of a comparison of the average unit price by country for two products: normal vaginal delivery without complications; and knee replacement.

Table 4. Average unit quasi-price by selected products by country. Nominal US$, 2007

	AUS	CAN	FIN	FRA	ISR	KOR	POR	SLV	SWE	USA	Coefficient of Variation
Normal delivery	2,984	2,801	1,521	2,894	1,856	1,056	1,266	1,482	2,591	4,451	45.7%
Knee replacement	14,608	9,912	9,936	12,424	8,272	9,222	10,319	7,652	10,348	14,946	22.9%

53. Annex 3 reports the basic tables used to compute CPL values: Table A3.1 reports the number of cases by case type and by country; Tables A3.2 and A3.3 show, respectively, the average length of stay and its coefficients of variation by case and by country[11]; Table A3.4 reports the average quasi-price by case type and by country in national currency, while table A3.5 reports those values in US$. This is a reference table that allows a first comparison of the values across countries. It is worth noting that Canada could estimate quasi-prices only for a subset of all case types. That is the reason why several cells of tables A3.4 and A3.5 are empty while the corresponding cells contain a value in the tables A3.1-A3.3. Table A3.6 reports the weights by case type by country. Table A3.7 reports the CPL by case type and by country. It also includes the average and coefficient of variation by product.

54. There are several instances where results turned out to be unusual – this may either reflect statistical shortcomings or particular circumstances in countries. At any rate, more investigation will be needed to pin down the reasons behind these observations:

- IS08 (Discectomy) for Australia has a CPL value of 216. In the DRG classification, discectomy codes are assigned to two different categories on the basis of the principal diagnosis: disease and disorders of the nervous system; and disease and disorders of the musculoskeletal system and connective tissue. The latter category was chosen for the study. The quasi-price for IS08 diminishes by 27% if the former is taken into account.

- The CPL of IS21 (Pulmectomy) for Finland has a value of 242. This might be due to the very low number of cases (six) which might not consistently represent the case type average quasi-price.

11 For Australia, France, and Germany coefficient of variations by product were not available.

- The CPLs of the selected medical case types for Italy are quite high. Here the use of 2005 quasi-price data deflated to 2007 may play an important role. In addition, the changes in the profiles of care for the service in study – e.g. decrease in length of stay, shift to outpatient care – might not be reflected in the figures used to feed the methodology.

- The CPL for IS22 (Repair of inguinal hernia) for the United States is 281. Again, the selection criteria might be further refined by including a selection based also on the principal diagnosis codes. If we select cases on the basis of the DRG – taking into account both principal diagnosis and procedure – the median quasi-price is 5,920 US$ (as compared to 8,917 US$).

CONCLUSIONS AND NEXT STEPS

55. The general conclusion from the two pilot studies is that the proposed method is a feasible way of compiling prices for hospital services for a broad number of OECD countries. Using routinely collected administrative information through secondary databases to estimate quasi-prices for a representative set of health products has the advantages of larger sample size, greater external data validity and limited costs of collecting data as compared to primary data collection.

56. The approach used in our pilot study limits the possible bias arising from differences in coding and patient classification systems between countries, in two ways. The first has to do with the definition of case types: product identification via ICD codes along with a verbal description of the case types allowed us to select the diagnoses and procedure codes in each country that best matched this definition. The second reason why differences in national coding systems should have limited impact on the comparability of results is the use of quasi-prices via DRG data. The correspondance between case types and DRGs for countries where only an average cost at DRG level is available, allowed an evaluation of whether the DRG categories were exclusive enough to be included in the study.

57. Several lessons have been learned from the work carried out with pilot countries.

- The time required to carry out the study in each particular country depends on the diagnoses and procedure codes used in that country, the availability of the diagnosis and procedure codes mapping tables, and the cost object (patient versus group). The effort to identify codes is a one-off investment and needs to be revised only if product definitions change over time and/or local diagnoses and procedures codes are updated.

- The study confirms that data are much more likely to be available if the payment system is linked to providers' activities, as this makes detailed cost information available which can be used to feed the PPPs comparison. The pilot study also confirmed that it is likely that the more the case types correspond to a DRG category, the more likely it is that average costs will be available to feed the methodology.

- For spatial analyses, it is important to assess the incidence of profit margins when comparing across countries. Whether there are profit margins and whether they are sizeable or not, depends on each country's institutional arrangements and on the precise definition of the costs of capital. When national accounts data on health expenditure reflects total revenues, the appropriate quasi-price for deflation of these expenditures is average revenues. Otherwise, and for direct comparisons of average costs, they are the appropriate measure of quasi-prices.

- The hospital-PPP pilot study provides a first measure of quality through the differentiation of services by case type. In other words, products of different quality are treated as different products. The validity of this assumption may have to be reassessed, particularly when

sufficiently homogeneous service products cannot be identified in all countries, and when different technologies are available and used to provide health care.

- To improve comparisons, it might be necessary to propose an approach that takes into account that several of the conditions and procedures might be also outpatient or same day stays, rather than only inpatient admission.

58. Key findings of the pilot study seem to be in line with less systematic evidence from other sources, in particular:

- hospital services in the United States turn out to be significantly more costly than in the other countries considered in this study;

- on the other end of the scale figure Korea and Israel with price levels around 60% of the average of all countries;

- for the 12 countries under consideration, price level differences cannot be explained by differences in the average length of stay – rather, high-priced countries also exhibit high prices per day of hospitalisation.

59. There is however still a need to refine the methodology, and to develop an alternative approach for countries where the available data does not allow following the standard approach. Also, the methodology has to be expanded to cover PPPs for the services of mental health and speciality hospitals, nursing and residential care facilities. These and other developments will be undertaken in co-operation and with the active support of Eurostat.

60. Also, PPP results need to be translated into volume measures of health services. This requires a set of expenditure data from the national accounts that are consistent with the present framework for health PPPs. Such consistency (for example with regard to classifications) is important otherwise deflating health expenditure with health PPPs will give rise to biased measures of the volumes of health services across countries.

61. Finally, it has to be stressed that the present results are still of an experimental nature. As other countries join in, and as participating countries improve on the available data, results will be revised and improved. Thus, the results at hand should be interpreted with caution. But it is also hoped that even in their preliminary form they are of interest to analysts and policy makers.

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ANNEX 1: MAIN CHARACTERISTICS OF THE PILOT STUDY BY COUNTRY

Table A.1.1 Coding and patient classification systems used across pilot countries

Country	*Diagnosis*	*Procedures*	*Classification system*
Australia	ICD-10-AM	ICD-10-AM	Australian Refined-DRG
Canada	ICD-10-CA	CCI	Case Mix Groups +
Finland	ICD-10	NCSP	Nord-DRG
France	ICD-10	CCAM	*Groupes Homogènes de Malades*
Germany	ICD-10	OPS	German DRG
Israel	ICD-9-CM	ICD-9-CM	Local DRG
Italy	ICD-9-CM	ICD-9-CM	United States Medicare DRG
Korea	ICD-10	Local system	Korean DRG
Netherlands	ICD-9-CM	Local systems	*Diagnose Behandeling Combinatie* (DBC)
Norway	ICD-10	NSCP-N	Nord-DRG
Portugal	ICD-9-CM	ICD-9-CM	All-Patient DRG
Slovenia	ICD-10	KTDP	DRG
Sweden	ICD-10	NCSP-N	Nord-DRG
United Kingdom	ICD-10	OPCS	Healthcare Resource Groups
United States (Medicare)	ICD-9-CM	ICD-9-CM	Medicare Severity DRG

ICD: International Classification of Disease; CM: Clinical Modification

ACHI: Australian Classification of Health Interventions; CCAM: *Classification Commune des Actes Médicaux*; CCI: Canadian Classification of Intervention; NCSP: NOMESCO Classification of surgical procedures; OPCS: Office of Population, Censuses and Surveys Classification of Interventions and Procedures; OPS: Classification of Surgical and Medical Procedures.

Table A.1.2 Main characteristics of the pilot study by country

Country	Sample	Method of valuation	Cost object	Cost items excluded	Number of products
Australia	241 hospitals 89.4% of total public discharges	Administered price	DRG-like category	None	8 Inpatient Medical (IM) 21 Inpatient Surgical (IS)
Canada	568 hospitals	Administered price	DRG-like category	None	1 IM 18 IS
Finland	7 hospitals 22.2% of discharges	Administered price	Case of hospitalisation	None	8 IM 21 IS
France	41 hospitals 9.2 % of total discharges	Administered price	Case of hospitalisation	None	8 IM 21 IS
Germany	1684 hospitals 96.7% of discharges	Negotiated price	DRG-like category	Consumption of fixed capital	7 IM 10 IS
Israel	26 hospitals 80% of discharges	Administered price	Case of hospitalisation	None	8 IM 21 IS
Italy	29 hospitals 7.6% of discharges	Administered price	DRG-like category	None	4 IM 8 IS
Korea	1053 general hospitals	Negotiated price	Case of hospitalisation	None	7 IM 20 IS
Netherlands	All hospital cases	Negotiated price	Case of hospitalisation	None	1 IM 18 IS

Table A.1.2 Main characteristics of the pilot study by country (continued)

Country	Sample	Method of valuation	Cost object	Cost items excluded	Number of products
Norway	21 hospitals	Administered price	DRG-like category	Consumption of fixed capital	5 IM 9 IS
Portugal	81 hospitals All discharges	Negotiated price	DRG-like category	None	8 IM 21 IS
Slovenia	22 hospitals	Negotiated price	DRG-like category	None	8 IM 21 IS
Sweden	89 hospitals All inpatient cases	Negotiated price	Case of hospitalisation	None	8 IM 21 IS
United States	1000 community hospitals 20% of total discharges	Negotiated price	Case of hospitalisation	None	8 IM 21 IS

Table A.1.3 Cost categories

Resource Macro Category	*Resource Micro Category*
Overhead: medical Infrastructure	Laundry
	Sterilization
	Patient Transports (within the hospital)
	Food Service (to patients)
	Other (includes patient transports outside the hospital, staff transports, and transportation of samples/blood)
	Total Overhead: medical infrastructure
Overhead: non-medical infrastructure	Administrative Staff
	Cleaning
	Security
	Gardening
	Desk Officers
	Telephone
	Printing and Stationery
	Rent
	Taxes
	Energy
	Water
	Waste Disposal
	IT/IS Services
	Building Maintenance
	Equipment Maintenance
	Total Overhead: non-medical infrastructure
Capital	Consumption of fixed capital
Research and development	Research and Development
Direct: compensation of employees	Medical Staff
	Nursing Staff
	Technical Staff
	Administrative Staff
Direct: goods and services	Medical and Surgical Equipment[12]
	Laboratory Equipment[13]
	Disposables[14]
	Drugs
	Medical Gases
	Dressings
	Prosthesis

12 Medical and surgical equipment includes small tools, that is goods that may be used repeatedly, or continuously, in production over many years but may nevertheless be small, inexpensive and used to perform relatively simple operations.

