ESCUELA ANDALUZA
DE SALUD PÚBLICA
Consejería de Salud y Familias

iMPACT HTA Improved methods and actionable tools for enhancing HTA

Technical aspects of the European Healthcare and Social Cost Database (EU HCSCD)

User's Guide

Final version

(Deliverable D3.2, part 1)

November 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 779312

Contents

Introduction

Why is the European Healthcare and Social Cost Database (EU HCSCD) relevant?

The rationale for developing the EU HCSCD for use in Health Technology Assessment (HTA) across countries is to provide a common dataset of international costs, which can feed into health economic evaluations carried out by transferring economic evaluation analysis and models across countries. No many projects gathering cost information on different healthcare and non-healthcare resources, as well as on productivity losses have been developed so far, such as HealthBASKET[1]; additionally, there is no dataset of collecting this information, and consequently, there is no dataset of costs for use in HTA across countries. Defining a core dataset of costs for use in HTA across countries will be a useful tool, as it will enable analyses that try to understand the variation in costs within and across countries (taking into account the differences between the healthcare systems and other factors). Additionally, it will make it easier to carry out multi-country studies and to adapt economic evaluation studies from country to country by saving human resources time (and consequently costs) in the task of looking for healthcare, non-healthcare and productivity losses costs.

To enable cost comparability across countries and/or institutions, the unit cost data of all institutions compared should have been computed using the same cost accounting methods. Moreover, the unit cost should refer to homogeneous objects (services). That means that to be able to meaningfully compare the cost of, for example, mastectomy across hospitals of several countries, the procedure should be comparable because the combination of resources is exactly the same in all hospitals.

Objective

The EU HCSCD for use in HTA across countries is being developed in the framework of the WP3 titled 'Developing a costing methodology and a core dataset of costs for facilitating cross border comparisons in economic evaluation' in collaboration with WP4 'Social costs and their role in economic evaluation for healthcare decision-making' of the IMPACT-HTA project (No 779312).

The **main objective** of WP3 is to outline a costing methodology and a minimum common dataset of international costs (i.e. health-care evaluation analyses and models across countries. To do this, three **specific objectives** have been proposed: 1) to produce a core dataset that incorporates direct health care costs across jurisdictions; 2) to propose a methodological framework for computing homogenous cost data across countries on a sustainable basis over time; and 3) to enable cost comparability across settings, including the explanation of factors that account for differences in health care costs across settings.

Design of the EU HCSCD structure

The EU HCSCD structure, containing the information that would be required for each unit cost item to be included, has been designed based on the literature review of different costing methodologies taking as references the Centre for Health Economics of the University of York[2], manuals for economic evaluation[3], costing guidelines[4,5] and accounting manuals[6].

Cost accounting is a procedure for allocating costs to resource items or activity. To obtain costing data from and to make meaningful comparisons across countries, we need to understand (A) how are resource units identified and measured in each country, and (B) how are costs allocated to those units in each country (Table 1).

Table 1. Typology of resource units and costing methods

	PRIMARY RESOURCES	GOODS AND SERVICES	PROCESSES AND INTERVENTIONS
Description	A "basic" or "indivisible" input to healthcare	A composite resource consisting of several primary resources consumed jointly	A composite resource defined at a more aggregate level than "goods and services"
Examples of resource units	Staff (hour), devices, medicines, health products/disposables	Day in hospital, visit to specialist, visit to primary care, diagnostic test	Diagnostic Related Group (DRG) hospital admission, inpatient day
Examples of typical methods for estimating cost of each unit	Estimated from list prices (devices/ medicines), nationally agreed salaries (staff). The cost does not usually include provider overheads	May be estimated by micro-costing or top-down methods, or a combination	Usually estimated by top down costing. Usually includes fully allocated provider overheads

Source: *Prepared by authors based on Drummond (2015)[3] and Mogyorosy (2005)[2]*

1) Primary resources

Many primary resources are likely to be defined in a fairly standard way across countries, e.g. medicines by name, dose, etc., devices by manufacturer & model. Staff grades may be more complicated. Health professionals may have quite different functions, e.g. in some countries, a senior doctor has a dedicated % of time for administration, travel or research, but not in other countries. In some countries, nurses can take senior roles ("consultant nurse"), in other countries their role is more restricted.