13 Laboratory equipment includes small tools, that is goods that may be used repeatedly, or continuously, in production over many years but may nevertheless be small, inexpensive and used to perform relatively simple operations.

14 This category includes Medical and surgical supplies.

ANNEX 2 - LIST OF PRODUCTS USED IN THE PILOT EXERCISE

IM01, Acute Myocardial Infarction

Case type description	This case type relates to either newly diagnosed myocardial infarction or episode of care following the initial episode when the patient is admitted for further observation, evaluation or treatment for a myocardial infarction that has received initial treatment, but is still less than 8 weeks old. It includes: Coronary (artery) embolism, occlusion, rupture, thrombosis; Infarction of heart, myocardium, or ventricle; Rupture of heart, myocardium, or ventricle; and ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction.
ICD-10 codes	I21.0, Acute transmural myocardial infarction of anterior wall I21.1, Acute transmural myocardial infarction of inferior wall I21.2, Acute transmural myocardial infarction of other sites I21.3, Acute transmural myocardial infarction of unspecified site I21.4, Acute subendocardial myocardial infarction I21.9, Acute myocardial infarction, unspecified I22.0, Subsequent myocardial infarction of anterior wall I22.1, Subsequent myocardial infarction of inferior wall I22.8, Subsequent myocardial infarction of other sites I22.9, Subsequent myocardial infarction of unspecified site
Rules	No operating room procedure is performed
Inclusion	
Exclusion	

IM02, Angina pectoris

Case type description	This case type includes both stable and unstable angina. Stable angina is chest pain or discomfort that typically occurs with activity or stress. The pain usually begins slowly and gets worse over the next few minutes before going away. It quickly goes away with medication or rest, but may happen again with additional activity or stress. Unstable angina is a condition in which the heart doesn't get enough blood flow and oxygen. It is a prelude to a heart attack.
ICD-10 codes	I20.0, Unstable angina I20.1, Angina pectoris with documented spasm I20.8, Other forms of angina pectoris I20.9, Angina pectoris, unspecified
Rules	No operating room procedure is performed
Inclusion	
Exclusion	

IM03, Cholelitiasis

Case type description	This case type identifies cases with presence or formation of gallstones in the gallbladder or bile ducts. This can cause severe upper right abdominal pain radiating to the right shoulder, as a result of blocked bile flow.
ICD-10 codes	K80.0, Calculus of gallbladder with acute cholecystitis K80.1, Calculus of gallbladder with other cholecystitis K80.2, Calculus of gallbladder without cholecystitis K80.3, Calculus of bile duct with cholangitis K80.4, Calculus of bile duct with cholecystitis K80.5, Calculus of bile duct without cholangitis or cholecystitis K80.8, Other cholelithiasis
Rules	No operating room procedure is performed.
Inclusion	
Exclusion	

IM04, Heart failure

Case type description	Heart failure occurs when the heart cannot pump enough blood to meet the body's needs, and it typically develops after other conditions have weakened or damaged the heart. Considered a chronic condition, it tends to develop slowly over time. However, patients may experience a sudden onset of symptoms, which is known as acute heart failure. Congestive heart failure is defined as blood backing up into the liver, abdomen, lower extremities, and lungs.
ICD-10 codes	I50.0, Congestive heart failure I50.1, Left ventricular failure I50.9, Heart failure, unspecified
Rules	No operating room procedure is performed.
Inclusion	
Exclusion	Hypertensive heart failure Rheumatic heart failure

IM06, Malignant neoplasm of breast

Case type description	Breast cancer is a malignant tumor that starts from cells of the breast. The disease occurs almost entirely in women, but men can get it, too.
ICD-10 codes	C50.0, Malignant neoplasm of breast - Nipple and areola C50.1, Malignant neoplasm of breast - Central portion of breast C50.2, Malignant neoplasm of breast - Upper-inner quadrant of breast C50.3, Malignant neoplasm of breast - Lower-inner quadrant of breast C50.4, Malignant neoplasm of breast - Upper-outer quadrant of breast C50.5, Malignant neoplasm of breast - Lower-outer quadrant of breast C50.6, Malignant neoplasm of breast - Axillary tail of breast C50.8, Malignant neoplasm of breast - Overlapping lesion of breast C50.9, Malignant neoplasm of breast - Breast, unspecified
Rules	No operating room procedure is performed.
Inclusion	
Exclusion	Carcinoma in situ of breast

IM07, Malignant neoplasm of bronchus and lung

Case type description	Primary malignant neoplasm arising from the cells of the bronchus, or lung
ICD-10 codes	C34.0, Malignant neoplasm of bronchus and lung - Main bronchus C34.1, Malignant neoplasm of bronchus and lung - Upper lobe, bronchus or lung C34.2, Malignant neoplasm of bronchus and lung - Middle lobe, bronchus or lung C34.3, Malignant neoplasm of bronchus and lung - Lower lobe, bronchus or lung C34.8, Malignant neoplasm of bronchus and lung - Overlapping lesion of bronchus and lung C34.9, Malignant neoplasm of bronchus and lung, unspecified
Rules	No operating room procedure is performed.
Inclusion	
Exclusion	Carcinoma in situ of bronchus and lung

IM08, Normal delivery

Case type description	Delivery requiring minimal or no assistance, with or without episiotomy, without fetal manipulation [e.g., rotation version] or instrumentation [forceps] of a spontaneous, cephalic, vaginal, full-term, single, live-born infant
ICD-10 codes	O80.0, Spontaneous vertex delivery O80.1, Spontaneous breech delivery O80.8, Other single spontaneous delivery O80.9, Single spontaneous delivery, unspecified
Rules	No operating room procedure is performed
Inclusion	
Exclusion	

IM09 Pneumonia

Case type description	Inflammation of one or both lungs, in which the air sacs (alveoli) become filled with liquid, which renders them useless for breathing. It is usually caused by bacterial (especially pneumococcal) or viral infection.
ICD-10 codes	J12.0, Adenoviral pneumonia J12.1, Respiratory syncytial virus pneumonia J12.2, Parainfluenza virus pneumonia J12.8, Other viral pneumonia J12.9, Viral pneumonia, unspecified J13, Pneumonia due to Streptococcus pneumoniae J14, Pneumonia due to Haemophilus influenzae J15.0, Pneumonia due to Klebsiella pneumoniae J15.1, Pneumonia due to Pseudomonas J15.2, Pneumonia due to staphylococcus J15.3, Pneumonia due to streptococcus, group B J15.4, Pneumonia due to other streptococci J15.5, Pneumonia due to Escherichia coli J15.6, Pneumonia due to other aerobic Gram-negative bacteria J15.7, Pneumonia due to Mycoplasma pneumoniae J15.8, Other bacterial pneumonia J15.9, Bacterial pneumonia, unspecified J16.0, Chlamydial pneumonia J16.8, Pneumonia due to other specified infectious organisms J18.0, Bronchopneumonia, unspecified J18.1, Lobar pneumonia, unspecified J18.2, Hypostatic pneumonia, unspecified J18.8, Other pneumonia, organism unspecified J18.9, Pneumonia, unspecified
Rules	No operating room procedure is performed
Inclusion	
Exclusion	Rheumatic pneumonia

IS02 Appendectomy

Case type description	Procedure to surgically remove appendix through laparoscopic intervention or traditional appendectomy.
ICD-9-CM codes	47.01, Laparoscopic appendectomy 47.09, Other appendectomy 47.11, Laparoscopic incidental appendectomy 47.19, Other incidental appendectomy
Rules	Any principal diagnosis code
Inclusion	Incidental appendectomy
Exclusion	

IS03 Caesarean section

Case type description	Procedure where a baby is delivered by cutting through the front wall of the abdomen to open the womb. It can be performed as a planned procedure, where the medical need for the operation becomes apparent during pregnancy; an emergency procedure, where a situation arises during labour that calls for urgent delivery of the baby; or an elective procedure, on the basis of personal choice rather than as a result of medical risk
ICD-9-CM codes	74.0, Classical cesarean section 74.1, Low cervical cesarean section 74.2, Extraperitoneal cesarean section 74.4, Cesarean section of other specified type 74.99, Other cesarean section of unspecified type
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS04 Cholecystectomy

Case type description	Cholecystectomy is the surgical removal of the gallbladder. It is the most common method for treating symptomatic gallstones. Surgical options include the standard procedure, called laparoscopic cholecystectomy, and an older more invasive procedure, called open cholecystectomy.
ICD-9-CM codes	51.21, Other partial cholecystectomy 51.22, Cholecystectomy 51.23, Laparoscopic cholecystectomy 51.24, Laparoscopic partial cholecystectomy
Rules	Any principal diagnosis code
Inclusion	Partial colecistectomy
Exclusion	

IS05 Colorectal resection

Case type description	A colorectal resection is a surgery to remove a section of the large intestine. It is done to remove injured or diseased parts of the colon.
ICD-9-CM codes	45.71, Multiple segmental resection of large intestine 45.72, Cecectomy 45.73, Right hemicolectomy 45.74, Resection of transverse colon 45.75, Left hemicolectomy 45.76, Sigmoidectomy 45.79, Other partial excision of large intestine 45.8, Total intra-abdominal colectomy 48.41, Soave submucosal resection of rectum 48.49, Other pull-through resection of rectum 48.5, Abdominoperineal resection of rectum 48.61, Transsacral rectosigmoidectomy 48.62, Anterior resection of rectum with synchronous colostomy 48.63, Other anterior resection of rectum 48.64, Posterior resection of rectum 48.65, Duhamel resection of rectum 48.69, Other resection of rectum
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS06 Coronary artery bypass graft

Case type description	A surgical procedure used to divert blood around narrow or clogged arteries (blood vessels). This improves blood flow and oxygen supply to the heart. CABG involves taking a blood vessel from another part of the body, usually the chest or leg, to use as a graft. The grafts replace any hardened or narrowed arteries in the heart. A surgeon will attach the new blood vessel to the coronary artery above and below the narrowed area or blockage.
ICD-9-CM codes	36.10, Aortocoronary bypass for heart revascularization, not otherwise specified 36.11, (Aorto)coronary bypass of one coronary artery 36.12, (Aorto)coronary bypass of two coronary arteries 36.13, (Aorto)coronary bypass of three coronary arteries 36.14, (Aorto)coronary bypass of four or more coronary arteries 36.15, Single internal mammary-coronary artery bypass 36.16, Double internal mammary-coronary artery bypass 36.17, Abdominal - coronary artery bypass 36.19, Other bypass anastomosis for heart revascularization
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS07 Defibrillator, insertion, revision, replacement, and removal

Case type description	An implantable cardioverter defibrillator (ICD) is a small battery-operated device. It is placed in the chest to monitors the heart's rhythm. If the heart begins to beat in a disorganized way, the device provides a shock. The shock is given to restore a normal rhythm. Automatic cardioverter defibrillator implantation is the surgical insertion of an (ICD).
ICD-9-CM codes	0.51, Implantation of cardiac resynchronization defibrillator, total system [CRT-D] 00.52, Implantation or replacement of transvenous lead [electrode] into left ventricular coronary venous system 00.54 Implantation or replacement of cardiac resynchronization defibrillator pulse generator device only [CRT-D] 37.94, Implantation or replacement of automatic cardioverter/defibrillator, total system [AICD] 37.95, Implantation of automatic cardioverter/defibrillator lead(s) only 37.96, Implantation of automatic cardioverter/defibrillator pulse generator only 37.97, Replacement of automatic cardioverter/defibrillator lead(s) only 37.98, Replacement of automatic cardioverter/defibrillator pulse generator only
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS08 Discectomy

Case type description	A discectomy is a surgical procedure in which the central portion of an intervertebral disc, the nucleus pulposus, which is causing pain by stressing the spinal cord or radiating nerves, is removed.
ICD-9-CM codes	80.50, Excision or destruction of intervertebral disc, unspecified 80.51, Excision of intervertebral disc 80.59, Other destruction of intervertebral disc
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS09 Endarterectomy: vessels of head and neck

Case type description	Endarterectomy is a surgical procedure to remove the atheromatous plaque material, or blockage, in the lining of an artery constricted by the buildup of soft/hardening deposits. It is carried out by separating the plaque from the arterial wall. The procedure is widely used on the carotid artery of the neck as a way to reduce the risk of stroke, particularly when the carotid artery is narrowed by more than 70%.
ICD-9-CM codes	38.11, Endarterectomy intracranial vessels 38.12, Endarterectomy other vessels of head and neck
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS12 Hip replacement: total and partial

Case type description	Hip replacement surgery provides a long term solution for worn or damaged hip joints which can cause severe pain and loss of mobility. The operation replaces both the natural socket (the acetabulum) and the rounded natural ball at the head of the thigh-bone (femur) with artificial parts (prosthetics).
ICD-9-CM codes	00.70, Revision of hip replacement, both acetabular and femoral components 00.71, Revision of hip replacement, acetabular component 00.72, Revision of hip replacement, femoral component 00.73, Revision of hip replacement, acetabular liner and/or femoral head only 81.51, Total hip replacement 81.52, Partial hip replacement 81.53, Revision of hip replacement, not otherwise specified
Rules	Any principal diagnosis code
Inclusion	Revision of hip replacement
Exclusion	

IS13 Hysterectomy: abdominal and vaginal

Case type description	A procedure where the womb (uterus) is surgically removed. Hysterectomies are performed to treat conditions that affect the female reproductive system, such as heavy menstrual bleeding (menorrhagia), non cancerous tumours (fibroids) and types of cancer.
ICD-9-CM codes	68.31, Laparoscopic supracervical hysterectomy [LSH] 68.39, Other and unspecified subtotal abdominal hysterectomy 68.41, Laparoscopic total abdominal hysterectomy 68.49, Other and unspecified total abdominal hysterectomy 68.51, Laparoscopically assisted vaginal hysterectomy (LAVH) 68.59, Other and unspecified vaginal hysterectomy 68.61, Laparoscopic radical abdominal hysterectomy 68.69, Other and unspecified radical abdominal hysterectomy 68.71, Laparoscopic radical vaginal hysterectomy [LRVH] 68.79, Other and unspecified radical vaginal hysterectomy 68.9, Other and unspecified hysterectomy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS14 Knee replacement

Case type description	In knee replacement surgery (arthroplasty) a damaged, worn or diseased knee is replaced with an artificial joint. Knee replacement is a routine operation for knee pain when the knee joint has been severely damaged, most commonly by arthritis. There are two main types of knee surgery, depending on the condition of the knee: total knee replacement and half (partial) knee replacement. Both are included in the case type defintion
ICD-9-CM codes	00.80, Revision of knee replacement, total (all components) 00.81, Revision of knee replacement, tibial component 00.82, Revision of knee replacement, femoral component 00.83, Revision of knee replacement, patellar component 00.84, Revision of total knee replacement, tibial insert (liner) 81.54, Total knee replacement 81.55, Revision of knee replacement,not otherwise specified
Rules	Any principal diagnosis code
Inclusion	Revision of knee replacement
Exclusion	

IS15 Lumpectomy, quadrantectomy of breast

Case type description	Quadrantectomy is a surgical procedure in which a "quadrant" (approximately one-fourth) of the breast, including tissue surrounding a cancerous tumor, is removed. It is also called a partial or segmental mastectomy. Lumpectomy is considered "breast-conserving" surgery because only the malignant tumor and a surrounding margin of normal breast tissue are removed. Lymph nodes in the armpit (axilla) may also be removed. This procedure is also called lymph node dissection.
ICD-9-CM codes	85.20, Excision or destruction of breast tissue, not otherwise specified 85.21, Local excision of lesion of breast 85.22, Resection of quadrant of breast 85.23, Subtotal mastectomy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS16 Mastectomy

Case type description	A mastectomy is an operation to remove the whole breast, usually because it has been affected by cancer. There are four types of mastectomy: Simple mastectomy (the removal of all the breast tissue and most of the skin covering it); Subcutaneous mastectomy (the removal of all the breast tissue, but leaving the skin covering it); Radical mastectomy (the removal of all the breast tissue, but leaving the skin covering it); modified radical mastectomy (similar to the radical mastectomy, except that the large muscle behind the breast is left in place)
ICD-9-CM codes	85.41, Unilateral simple mastectomy 85.42, Bilateral simple mastectomy 85.43, Unilateral extended simple mastectomy 85.44, Bilateral extended simple mastectomy 85.45, Unilateral radical mastectomy 85.46, Bilateral radical mastectomy 85.47, Unilateral extended radical mastectomy 85.48, Bilateral extended radical mastectomy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS17 Open prostatectomy

Case type description	Abnormalities of the prostate, such as a tumour, or if the gland itself becomes enlarged for any reason, can restrict the normal flow of urine along the urethra. Open Prostatectomy is a surgical procedure involving a skin incision and enucleation of the prostatic adenoma, through the prostatic capsule (RPP-retropubic prostatectomy) or through the bladder (SPP-suprapubic prostatectomy).
ICD-9-CM codes	60.3, Suprapubic prostatectomy 60.4, Retropubic prostatectomy 60.5, Radical prostatectomy 60.61, Local excision of lesion of prostate 60.62, Perineal prostatectomy 60.69, Other prostatectomy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS18 Pacemaker insertion, revision, replacement, and removal

Case type description	This is a procedure to insert, revise, replace, or remove an artificial pacemaker. A pacemaker is a small, battery-operated device. It helps maintain a normal heartbeat by sending electrical impulses to the heart.
ICD-9-CM codes	00.50, Implantation of cardiac resynchronization pacemaker without mention of defibrillation, total system [CRT-P] 00.52, Implantation or replacement of transvenous lead [electrode] into left ventricular coronary venous system 00.53, Implantation or replacement of cardiac resynchronization pacemaker pulse generator only [CRT-P] 37.70, Initial insertion of lead [electrode], not otherwise specified 37.71, Initial insertion of transvenous lead [electrode] into ventricle 37.72, Initial insertion of transvenous leads [electrodes] into atrium and ventricle 37.73, Initial insertion of transvenous lead [electrode] into atrium 37.74, Insertion or replacement of epicardial lead [electrode] into epicardium 37.75, Revision of lead [electrode] 37.76, Replacement of transvenous atrial and/or ventricular lead(s) [electrode] 37.77, Removal of lead(s) [electrode] without replacement 37.80, Insertion of permanent pacemaker, initial or replacement, type of device not specified 37.81, Initial insertion of single-chamber device, not specified as rate responsive 37.82, Initial insertion of single-chamber device, rate responsive 37.83, Initial insertion of dual-chamber device 37.85, Replacement of any type pacemaker device with single-chamber device, not specified as rate responsive 37.86, Replacement of any type of pacemaker device with single-chamber device, rate responsive 37.87, Replacement of any type pacemaker device with dual-chamber device 37.89, Revision or removal of pacemaker device
Rules	Any principal diagnosis code
Inclusion	
Exclusion	Insertion of temporary pacemaker