2) Goods and services

"Goods and services" here are bundles of several primary resources that are consumed jointly. For example, a day in hospital will include some staff activity (nursing, doctors

ward rounds), some amenity services (catering, laundry) and often more general overheads (energy, general maintenance, portering, etc.). We need to understand if there are important differences in the way such services are defined between countries. There may be quite important differences, even for items with similar-sounding labels. For example, a laboratory test is a service that includes some consumables, along with laboratory technician time, administration, communication of results to the patient etc. A similar test (e.g. cholesterol) might be provided in hospitals, clinics, primary care etc., leading to differences in cost between countries. Another example: an "outpatient" consultation may take place in hospital, clinic, or an office. There may be procedures or tests carried out, or not. The consultation may be led by a doctor, nurse or other professional (sometimes in teams). Again, these might lead to differences in cost.

3) Processes and interventions

"Processes and interventions" are activities that aggregate several procedures, "goods and services" and primary resources. For example, many countries use a DRG system to classify hospital admissions or discharges. The challenge here is to understand how the classification system is constructed and how the systems are similar or differ between countries. Previous EU projects have investigated these questions, which provided a useful starting point.

Ways of ensuring comparability

Ensuring comparability consists of collecting as detailed information on costing methodologies used to estimate cost of each item included in the EU HCSCD as possible. By detailed information we understand the knowledge about what resources are included in the cost, how were the resources estimated and how was the unit cost calculated and assigned to the resources. In addition, this will enable economic analysts to analyze similarities of cost methodologies between countries.

In the long term, to ensure comparability can only be attained if all countries/institutions use the same accounting methodology. However, the unit values applied at present have different origins, not only cost accounting from health care organization, but also market prices, tariffs, public prices, etc.

All the fields described in the next section have been included in the cost database to mitigate the problems of comparability.

The EU HCSCD structure

The categories of the selected direct healthcare cost items

As mentioned earlier, three main categories of direct healthcare cost items have been identified: costs of primary (homogenous) resources, composite goods and services and complex processes and interventions (Table 1). All of them are further divided into subcategories.

PRIMARY HOMOGENOUS RESOURCES are subdivided into medicines, medical devices, disposables and personnel costs.

- **Medicine** refers to a drug or other preparation for the treatment or prevention of disease.
- **Medical device** refers to an article, instrument, apparatus or machine that is used in the prevention, diagnosis or treatment of illness or disease, or for detecting, measuring, restoring, correcting or modifying the structure or function of the body for some health purpose[7].
- **Health products/Disposables** refer to the items designed for single use or those that may be used more than once after proper cleaning and sterilisation and/or disinfection[8].
- **Personnel** refers to the labour time of health care professionals (e.g., workers employed in health care institutions or processes).

COMPOSITE GOODS AND SERVICES comprise outpatient visits, hospitalizations, image diagnosis and laboratory tests, ambulance services, diagnostic procedures and therapeutic procedures.

- **Outpatient visit** refers to the visit of a patient who is not hospitalized overnight but who visits a hospital or clinic for diagnosis or treatment[9]. Home visits (medical or nursing staff attending a patient at his home) and Accident and Emergency (A&E) visits were also considered.
- **Hospitalization** refers to the admittance to the hospital as an inpatient[9].
- **Image diagnosis** refers to the radiography, sonography, and other technologies used to create a graphic depiction of the body for diagnosis or therapeutic purposes[9].
- **Laboratory tests** are services provided by medical laboratories for the diagnosis of disease[9].
- **Ambulance service** refers to the service provided by a vehicle which can transport medical patients to the treatment site or back to their place of residence, and in some instances will also provide out-of-hospital medical care to the patient during the transportation. This subcategory is further divided into non-emergency patient transport and intensive care ambulance.