IS19 Percutaneous transluminal coronary angioplasty (PTCA)

Case type description	A procedure in which a small balloon at the tip of the catheter is inserted near the blocked or narrowed area of the coronary artery. When the balloon is inflated, the fatty plaque or blockage is compressed against the artery walls and the diameter of the blood vessel is widened (dilated) to increase blood flow to the heart.
ICD-9-CM codes	00.66, Percutaneous transluminal coronary angioplasty [PTCA] or coronary atherectomy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS20 Peripheral vascular bypass

Case type description	A peripheral vascular bypass, also called a lower extremity bypass, is the surgical rerouting of blood flow around an obstructed artery that supplies blood to the legs and feet. This surgery is performed when the buildup of fatty deposits (plaque) in an artery has blocked the normal flow of blood that carries oxygen and nutrients to the lower extremities. Bypass surgery reroutes blood from above the obstructed portion of an artery to another vessel below the obstruction. A bypass surgery is named for the artery that will be bypassed and the arteries that will receive the rerouted blood. The three common peripheral vascular bypass surgeries are: Aortobifemoral bypass surgery, which reroutes blood from the abdominal aorta to the two femoral arteries in the groin; Femoropopliteal bypass (fem-pop bypass) surgery, which reroutes blood from the femoral artery to the popliteal arteries above or below the knee; and Femorotibial bypass surgery, which reroutes blood between the femoral artery and the tibial artery.
ICD-9-CM codes	39.25, Aorta-iliac-femoral bypass 39.29, Other (peripheral) vascular shunt or bypass
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS21 Pulmectomy

Case type description	Each lung is made up of 2 or 3 sections, called lobes. A lobectomy is the surgical removal of one of these sections from the lung. Pneumonectomy is the medical term for the surgical removal of a lung.
ICD-9-CM codes	32.30, Thoracoscopic segmental resection of lung 32.39, Other and unspecified segmental resection of lung 32.41, Thoracoscopic lobectomy of lung 32.49, Other lobectomy of lung 32.5, Pneumonectomy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS22 Repair of inguinal hernia

Case type description	Inguinal hernia repair, also known as herniorrhaphy, is the surgical correction of an inguinal hernia. An inguinal hernia is an opening, weakness, or bulge in the lining tissue (peritoneum) of the abdominal wall in the groin area between the abdomen and the thigh. The surgery may be a standard open procedure through an incision large enough to access the hernia or a laparoscopic procedure performed through tiny incisions, using an instrument with a camera attached (laparoscope) and a video monitor to guide the repair
ICD-9-CM codes	53.00, Unilateral repair of inguinal hernia, not otherwise specified 53.01, Repair of direct inguinal hernia 53.02 ,Repair of indirect inguinal hernia 53.03, Repair of direct inguinal hernia with graft or prosthesis 53.04, Repair of indirect inguinal hernia with graft or prosthesis 53.05, Repair of inguinal hernia with graft or prosthesis, not otherwise specified 53.10, Bilateral repair of inguinal hernia, not otherwise specified 53.11, Bilateral repair of direct inguinal hernia 53.12, Bilateral repair of indirect inguinal hernia 53.13, Bilateral repair of inguinal hernia, one direct and one indirect 53.14, Bilateral repair of direct inguinal hernia with graft or prosthesis 53.15, Bilateral repair of indirect inguinal hernia with graft or prosthesis 53.16, Bilateral repair of inguinal hernia, one direct and one indirect, with graft or prosthesis 53.17, Bilateral inguinal hernia repair with graft or prosthesis, not otherwise specified
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS23 Thyroidectomy

Case type description	A thyroidectomy is an operation that involves the surgical removal of all or part of the thyroid gland. Surgeons often perform a thyroidectomy when a patient has thyroid cancer or some other condition of the thyroid gland (such as hyperthryroidism). Less extreme variants of thyroidectomy include hemithyroidectomy" (or "unilateral lobectomy") -- removing only half of the thyroid , and isthmectomy - removing the band of tissue (or isthmus) connecting the two lobes of the thyroid
ICD-9-CM codes	06.2, Unilateral thyroid lobectomy 06.31, Excision of lesion of thyroid 06.39, Other thyroidectomy 06.4, Complete thyroidectomy 06.50, Substernal thyroidectomy, not otherwise specified 06.51, Partial substernal thyroidectomy 06.52, Complete substernal thyroidectomy 06.6, Excision of lingual thyroid
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

IS24 Transurethral resection of prostate

Case type description	Transurethral resection of the prostate (also known as TURP) is a urological operation. It is used to treat benign prostatic hyperplasia (BPH). As the name indicates, it is performed by visualising the prostate through the urethra and removing tissue by electrocautery or sharp dissection. This procedure is done with spinal or general anesthetic. A large triple lumen catheter is inserted through the urethra to irrigate and drain the bladder after the surgical procedure is complete.
ICD-9-CM codes	60.21, Transurethral (ultrasound) guided laser induced prostatectomy (TULIP) 60.29, Other transurethral prostatectomy 60.96, Transurethral destruction of prostate tissue by microwave thermotherapy 60.97, Other transurethral destruction of prostate tissue by other thermotherapy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS01 Arthroscopic excision of meniscus of knee

Case type description	Knee arthroscopic surgery is a procedure performed through small incisions in the skin to repair injuries to tissues such as ligaments, cartilage, or bone within the knee joint area. The surgery is conducted with the aid of an arthroscope, a very small instrument guided by a lighted scope attached to a television monitor. Arthroscopic surgeries range from minor procedures such as flushing or smoothing out bone surfaces or tissue fragments (lavage and debridement) associated with osteoarthritis, to the realignment of a dislocated knee and ligament grafting surgeries
ICD-9-CM codes	80.26, Arthroscopy, knee + 80.6, Excision of semilunar cartilage of knee
Rules	Any principal diagnosis code. The two codes should be reported at the same time for the same case
Inclusion	
Exclusion	

OS02 Breast biopsy and other diagnostic procedures on breast

Case type description	A breast biopsy is the removal of breast tissue for examination by a pathologist. This can be accomplished surgically or by extracting, or withdrawing, tissue through a needle.
ICD-9-CM codes	85.11, Closed [percutaneous] [needle] biopsy of breast 85.12, Open biopsy of breast 85.19, Other diagnostic procedures on breast
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS03 Cataract surgery

Case type description	Extracapsular cataract extraction is a category of eye surgery in which the lens of the eye is removed while the elastic capsule that covers the lens is left partially intact to allow implantation of an intraocular lens. This approach is contrasted with intracapsular cataract extraction, an older procedure in which the surgeon removed the complete lens within its capsule and left the eye aphakic (without a lens)
ICD-9-CM codes	13.11, Intracapsular extraction of lens by temporal inferior route 13.19, Other intracapsular extraction of lens 13.2, Extracapsular extraction of lens by linear extraction technique 13.3, Extracapsular extraction of lens by simple aspiration (and irrigation) technique 13.41, Phacoemulsification and aspiration of cataract 13.42, Mechanical phacofragmentation and aspiration of cataract by posterior route 13.43, Mechanical phacofragmentation and other aspiration of cataract 13.51, Extracapsular extraction of lens by temporal inferior route 13.59, Other extracapsular extraction of lens 13.64, Discission of secondary membrane [after cataract] 13.65, Excision of secondary membrane [after cataract] Capsulectomy 13.66, Mechanical fragmentation of secondary membrane [after cataract] 13.69, Other cataract extraction 13.70, Insertion of pseudophakos, not otherwise specified 13.71, Insertion of intraocular lens prosthesis at time of cataract extraction, one-stage 13.72, Secondary insertion of intraocular lens prosthesis 13.8, Removal of implanted lens 13.90, Operation on lens, Not Elsewhere Classified 13.91, Implantation of intraocular telescope prosthesis
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS04 Colonoscopy and biopsy

Case type description	Colonoscopy is an endoscopic medical procedure that uses a long, flexible, lighted tubular instrument called a colonoscope to view the rectum and the entire inner lining of the colon (large intestine).
ICD-9-CM codes	45.23, Colonoscopy 45.24, Flexible sigmoidoscopy 45.25, Closed [endoscopic] biopsy of large intestine
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS05 Colposcopy

Case type description	Colposcopy is a procedure that allows a physician to examine a woman's cervix and vagina using a special microscope called a colposcope. It is used to check for precancerous or abnormal areas.
ICD-9-CM codes	70.21, Vaginoscopy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS06 Diagnostic bronchoscopy and biopsy of bronchus

Case type description	Bronchoscopy is a procedure in which a hollow, flexible tube called a bronchoscope is inserted into the airways through the nose or mouth to provide a view of the tracheobronchial tree. It can also be used to collect bronchial and/or lung secretions and to perform tissue biopsy.
ICD-9-CM codes	33.22, Fiber-optic bronchoscopy 33.23, Other bronchoscopy 33.24, Closed [endoscopic] biopsy of bronchus 33.26, Closed [percutaneous] [needle] biopsy of lung 33.27, Closed endoscopic biopsy of lung
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS07 Hysteroscopy

Case type description	Hysteroscopy enables a physician to look through the vagina and neck of the uterus (cervix) to inspect the cavity of the uterus with an instrument called a hysteroscope. Hysteroscopy is used as both a diagnostic and a treatment tool.
ICD-9-CM codes	68.12 ,Hysteroscopy 68.16, Closed biopsy of uterus
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS08 Ligation and stripping of varicose veins – lower limb

Case type description	Vein ligation and stripping is a surgical approach to the treatment of varicose veins. It is also sometimes called phlebectomy. Ligation refers to the surgical tying off of a large vein in the leg called the greater saphenous vein, while stripping refers to the removal of this vein through incisions in the groin area or behind the knee. If some of the valves in the saphenous vein are healthy, the weak portion of the vein can be closed off by ligation. If the entire vein is weak, it is closed off and pulled downward and out through an incision made below it. Tying and removal of the greater saphenous vein is done to reduce the pressure of blood flowing backward through this large vein into the smaller veins that feed into it.
ICD-9-CM codes	38.5, Ligation and stripping of varicose veins, lower limb veins
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS09 Needle biopsy of prostate

Case type description	A prostate needle biopsy is a surgical procedure in which a small sample of tissue is removed from the prostate gland and examined under the microscope by a pathologist, a doctor specializing in identifying disease through the study of cells, tissue and organs.
ICD-9-CM codes	60.11, Closed [percutaneous] [needle] biopsy of prostate
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS10 Proctoscopy and anorectal biopsy

Case type description	A rectal biopsy is a procedure to remove a small piece of rectal tissue for examin. Anoscopy is a method to view the rectal area, including the anus, anal canal, and lower rectum. Sigmoidoscopy is an internal examination of the lower large bowel (colon), using an instrument called a sigmoidoscope.
ICD-9-CM codes	48.23, Rigid proctosigmoidoscopy 48.24, Closed [endoscopic] biopsy of rectum 48.26, Biopsy of perirectal tissue 49.21, Anoscopy 49.22, Biopsy of perianal tissue 49.23, Biopsy of anus
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

OS11 Tonsillectomy and/or adenoidectomy

Case type description	Tonsillectomy is a surgical procedure to remove the tonsils. The tonsils are part of the lymphatic system, which is responsible for fighting infection. An adenoidectomy is the surgical removal of the adenoids—small lumps of tissue that lies in the back of the throat behind the nose.
ICD-9-CM codes	28.2, Tonsillectomy without adenoidectomy 28.3, Tonsillectomy with adenoidectomy 28.4, Excision of tonsil tag 28.6, Adenoidectomy without tonsillectomy 28.7, Control of hemorrhage after tonsillectomy and adenoidectomy
Rules	Any principal diagnosis code
Inclusion	
Exclusion	

ANNEX 3 – LIST OF TABLES WITH DATA USED IN THE PILOT STUDY

Table A.3.1 Number of cases by case type and by country, 2007

Code	Case	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	GER	NOR
IM01	Acute myocardial infarction	23339	17698	2013	1304	3840	5737	15727	7701	1447	15015	297521	74481	
IM02	Angina pectoris	37865	3258	1070	1892	1642	4613		3227	1834	9980	23417		
IM03	Cholelitiasis	16830	5076	648	3684	2477	9848	6471	6628	1657	4883	76382	22351	5295
IM04	Heart failure	33361	29950	2210	19826	10081	37022	8856	14610	3106	19667	774790	269216	8998
IM06	Malignant neoplasm of breast	2336	356	628	1665	311	2960	28533	1044	2656	1998	7534	53763	3130
IM07	Malignant neoplasm of bronchus and lung	13014	3699	761	8255	2387	3193	43279	4163	1194	4416	79434	152450	8621
IM08	Normal delivery	25808	22739	3506	43305	15635	45185	123786	19088	12144	26913	282439	62777	
IM09	Pneumonia	60288	35922	4333	19038	8827	27201	170652	38131	3918	22885	1046752	221028	26056
IS02	Appendectomy	20439	24433	1786	6108	3010	7756	69089	11050	1839	8880	293502	100634	4760
IS03	Caesarean section	55556	74972	3204	13467	41	22905	113534	27306	2790	17991	1451359	198385	9671
IS04	Cholecystectomy	25044	19589	1233	7613	4646	5922	20626	15880	4216	7460	372598	153563	6383
IS05	Colorectal resection	10595	21077	570	4043	1428	3381	4860	7350	1	5110	280959		
IS06	Coronary artery bypass graft	4388	10733	439	2656	732	2699	1899	2630	528	3730	192107	28494	2873
IS07	Defibrillator insertion, revision, replacement, and removal	2184	3051	109	1096	541			766	487	812	125030	21400	
IS08	Discectomy	962	4853	1298	2945	2446	924	40052	2630	513	3999	123387		
IS09	Endarterectomy: vessels of head and neck	1819	2532	77	40	1289	728	111	503	124	892	113390		
IS12	Hip replacement: total and partial	13810	26727	1748	8335	5484	2172	29949	7707	3057	18296	384497	159220	
IS13	Hysterectomy: abdominal and vaginal	14203	32999	1420	4301	333	2801	24940	11017	1082	7228	508943	82337	
IS14	Knee replacement	11699	36017	1260	2865	1869	1892	21173	4655	1255	8987	585500	140812	
IS15	Lumpectomy, quadrantectomy of breast	6804	4223	900	7873	253	2463	2866	4234	726	3516	11869		
IS16	Mastectomy	8567	7012	686	3239	414	725	6730	2771	273	1917	68211		1316
IS17	Open prostatectomy	16226	7159	177	2467	118	1077	147	2657	269	2467	86974		
IS18	Pacemaker insertion, revision, replacement, and removal	2253	1228	704	4406	593	2767	1173	5155	439	6405	192831		
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	17276	17459	463	13267	6842	10362	4268	7579	1097	15254	660217	10365	10300
IS20	Pheripheral vascular bypass	4389	3282	320	803	924	1077	793	1138	66	583	61568		
IS21	Pulmectomy	4047	5076	6	2501	613	475	2200	741	17	662	33178		
IS22	Repair of inguinal hernia	17187	10633	887	7139	1582	8087	25288	14333	3392	3917	32330		2183
IS23	Thyroidectomy	4162	8006	467	5175	281	1333	17231	4677	200	2123	46917		1125
IS24	Transurethral resection of prostate (TURP)	9071	13342	575	2570	1916	1714	2940	2330	537	4869	68241	58588	4103

Table A.3.2 Average length of stay by case type and by country, 2007

Code	Case	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	GER	NOR
IM01	Acute myocardial infarction	4.35	6.25	5.22	7.12	8.27	5.46	4.47	8.48	6.50	4.25	4.41	7.80	
IM02	Angina pectoris	2.32	2.68	4.05	4.07	4.48	3.03		1.76	3.14	1.96	1.94		
IM03	Cholelitiasis	3.04	3.79	3.14	6.15	7.27	3.80	5.64	7.01	4.96	2.97	3.72	5.10	3.98
IM04	Heart failure	6.41	7.32	7.03	9.16	8.46	4.19	8.51	9.57	8.76	5.13	4.93	10.70	5.80
IM06	Malignant neoplasm of breast	3.65	10.65	4.41	4.68	10.16	3.78	4.21	8.16	1.96	5.93	5.85	4.00	4.83
IM07	Malignant neoplasm of bronchus and lung	5.86	10.67	6.52	6.86	10.70	4.03	6.00	12.46	4.12	7.80	6.42	6.10	6.90
IM08	Normal delivery	2.02	1.65	3.00	4.52	3.12	2.59	3.15	2.72	3.81	1.96	1.90	3.20	
IM09	Pneumonia	5.68	5.83	6.12	9.73	9.59	4.41	6.77	10.63	7.43	4.61	4.88	9.30	6.64
IS02	Appendectomy	2.97	3.16	2.29	5.15	4.45	3.26	5.85	4.91	4.94	2.40	2.74	4.90	2.92
IS03	Caesarean section	4.84	3.29	4.73	7.67	6.90	5.08	6.65	4.61	8.30	3.95	3.60	7.20	6.00
IS04	Cholecystectomy	2.83	4.11	2.83	7.12	5.44	3.23	7.93	6.20	4.62	2.42	4.57	6.70	4.20
IS05	Colorectal resection	11.96	10.85	8.40	18.05	13.80	11.09	16.94	16.20	21.00	9.60	9.76		
IS06	Coronary artery bypass graft	9.38	10.05	9.06	15.00	13.05	10.65	15.45	12.81	14.66	7.33	9.36	11.70	9.05
IS07	Defibrillator insertion, revision, replacement, and removal	5.50	6.68	6.11	8.21	8.32			7.52	5.03	3.87	4.63	10.30	
IS08	Discectomy	7.96	2.67	3.40	5.66	4.79	4.18	11.79	5.96	8.14	4.44	2.15		
IS09	Endarterectomy: vessels of head and neck	5.15	3.12	3.77	9.59	4.52	5.06	20.42	8.27	8.18	3.91	2.55		
IS12	Hip replacement: total and partial	9.40	6.99	5.96	12.89	10.85	8.78	20.36	12.35	12.23	7.22	4.67	14.00	
IS13	Hysterectomy: abdominal and vaginal	4.02	3.01	2.15	6.41	5.05	5.59	7.30	5.93	9.00	4.00	2.57	7.00	
IS14	Knee replacement	7.18	4.69	5.28	11.22	9.38	8.09	20.05	10.47	11.47	6.00	3.64	14.10	
IS15	Lumpectomy, quadrantectomy of breast	1.15	1.54	1.53	3.45	3.48	1.66	5.63	3.45	3.50	1.40	2.84		
IS16	Mastectomy	2.92	2.04	2.43	6.82	4.64	4.06	11.48	6.97	9.82	2.36	2.21		4.36
IS17	Open prostatectomy	4.79	3.51	5.94	9.33	5.11	7.31	13.99	9.12	11.67	4.32	2.42		
IS18	Pacemaker insertion, revision, replacement, and removal	2.32	5.96	4.50	7.94	4.05	4.16	9.30	6.19	4.19	3.00	4.53		
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	3.32	3.94	2.99	5.13	5.58	3.70	9.39	6.01	4.79	2.54	2.70	4.00	2.45
IS20	Pheripheral vascular bypass	7.27	9.94	8.79	16.97	9.73	11.85	17.87	21.18	14.82	7.72	7.19		
IS21	Pulmectomy	34.12	6.93	15.50	13.38	12.85	8.54	16.19	10.36	12.76	7.60	8.50		
IS22	Repair of inguinal hernia	1.35	2.73	1.80	3.46	3.97	1.82	5.71	2.82	2.90	1.66	7.23		2.35
IS23	Thyroidectomy	2.30	1.90	1.74	3.75	3.58	3.89	6.69	3.92	3.64	1.86	1.88		3.60
IS24	Transurethral resection of prostate (TURP)	3.58	2.93	3.40	6.83	5.06	4.35	7.30	6.85	8.03	2.66	3.04	7.70	3.83