- **Non-emergency patient transport** refers to the transport for patients who require clinical monitoring or assistance but do not need a time-critical emergency ambulance[10].
- **Intensive care ambulance** is well-equipped ambulances that provides emergency medical care. Once it is activated by an incident that causes serious illness or injury, the focus of intensive care ambulance is emergency care of the patient(s)[11].
- **Diagnostic procedures** refer to the type of test used to help diagnose a disease or condition[12].
- **Therapeutic procedures** refer to the medicine or therapy used to cure disease or pain by the involvement and intercession of proactive, therapeutic practice[13].

COMPLEX PROCESSES & PROCEDURES comprise complex processes and surgical procedures.

- **Inpatient medical and surgical processes** require patients to stay the night following the surgery.
- **Day case procedures/Outpatient surgery** refers to a patient or case that comes into hospital for a surgical procedure and is dealt with and released in the course of one day[14].

Selected fields each observation consists of

- Item in local language: Apart from English, each item will be provided in the language of the country the resource is taken from.
- Code: refers to the combination of letters and/or numbers each costing item is described with in the original source.
- Number of units: refers to the number of items delivered in the year of observation that are included in unit price. The purpose of this field is to know how reliable a certain value – usually an average - is.
- Unit of measurement: refers to the unit that can be acquired at an observable price or the unit that is used by each health care centre/hospital.
- Local price: refers to the unit price of each item.
- Currency: is the currency of the unit price of the country the items refers to (e.g., SEK for Swedish Krone, PLN for Polish zloty, etc.).
- Price in euros: is the previously mentioned price in local currency converted to euros. The conversion is based on rates taken from https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/index.en.html and is made as follows. The unit price of a particular medical procedure corresponding to England to the year e.g., 2014 is introduced in the database in local currency, in this case in British pound. The conversion to euros is made according to the last conversion rate introduced in the database for the same year, which will be the last day of December. Every

time this rate is changed, all the prices corresponding to 2014 for the country under consideration are automatically updated in the database. In case a cost of a current year needs to be introduced in the EU HCSCD, the conversion rate will correspond to 1st January of the same year. At the end of the year, this conversion rate will be updated to the last day of the same year and all costs corresponding to that year will be automatically updated.

- Year (Gross Domestic Product (GDP) deflator): refers to the year of the last GDP deflator available. GDP deflator values used in the EU HCSCD were taken from the World Bank website[15].
- Local price (GDP deflator applied): refers to the local price after applying the last GDP deflator available. Imagine that we have a 2015 local price and we want to update it into 2018 price. The following formula will be used:
  (local_price_2015) x (1 + GDP_2016) x (1 + GDP_2017) x (1 + GDP_2018)
  The GDP value is expressed as a percentage; therefore, it is divided by 100 before being applied in the above formula. Note that there is a two-year lag between the current year and the year of the last GDP available[15]. Every time a new GDP value is published and introduced into the EU HCSCD, all costs will be automatically updated to the most recent available year. The DGP deflator was selected as the most appropriate way of adjusting costs for cost-effectiveness analysis following the World Health Organization recommendations[16].
- Price in euros (GDP deflator applied): is the previously mentioned 'local price (GDP deflator applied)' converted into euros. That is, a GDP deflator is applied to a local price and subsequently converted into euros.
- Year (Consumer Price Index (CPI)): refers to the year of the last CPI available. The CPI values were taken from Eurostat website[17]. It should be noted that in order to make comparisons between prices after applying CPI and GDP deflator, the year of both the last CPI available and the last GDP deflator available are identical.
- Local price (CPI applied): refers to the local price after applying the last CPI available. Imagine that we have a 2015 local price and we want to update it into 2018 price. The following formula will be used:
  (local_price_2015) x (1 + CPI_2016) x (1 + CPI_2017) x (1 + CPI_2018)
  The CPI value is expressed as a percentage; therefore, it is divided by 100 before being applied in the above formula.
- Price in euros (CPI applied): refers to 'local price (CPI applied)' converted into euros.
- Type of unit value (Method of valuing resource use): refers to the type of monetary value that is placed on each of the resources used (e.g., public price, reference price, leasing price, production cost, tariff, etc.).
- Type of institution: this field makes a distinction between the types of centre the patients are attended at. This is important given that attending patients at

hospital or emergency service is more costly than attending them at a health care centre.

- Country: the country the item refers to.
- Source of cost data: refers to the institution the cost originates from, that is, the institution responsible for communicating or publishing the costing information (e.g., Department of Health and Social Care).
- Reference of cost data: it could be a publication, a web page or any report where the cost is mentioned (e.g., https://www.gov.uk/government/collections/nhs-reference-costs).
- Year: refers to the year when the cost registration took place or when the cost was observed, not to the year of cost publication.
- Notes: this field is optional and may be used for explanations or notes relevant to the information contained in remaining fields corresponding to a particular item.

There are some additional database fields (those that apply only for particular items). They are organized as follows.

- Model: value used to represent one medical device or a family of medical devices to group many variations that have shared characteristics. This field applies to medical devices and health products/disposables.
- Brand: Proprietary/commercial name occasionally used to assist in the identification of the regulated medical device and/or disposables/reusable. This field applies to medical devices and health products/disposables.
- Strength: is the amount of a drug in a given dosage form, measured as the number of micrograms per millilitre. This field applies only to medicines.
- Type of unit: refers to the way the units are delivered (e.g., box). This field applies to medicines and health products/disposables.

Terminology used in the field 'Type of unit value':

Monetary value placed on each costing item described in the EU HCSCD may be defined in different ways. For medicines, medical devices and health products, the unit values such as ex-factory price, purchase price, public price, reference price, wholesale price and leasing price were identified.

Ex-factory price is the price set at the level of manufacturer. Purchase price is the price set at the level of wholesaler. Public price, also called 'pharmacy retail price', 'consumer price' or 'end price' is the selling price of individual drugs (i.e. same active principle, different brands; e.g. Codamol, Tachidol) at pharmacy for the general public. Reference price is the maximum reimbursement price (for all drugs containing the same active principle, e.g. paracetamol) paid by National Health Service (NHS). By leasing price, we refer to an amount of many paid for rental of a costing item during a certain period of

time. Wholesale price is the ex-factory price plus the wholesaler margin. Additionally, many different brands with different prices were found for medicines. However, it was difficult to find the same brand in all the countries. Therefore, the cost corresponding to the cheapest brand was selected for the EU HCSCD.

Regarding the remaining cost items, we use public price for those procedures, exams, processes paid to a public health insurance system by private or external users that are not authorised to receive these services as regular beneficiaries. Tariffs are prices paid by a public or private insurer to a health care provider for those services that are free or subsidized for other users. Ad hoc study cost refers to costing data taken from ad hoc studies. Production cost represents real healthcare facility expenses on a specific costing item.

Terminology used in the field 'Type of institution'

As already explained, the cost of a healthcare service varies according to the type of institution where it is performed. Therefore, we distinguish between a hospital, ambulatory care, outpatient clinic, primary care and home. Hospital is used for all procedures and processes that require hospitalization (hospital stay > 1 day, day case – hospital stay = 1 day−), or those procedures that are performed in a hospital even if that they do not require patient's admission such as intensive care ambulance or A&E visit. Outpatient clinic is a setting independent from a hospital where outpatient procedures are performed. Ambulatory care is used for outpatient procedures that do not require a hospitalization and that may be performed in a hospital or an outpatient clinic (we usually use this terminology when the cost of an outpatient procedure is independent from a setting). Primary care is used for patient's visits that implies curing of common diseases. Home is used for procedures performed at patient's home.

Table 2 provides an insight into the categories, subcategories and items of direct healthcare costs included in the EU HCSCD.