Table A.3.3 Coefficients of variation of the average length of stay, 2007

Code	Case	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	GER	NOR
IM01	Acute myocardial infarction		75.8	100.5		48.1	52.6	49.1	95.8	67.5	79.0	110.0		
IM02	Angina pectoris		76.1	128.5		62.8	67.0		195.2	87.2	83.0	85.0		
IM03	Cholelitiasis		99.8	98.9		62.0	63.4	68.6	86.4	73.0	88.0	96.0		104.6
IM04	Heart failure		83.0	91.6		52.6	65.8	68.4	88.9	57.3	82.0	98.0		118.0
IM06	Malignant neoplasm of breast		105.9	87.8		74.9	78.7	81.9	152.2	103.6	87.0	118.0		167.0
IM07	Malignant neoplasm of bronchus and lung		90.0	103.4		68.6	73.5	90.4	117.5	86.4	88.0	96.0		125.0
IM08	Normal delivery		44.0	50.0		27.2	31.9	17.5	36.6	24.1	60.0	33.0		
IM09	Pneumonia		103.0	99.6		61.1	64.6	44.9	106.2	58.2	76.0	96.0		81.5
IS02	Appendectomy		139.2	87.4		52.3	63.2	31.0	130.7	69.4	65.0	129.0		79.4
IS03	Caesarean section		42.5	64.7		159.1	33.6	15.7	76.5	83.8	43.0	88.0		73.1
IS04	Cholecystectomy		156.0	132.2		95.0	90.7	53.5	171.0	113.0	90.0	107.0		101.0
IS05	Colorectal resection		106.0	83.9		51.9	51.7	39.7	104.6		54.0	101.0		
IS06	Coronary artery bypass graft		87.9	69.6		45.0	48.1	39.7	102.3	74.0	30.0	84.0		57.8
IS07	Defibrillator insertion, revision, replacement, and removal		159.2	127.6		78.5			149.8	116.8	90.0	129.0		
IS08	Discectomy		164.8	90.3		60.4	64.4	51.4	146.9	94.6	62.0	148.0		
IS09	Endarterectomy: vessels of head and neck		173.7	94.0		53.8	61.1	36.4	114.6	99.8	40.0	136.0		
IS12	Hip replacement: total and partial		119.5	51.6		37.1	46.3	41.6	87.0	78.6	59.0	79.0		
IS13	Hysterectomy: abdominal and vaginal		76.5	80.0		45.9	39.9	26.4	103.0	52.4	52.0	98.0		
IS14	Knee replacement		71.3	44.0		41.4	35.8	41.4	66.5	73.2	39.0	55.0		
IS15	Lumpectomy, quadrantectomy of breast		232.5	84.5		97.1	49.4	65.2	118.1	101.1	60.0	147.0		
IS16	Mastectomy		145.1	71.1		56.8	53.4	42.2	58.8	65.8	60.0	137.0		80.2
IS17	Open prostatectomy		95.8	47.4		63.3	30.7	33.2	95.6	47.0	52.0	90.0		
IS18	Pacemaker insertion, revision, replacement, and removal		157.7	135.6		106.1	86.6	46.3	172.3	129.1	98.0	111.0		
IS19	Percutaneous transluminal coronary angioplasty (PTCA)		139.4	136.4		62.7	69.6	67.2	125.2	97.3	81.0	117.0		99.4
IS20	Pheripheral vascular bypass		138.0	78.8		55.2	91.2	48.5	101.5	87.1	54.0	110.0		
IS21	Pulmectomy		103.9	43.7		54.2	48.8	44.7	83.8	40.4	35.0	98.0		
IS22	Repair of inguinal hernia		65.4	142.9		145.1	87.0	78.9	150.5	86.3	68.0	273.0		77.0
IS23	Thyroidectomy		177.1	127.7		110.2	55.7	31.2	118.8	109.3	53.0	159.0		80.0
IS24	Transurethral resection of prostate (TURP)		228.2	71.9		44.4	43.5	40.8	84.9	72.0	58.0	135.0		71.9

Table A.3.4 Average unit quasi-prices in national currencies, 2007

Code	Case	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	GER	NOR
IM01	Acute myocardial infarction	5074		3772	3973	6054	12704	1091198	4557	2258	30682	7579	3379	
IM02	Angina pectoris	2479		2532	2197		8106		2410	1343	15245	3647		
IM03	Cholelitiasis	3013		1466	2889		6582	1125536	1761	1444	20001	5969	1665	30923
IM04	Heart failure	6095		2691	3809	4562	6804	1370783	3365	1834	28811	5696	2865	42889
IM06	Malignant neoplasm of breast	3889		2627	2502	5208	6660	1236655	3392	1201	29688	6947	1675	37572
IM07	Malignant neoplasm of bronchus and lung	6092		2559	3283		7247	1709125	2637	1940	43659	9086	2228	42493
IM08	Normal delivery	3566	3008	1111	2114		7623	981588	925	1083	17507	4451	1307	
IM09	Pneumonia	5757		2680	4810	3528	7095	907562	2410	1817	27709	5893	2560	45812
IS02	Appendectomy	6028	5375	2731	3330	4125	7089	1481692	2559	1567	33524	7962	2150	33456
IS03	Caesarean section	8476	5178	3512	4252		8223	1818703	1460	2274	43083	7449	2726	59168
IS04	Cholecystectomy	6711	6821	3276	5060	3949	13084	3423226	2979	1711	39494	10487	2723	63252
IS05	Colorectal resection	19904	15932	8653	12764		30133	6550429	7393	5251	104103	17289		
IS06	Coronary artery bypass graft	25934	24378	17143	16893		63624	15407512	12516	8971	143392	34358	10276	179367
IS07	Defibrillator insertion, revision, replacement, and removal	24462	27907	24559	20194	18168			22166	5168	204876	30348	19158	
IS08	Discectomy	16799	7422	3847	4031		27997	4149495	4612	2762	55003	8007		
IS09	Endarterectomy: vessels of head and neck	11305	9133	6205	8458		41641	6195191	5956	2984	68876	8371		
IS12	Hip replacement: total and partial	19025	12872	7914	8154		32659	8385207	7940	5572	78178	17406	6501	
IS13	Hysterectomy: abdominal and vaginal	8527	6168	2914	4684		11951	2773272	2102	2111	51445	7313	3041	
IS14	Knee replacement	17460	10646	7254	9076		33981	8571672	7538	5590	69935	14946	7313	
IS15	Lumpectomy, quadrantectomy of breast	2743		3158	3198	2661	8178	1887354	1732	960	32662	7801		
IS16	Mastectomy	6604	5859	3478	4871		13576	3705465	2515	2163	37502	9297		39619
IS17	Open prostatectomy	9027	8375	5806	6871		13933	4366365	3736	3868	70065	13025		
IS18	Pacemaker insertion, revision, replacement, and removal	7342	16803	7626	8052	4679	20619	9467814	5307	3818	50708	14495		
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	8522	9966	4072	5133	7351	32102	9530748	5845	2374	62823	14378	2445	44364
IS20	Pheripheral vascular bypass	23390	15357	13267	10804		40545	7780139	7919	4954	95556	16657		
IS21	Pulmectomy	18047		22427	12298		28926	7545711	5816	4520	104493	25200		
IS22	Repair of inguinal hernia	3697	4822	2121	2430	3672	7392	1845587	1933	940	27309	8917		28528
IS23	Thyroidectomy	7171	5424	3593	3546		8309	2588653	2656	1950	41401	7483		40960
IS24	Transurethral resection of prostate (TURP)	6261	4886	3056	3642	3999	8807	2002875	1664	1756	29756	6625	2727	33745