Table 2. EU HCSCD: Categories, subcategories and selected items of the direct healthcare costs

Category	Subcategory	Item
Primary resources	Medicines	Paracetamol Atorvastatin Trastuzumab
	Medical devices	Drug-eluting stent Wearable cardioverter-defibrillator
	Health products	Glucose test strips
	Personnel	General practitioner Nurse Specialist
Composite goods and services	Outpatient visits	General practitioner visit Specialist visit Accident & Emergency visit
	Hospitalization	Day of hospitalization at "normal" ward Day of hospitalization at Intensive Care Unit
	Image diagnosis	Ultrasound Scan Computerised Tomography Scan
	Laboratory tests	Creatinine Ferritin
	Ambulance services	Non-emergency patient transport Intensive care ambulance
	Diagnostic procedures	Colonoscopy
	Therapeutic procedures	Haemodialysis Oxygen therapy
Complex processes and interventions	Inpatient medical and surgical processes	Heart failure (ICD10: I50) Hernia inguinal, femoral, umbilical (ICD10: K40, K41, K42)
	Day case procedures/ Outpatient surgery	Laparoscopic cholecystectomy Cataract extirpation

Source: Own elaboration

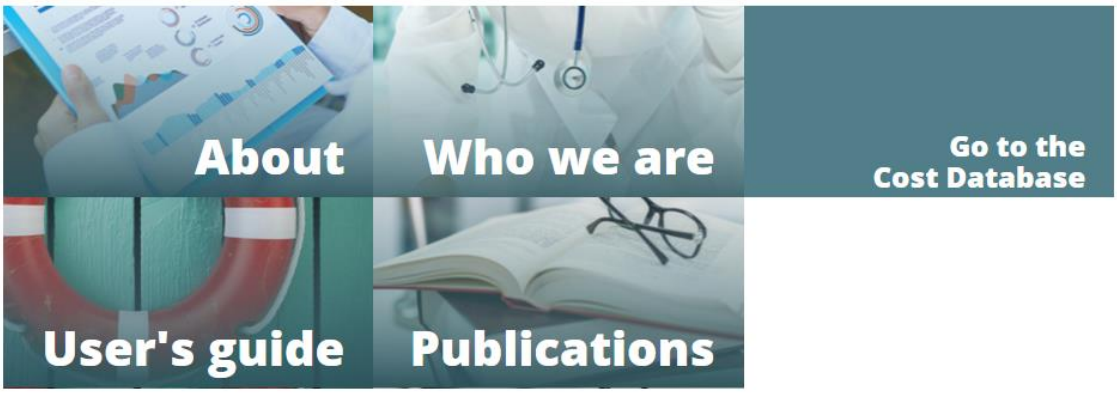
Source of inputs introduced into the EU HCSCD

In order to obtain all the previously mentioned information from the countries where partners are involved in the project IMPACT-HTA (England, France, Germany, Italy, Poland, Portugal, Slovenia, Spain and Sweden), the partners in the project teams were contacted. Therefore, both unit costs and methodology were obtained in their entirety from consortium partners.

Healthcare costs and social costs

There are two options in the home page: direct healthcare costs and social costs. The reason for this is that the EU HCSCD is a final product of both WP3 (healthcare costs) and WP4 (social costs). The following figures show how to use the EU HCSCD database. Even if the screenshots refer to healthcare costs, the procedure is the same for both healthcare and social costs.

Please, select healthcare costs and the following options appear.



The option 'About' offers a brief summary of both the EU HCSCD and IMPACT-HTA project.

User's guide contains two documents: 'Guidelines for cost definitions and harmonization of cost accounting methodologies and methodology that determines the common basket' and 'Technical aspects of the European Health Care Costs Database (EU HCSCD)'. The former is especially important for making cross-country comparisons of the costing items included in the EU HCSCD. The latter explains its correct usage.

All the papers published in scientific journals regarding the EU HCSCD can be found under 'Publications'.

'Who we are' section contains a brief *Curriculum Vitae* of all the members that participated in the development of the EU HCSCD.

The 'Go to the Cost Database' bottom gives access into the EU HCSCD.

How to use the EU HCSCD

After accessing the EU HCSCD (https://www.easp.es/Impact-Hta/), three searching strategies have been defined: basic search, view all costs and advanced search.