Table A.3.5 Average unit quasi-prices in US dollars, 2007

Code	Case	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	GER	NOR
IM01	Acute myocardial infarction	4245		5163	5439	8287	3093	1174	6238	3091	4540	7579	4626	
IM02	Angina pectoris	2074		3466	3007		1973		3299	1838	2256	3647		
IM03	Cholelitiasis	2521		2006	3955		1602	1211	2410	1976	2960	5969	2279	5536
IM04	Heart failure	5100		3684	5215	6245	1656	1475	4606	2511	4263	5696	3922	7678
IM06	Malignant neoplasm of breast	3254		3596	3425	7130	1621	1331	4643	1643	4393	6947	2293	6726
IM07	Malignant neoplasm of bronchus and lung	5097		3503	4495		1764	1839	3610	2655	6460	9086	3050	7607
IM08	Normal delivery	2984	2800	1521	2894		1856	1056	1266	1482	2591	4451	1789	
IM09	Pneumonia	4817		3669	6584	4830	1727	976	3299	2487	4100	5893	3504	8201
IS02	Appendectomy	5044	5004	3739	4558	5647	1726	1594	3502	2145	4961	7962	2943	5989
IS03	Caesarean section	7092	4820	4808	5820		2002	1957	1998	3113	6375	7449	3732	10593
IS04	Cholecystectomy	5615	6350	4484	6927	5406	3185	3683	4078	2343	5844	10487	3728	11324
IS05	Colorectal resection	16653	14831	11846	17473		7335	7048	10120	7188	15404	17289		
IS06	Coronary artery bypass graft	21698	22694	23468	23126		15488	16577	17133	12281	21218	34358	14067	32111
IS07	Defibrillator insertion, revision, replacement, and removal	20467	25980	33619	27644	24870			30343	7075	30316	30348	26226	
IS08	Discectomy	14055	6909	5267	5518		6815	4464	6313	3781	8139	8007		
IS09	Endarterectomy: vessels of head and neck	9458	8502	8494	11578		10136	6665	8153	4085	10192	8371		
IS12	Hip replacement: total and partial	15918	11983	10834	11162		7950	9022	10869	7628	11568	17406	8899	
IS13	Hysterectomy: abdominal and vaginal	7135	5742	3989	6412		2909	2984	2877	2889	7612	7313	4163	
IS14	Knee replacement	14608	9910	9931	12424		8272	9222	10319	7652	10348	14946	10011	
IS15	Lumpectomy, quadrantectomy of breast	2295		4323	4379	3642	1991	2031	2371	1314	4833	7801		
IS16	Mastectomy	5525	5455	4761	6668		3305	3987	3443	2960	5549	9297		7093
IS17	Open prostatectomy	7552	7797	7948	9405		3391	4698	5115	5296	10368	13025		
IS18	Pacemaker insertion, revision, replacement, and removal	6143	15643	10439	11023	6405	5019	10186	7265	5226	7503	14495		
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	7131	9277	5574	7027	10063	7814	10254	8001	3250	9296	14378	3347	7942
IS20	Pheripheral vascular bypass	19570	14296	18162	14790		9870	8371	10840	6781	14140	16657		
IS21	Pulmectomy	15099		30701	16835		7041	8118	7962	6187	15462	25200		
IS22	Repair of inguinal hernia	3093	4489	2904	3327	5026	1799	1986	2646	1287	4041	8917		5107
IS23	Thyroidectomy	6000	5050	4919	4854		2023	2785	3636	2669	6126	7483		7333
IS24	Transurethral resection of prostate (TURP)	5239	4548	4183	4986	5474	2144	2155	2277	2404	4403	6625	3733	6041

Table A.3.6 Weights: cost in percentage of total cost by case type and by country, 2007

Code	Case	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA
IM01	Acute myocardial infarction	3.4		6.0	0.6	6.8	3.0	1.0	4.8	3.2	4.6	2.6
IM02	Angina pectoris	2.7		2.1	0.5		1.6		1.1	2.4	1.5	0.1
IM03	Cholelitiasis	1.5		0.7	1.2		2.7	0.4	1.6	2.3	1.0	0.5
IM04	Heart failure	5.9		4.7	8.2	13.5	10.5	0.7	6.7	5.5	5.6	5.1
IM06	Malignant neoplasm of breast	0.3		1.3	0.5	0.5	0.8	2.0	0.5	3.1	0.6	0.1
IM07	Malignant neoplasm of bronchus and lung	2.3		1.5	3.0		1.0	4.3	1.5	2.2	1.9	0.8
IM08	Normal delivery	2.7	2.4	3.1	10.0		14.3	7.0	2.4	12.8	4.7	1.5
IM09	Pneumonia	10.0		9.1	10.0	9.2	8.0	8.9	12.5	6.9	6.3	7.2
	Total medical services	**28.6**	**2.4**	**28.5**	**33.8**	**30.0**	**41.9**	**24.3**	**31.0**	**38.5**	**26.2**	**17.9**
IS02	Appendectomy	3.6	4.5	3.8	2.2	54.9	2.3	5.9	3.8	2.8	3.0	2.7
IS03	Caesarean section	13.6	13.4	8.8	6.2		7.8	11.9	5.4	6.2	7.7	12.6
IS04	Cholecystectomy	4.8	4.6	3.2	4.2	3.5	3.2	4.1	6.4	7.0	2.9	4.5
IS05	Colorectal resection	6.1	11.6	3.9	5.6		4.2	1.8	7.4	0.0	5.3	5.7
IS06	Coronary artery bypass graft	3.3	9.0	5.9	4.9		7.1	1.7	4.5	4.6	5.3	7.7
IS07	Defibrillator insertion, revision, replacement, and removal	1.5	2.9	2.1	2.4	7.6			2.3	2.4	1.7	4.4
IS08	Discectomy	0.5	1.2	3.9	1.3		1.1	9.6	1.6	1.4	2.2	1.1
IS09	Endarterectomy: vessels of head and neck	0.6	0.8	0.4	0.0		1.3	0.0	0.4	0.4	0.6	1.1
IS12	Hip replacement: total and partial	7.6	11.9	10.9	7.4		2.9	14.5	8.3	16.5	14.2	7.8
IS13	Hysterectomy: abdominal and vaginal	3.5	7.0	3.2	2.2		1.4	4.0	3.1	2.2	3.7	4.3
IS14	Knee replacement	5.9	13.2	7.2	2.8		2.7	10.5	4.8	6.8	6.3	10.2
IS15	Lumpectomy, quadrantectomy of breast	0.5		2.2	2.7	0.3	0.8	0.3	1.0	0.7	1.1	0.1
IS16	Mastectomy	1.6	1.4	1.9	1.7		0.4	1.4	0.9	0.6	0.7	0.7
IS17	Open prostatectomy	4.2	2.1	0.8	1.8		0.6	0.0	1.4	1.0	1.7	1.3
IS18	Pacemaker insertion, revision, replacement, and removal	0.5	0.7	4.2	3.9	0.6	2.4	0.6	3.7	1.6	3.2	3.3
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	4.2	6.0	1.5	7.4	0.3	13.8	2.3	6.0	2.5	9.5	11.0
IS20	Pheripheral vascular bypass	3.0	1.7	3.3	0.9		1.8	0.4	1.2	0.3	0.6	1.2
IS21	Pulmectomy	2.1		0.1	3.4		0.6	1.0	0.6	0.1	0.7	1.0
IS22	Repair of inguinal hernia	1.8	1.8	1.5	1.9	1.0	2.5	2.7	3.8	3.1	1.1	0.3
IS23	Thyroidectomy	0.9	1.5	1.3	2.0		0.5	2.6	1.7	0.4	0.9	0.4
IS24	Transurethral resection of prostate (TURP)	1.6	2.2	1.4	1.0	1.9	0.6	0.3	0.5	0.9	1.4	0.5
	Total surgical services	**71.4**	**97.6**	**71.5**	**66.2**	**70.0**	**58.1**	**75.7**	**69.0**	**61.5**	**73.8**	**82.1**
		100.0	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**		**100.0**	**100.0**	**100.0**

Table A.3.7 Comparative price levels by case type and by country, group = 100, 2007

Code	Case	AUS	CAN	FIN	FRA	ITA	ISR	KOR	POR	SLV	SWE	USA	AVG	CV
IM01	Acute myocardial infarction	98		119	125	191	71	27	144	71	105	175	113	44%
IM02	Angina pectoris	80		133	115		76		127	71	87	140	103	27%
IM03	Cholelitiasis	103		82	161		65	49	98	80	120	243	111	53%
IM04	Heart failure	140		101	143	171	45	40	126	69	117	156	111	41%
IM06	Malignant neoplasm of breast	99		110	104	217	49	41	142	50	134	212	116	54%
IM07	Malignant neoplasm of bronchus and lung	136		93	120		47	49	96	71	172	242	114	55%
IM08	Normal delivery	139	130	71	134		86	49	59	69	120	207	109	43%
IM09	Pneumonia	143		109	195	143	51	29	98	74	122	175	114	46%
IS02	Appendectomy	133	132	98	120	149	45	42	92	56	131	210	111	43%
IS03	Caesarean section	173	117	117	142		49	48	49	76	155	182	112	45%
IS04	Cholecystectomy	111	125	88	137	107	63	73	80	46	115	207	108	40%
IS05	Colorectal resection	138	123	98	145		61	59	84	60	128	144	106	33%
IS06	Coronary artery bypass graft	108	113	117	115		77	82	85	61	105	171	103	28%
IS07	Defibrillator insertion, revision, replacement, and removal	86	109	141	116	105			128	30	128	128	108	31%
IS08	Discectomy	216	106	81	85		105	69	97	58	125	123	107	42%
IS09	Endarterectomy: vessels of head and neck	112	100	100	137		120	79	96	48	120	99	103	24%
IS12	Hip replacement: total and partial	142	107	97	100		71	81	97	68	103	156	103	26%
IS13	Hysterectomy: abdominal and vaginal	149	120	83	134		61	62	60	60	159	152	108	40%
IS14	Knee replacement	135	91	92	115		76	85	95	71	96	138	102	23%
IS15	Lumpectomy, quadrantectomy of breast	68		128	129	108	59	60	70	39	143	231	118	61%
IS16	Mastectomy	108	107	93	130		65	78	67	58	108	182	107	41%
IS17	Open prostatectomy	109	112	115	136		49	68	74	76	150	188	108	39%
IS18	Pacemaker insertion, revision, replacement, and removal	68	174	116	123	71	56	113	81	58	83	161	109	45%
IS19	Percutaneous transluminal coronary angioplasty (PTCA)	88	115	69	87	124	96	127	99	40	115	178	106	33%
IS20	Pheripheral vascular bypass	146	107	135	110		74	62	81	51	105	124	106	35%
IS21	Pulmectomy	119		242	133		55	64	63	49	122	199	116	58%
IS22	Repair of inguinal hernia	97	141	91	105	158	57	63	83	41	127	281	113	56%
IS23	Thyroidectomy	142	120	116	115		48	66	86	63	145	177	108	38%
IS24	Transurethral resection of prostate (TURP)	136	118	108	129	142	55	56	59	62	114	171	108	37%