Basic search

This search consists of searching the typed word across the field 'Item'. For example, if you type 'general practitioner', the database will report all the items containing 'general practitioner'. As you can see in the below example, it reports items called 'general practitioner' and 'general practitioner visit', because the EU HCSCD contains two items with the words general practitioner.

Item	Item subtype	Unit of Measurement	Year	Country	Price in euro	Price in euro (GDP Deflator applied)	Price in euro (CPI applied)	
General practitioner		hour	2017	England	166.81	173.14	174.06	View
General practitioner		hour	2017	England	140.89	146.23	147.01	View
General practitioner		hour	2017	England	151.03	156.76	157.59	View
General practitioner		hour	2017	England	123.98	128.68	129.37	View
General practitioner		hour	2017	Germany	39.00	40.44	40.30	View
General practitioner		patient/quarter	2017	Germany	65.15	67.55	67.32	View
General practitioner		hour	2013	Italy	60.71	64.12	62.67	View
General practitioner		patient/year	2005	Italy	38.62	46.58	47.39	View
General practitioner	After Hours GP	hour	2013	Italy	23.91	25.25	24.68	View
General practitioner	paediatrician	hour	2013	Italy	53.43	56.43	55.16	View
General practitioner		patient/year	2018	Poland	36.97	38.06	37.74	View
General practitioner		hour	2019	Portugal	14.86	14.86	14.86	View
General practitioner		hour	2019	Portugal	16.34	16.34	16.34	View
General practitioner visit		visit	2018	France	101.66	102.91	102.98	View
General practitioner visit		visit	2018	France	25.00	25.31	25.33	View
General practitioner visit		visit	2018	France	30.00	30.37	30.39	View
General practitioner visit	paediatrician	visit	2018	France	30.00	30.37	30.39	View
General practitioner visit	paediatrician	visit	2018	France	32.00	32.39	32.42	View
General practitioner visit		visit	2019	France	60.00	60.00	60.00	View
General practitioner visit		visit	2019	France	46.00	46.00	46.00	View

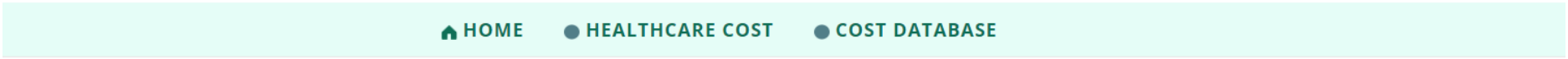
Together with the searched item, five additional fields are displayed: item subtype, year, country, price in euro and price in euro (GDP deflator applied). To display all the information regarding a particular costing item, click on 'view'. This has to be done for each item separately. To visualize all the information for all the items found, click on 'select all' and afterwards, click on 'export csv'. All the steps that need to be undertaken in order to export the selected data into csv and then convert them into excel are explained in detail in a separate section called 'Exporting the data'.

View all costs

View all costs option allows user to visualize all costs introduced into the database.

Advanced search

This modality is suitable for those users who want to search across the particular fields of interest. By clicking on "advanced search", all the fields related to a cost item are displayed.



Cost Database Advanced Search

Home / HealthCare Cost / Cost Database / Advanced Search

Category: -No value-

Subcategory: -No value-

Notes:

Item:

Item subtype:

Code:

Item in local language:

Model:

Brand:

Country: -No value-

Region: -No value-

Year: =

Type of Unit: -No value-

Unit of Measurement: -No value-

Strength:

Number Units Delivered: =

Price in euros: =

Type of Unit Value: -No value-

Type of Institution: -No value-

Source:

Bibliographical Reference:

Search

For the numerical fields, the option of searching using mathematical operators has been introduced (such as equal to, higher than, equal to or higher than, lower than, equal to and lower than, different from). For drop-down fields, select an option from all the possible values that have been previously defined for that particular field. In case of free fields, type the text you want to search for. E.g., you are interested in the cost of a stent (item) up to 2020 (year). Click “search”. All items with the previously defined characteristics are displayed.