GLOSSARY OF TERMS

Acronym/Term	Definition
Administered prices	See quasi-prices
Average cost	In the costing context, the total cost of production divided by the number of products in a period. Also known as full average cost. In contrast, marginal cost is the estimated cost of producing one additional unit of output.
Average Length of Stay (ALOS)	The average (or mean) number of days of stay in hospital for a group of patients.
Basic heading	The lowest level of aggregation of items in the GDP breakdown for which parities are calculated. In theory, a basic heading is defined as a group of similar well-defined goods or services. In practice, it is defined by the lowest level of final expenditure for which explicit expenditure weights can be estimated. Thus, an actual basic heading can cover a broader range of products than is theoretically desirable. Basic headings are the building blocks of a comparison. It is at the level of the basic heading that expenditures are defined, products selected, prices collected, prices edited (i.e. validated) and PPPs first calculated and averaged.
Base rate	Price for the DRG cost weight of 1.0.
Benchmark	A standard, or point of reference, against which things can be compared, assessed, measured or judged.
Case of hospitalisation	It refers to the unit of observation of the hospital services. In administrative databases, it is described on the basis of the principal diagnosis, secondary diagnoses, surgical procedures, age, sex, and discharge status of the case treated.
Case type	This term refers to classes of hospital services that are similar from a clinical perspective and in term of their consumption of resources
Case-mix	The term case-mix refers to both the number and types of patients treated and the mix of bundles of treatments, procedures and so on, provided to patients. In general, case-mix is a measure of hospital output and activities.
Comorbidity	A pre-existing condition of the admitted patient, excluding the principal diagnosis, for which the patient receives treatment of management during the admission or which affects the patient's care during the period of stay.
Comparability of products	The requirement that countries price products that are identical or, if not identical, equivalent. Products are said to be comparable if they have identical or equivalent physical and economic characteristics – that is, if they have the same or similar technical parameters and price determining properties. In the PPPs context, equivalence or similarity between products is defined as meeting the same needs with equal efficiency so that purchasers are indifferent between them and are not prepared to pay more for one than for the other. The pricing of comparable products ensures that the differences in prices between countries for a product reflect “pure” price differences and are not affected by differences in quality.
Cost modelling	A common term for a type of product costing which makes minimal use of

Acronym/Term	Definition
	measures of resource consumption by individual patients, and aims only to estimate mean costs for classes of patients.
Cost weight (relative weight)	A measure of the average cost of a DRG, compared with the average cost of a reference DRG. Usually the average cost across all DRGs is chosen as the reference value, and given a weight of 1.0.
Direct costs	Cost items related directly to a service e.g. salaries, drugs incurred in the provision of specific services. In the standard product costing methods, they refer to costs which are passed directly to cost centres from the general ledger (rather than allocated via overhead cost centres).
Diagnosis Related Groups (DRGs)	The DRGs form a manageable, clinically coherent set of patient classes that relate a hospital`s casemix to the resources demands and associated costs experienced by the hospital. They are defined on the basis of the principal diagnosis, secondary diagnoses, surgical procedures, age, sex, and discharge status of the patients treated. A case of hospitalization is assigned to one DRG, while a DRG typically contains many cases of hospitalizations.
Gross-costing or top down approach	This approach is essentially a product line (or case-mix) cost accounting model, with the core objective of costing individual patients grouped into similar classes. The basic information comes from the hospital's general ledger. The reference Yale cost model has four basic steps: 1) definition of the initial cost centres of the hospital, which include overhead cost centres or support services, ancillary services, and wards; 2) allocation of overhead costs to the remaining cost centres, ancillary services, and care units; 3) allocation of ancillary services to the wards (done according to actual use of ancillary services or to indicated use); 4) allocation of the final cost centres to patient level/DRG groups, according to actual use of resources or some allocation statistics.
Inpatient	An inpatient is a person who is formally admitted to the inpatient service of a hospital for observation, care, diagnosis, or treatment. Sub–categories of overnight stay and same–day could be defined. Further, admitted patients may be categorised into acute, and post-acute.
International Classification of Diseases, 9th Revision, Clinical Modification (ICD–9–CM)	The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) is based on the World Health Organization's Ninth Revision, International Classification of Diseases (ICD-9). ICD-9-CM is the official system of assigning codes to diagnoses and procedures associated with hospital utilization in the United States. The ICD-9-CM consists of: a tabular list containing a numerical list of the disease code numbers in tabular form; an alphabetical index to the disease entries; and a classification system for surgical, diagnostic, and therapeutic procedures (alphabetic index and tabular list).
Length of stay (LOS)	The number of days an inpatient spends in hospital. It is calculated in different ways for different purposes. The most common involves subtracting the discharge date from the admission date.
Micro-costing or bottom-up approach	It foresees the direct identification and measurement of patient-specific service delivery process Five steps are taken in the process of defining patients' resource use and cost profiles: 1) identification of clinical activities to describe treatment profiles; 2) identification of the discrete resource areas/intermediate cost centres which provide the identified activities; 3) definition of appropriate workload measures for each resource area; 4) identification of individual patients' treatment profiles, in terms of workload units of the relevant clinical

Acronym/Term	Definition
	activities performed; 5) place a value on workload units from each resource area in order to derive individual patients' cost profiles.
Negotiated prices	See quasi-price.
Outlier	An outlier is a data value that lies in the tail of the statistical distribution of a set of data values. In the DRGs context, an outlier is case with cost or length of stay exceeding the trim point value of the DRG distribution.
Outpatient care	Medical care including diagnosis, observation, treatment, and rehabilitation that is provided to cases that do not require hospitalization. It is also called ambulatory care.
Overhead	In the product costing context, they refer to cost items relating to more than one service, typically not involved in face-to-face patient contact. Overhead costs cannot be directly traced to products; thus they should be allocated to costs objects (that is, products) using an allocation base and an allocation method. In principle, the allocation base should be guided by the existence of a strong cause-and-effect relationship. Common approaches include: flat rate; square footage; employee numbers; employees costs; and number of patient. As to the allocation method, three approaches are followed: direct allocation; step down; reciprocal method. The differences among these methods relate to taking into account the interaction between cost centres (step down and reciprocal methods) and the allocation of reciprocal services between cost centres (only reciprocal method).
Patient classification	Groups of patients have demographic, diagnostic, and therapeutic attributes in common that determine their level of resource intensity. By developing clinically similar groups of patients with similar resource intensity, patients can be aggregated into meaningful patient classes. If these patient classes covered the entire range of patients seen in an inpatient setting, then collectively they would constitute a patient classification scheme that would provide a means of establishing and measuring hospital case-mix complexity.
Patient costing	A generic term for a type of product costing which makes use of measures of resource consumption by individual patients, and aims to estimate costs for each individual patient care episode.
Price	Price is defined as the value of one unit of a product, for which the quantities are perfectly homogeneous not only in a physical sense but also in respect of a number of other characteristics .
Principal diagnosis	The condition that after study was found to be chiefly responsible for that patient's episode of care.
Purchasing Power Parities (PPPs)	PPPs are spatial deflators and currency converters, which eliminate the effects of the differences in price levels between countries, thus allowing volume comparisons of GDP components and comparisons of price levels. PPPs are calculated in three stages: first for individual products, then for groups of products or basic headings and, finally, for groups of basic headings or aggregates. The PPPs for basic headings are unweighted averages of the PPPs for individual products. The PPPs for aggregates are weighted averages of the PPPs for basic headings. The weights used are the expenditures on the basic headings. PPPs at all stages are price relatives. They show how many units of currency A need to be spent in country A to obtain the same volume of a product or a basic heading or an aggregate that X units of currency B purchases in country B. In the case of a single product, the "same volume" means "identical volume".

Acronym/Term	Definition
Quasi-price	The term refers to negotiated prices and administered prices. The former are established through independent negotiations between purchasers/third party payers and providers, and are not directly tied to the cost of care. The latter are those regulated prices that emulate a competitive situation where prices equal average costs per product. Administered prices take often the form of reimbursement/payment rates, or tariffs.
Reference PPPs	Reference PPPs are PPPs that are use for basic headings for which no prices are collected. They are based on prices collected for other basic headings. Reference PPPs serve as proxies for the PPPs that would have been calculated had prices been collected for the basic headings for which no prices were collected.
Representativity	In the context of PPP calculations, a concept that relates to individual products within the same basic heading and to the product list for a basic heading. *Representativity of a product within a basic heading* is defined in terms of a specific country. A product is either representative or unrepresentative of the price level in country A for a given basic heading irrespective of the relative importance of the basic heading with respect to other basic headings. *Representativity of the product list for a basic heading* is defined in terms of all countries participating in the comparison. The product list should be equally representative – or equi-representative - of all participating countries.
Trim point	It represents a value calculated with statistical methods which identify the highest acceptable value for a distribution, such as that of length of stay by DRG. The trimming methods remove cases (outliers) from each DRG and have the effect in reducing the difference between the mean and the median, and are also capable of reducing the variance of the distribution and the standard deviation.
Unit cost	Average cost per unit of service or the “mean” cost of a particular type of service.

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