ESCUELA ANDALUZA DE SALUD PÚBLICA
Consejería de Salud y Familias

iMPACT HTA Improved methods and actionable tools for enhancing HTA

EU HCSCD EUROPEAN HEALTHCARE AND SOCIAL COST DATABASE

iMPACT HTA

HOME HEALTHCARE COST COST DATABASE

Cost Database Search Result

Home / HealthCare Cost / Cost Database / Cost Database Search Result

Select All Deselect All Export csv

	Item	Item subtype	Unit of Measurement	Year	Country	Price in euro	Price in euro (GDP Deflator applied)	Price in euro (CPI applied)	
☐	Drug eluting stent		stent	2018	Portugal	620.00	630.67	621.86	View
☐	Drug-eluting stent	non-polymeric stent	stent	2008	England	682.44	823.36	869.78	View
☐	Drug-eluting stent		stent	2019	Germany	62.06	62.06	62.06	View
☐	Drug-eluting stent		stent	2007	Italy	1,486.00	1,712.73	1,749.17	View
☐	Drug-eluting stent		stent	2013	Italy	448.95	474.13	463.47	View
☐	Drug-eluting stent		stent	2017	Slovenia	202,575.00	212,099.70	209,933.13	View
☐	Sirolimus-eluting stent		stent	2019	France	630.00	630.00	630.00	View
☐	Sirolimus-eluting stent		stent	2019	France	630.00	630.00	630.00	View
☐	Sirolimus-eluting stent	polymeric sirolimus-eluting stent (SES)	stent	2008	England	1,406.87	1,697.39	1,793.07	View

Exporting the data

The selected items will be exported into a .csv file. To open a .csv file that uses UTF-8 character encoding, please follow the steps listed below.

1. Open Microsoft Excel.
2. Click on the Data menu bar option → From Text icon.
3. Search the .csv file that you want to import.
4. Choose delimited
5. Set the character encoding to 65001: Unidocre (UTF-8) from the dropdown list.
6. Check My data has headers. You have to use it because the first row of .csv file has column names.
7. Click next.
8. Because our data is separated by semicolons, set a delimiter to semicolon.
9. Click next.
10. The displayed screen lets you select each column and set the Data Format. Select the General column and click the Advanced.
11. Set a point for decimal separator and a comma for thousands separator.
12. Finish.

The previous instructions were adapted from elsewhere[18].

Key characteristics of costing items included in the EU HCSCD

Down below are described the costing methodologies that were used in order to calculate the cost of described items and/or cost components included in each item (in case there were available in the country the costs proceed from). This section emphasizes the need not only for cost comparison, but also for comparison of the methodologies used in the calculation of the cost of each item. At the beginning of each country, tables with commonly used sources are provided.

ENGLAND

Personnel costs	https://www.pssru.ac.uk/project-pages/unit-costs/
Tariffs	https://improvement.nhs.uk/resources/national-tariff/#h2-201920-national-tariff-payment-system
Reference costs	https://improvement.nhs.uk/resources/reference-costs/#rc1718

PRIMARY RESOURCES

Medicines

The prices are updated at monthly basis and depend on category each drug belongs to[19]. There are three types of categories:

• Category A includes popular generics, which are widely available. Price is based on a weighted average of list prices from wholesalers and generic manufacturers.

• Category C items based on a particular brand or manufacturer's price.

• Category M includes readily available drugs, where the Department of Health calculates the price based on information submitted by manufacturers.

Medical devices

List prices are not commonly used for procuring devices in the NHS. Therefore, updated prices of **drug-eluting stent (DES**) were sought from the NHS Purchasing and Supply Agency. According to National Institute for Health and Care Excellence (NICE) guidance on DES, 'the prices for DES are driven by a number of factors including the: market conditions at the time of contracting; contract period; renewal date for the procurement arrangements (contracts are usually updated annually and the most recent contracts show significant decreases in the prices of DESs); volume commitment; period commitment; combination of period and volume commitment; product rationalisation

or standardisation; retrospective threshold discounts (e.g., free set quantities of stents when agreed volumes have been exceeded); consignment stock (e.g., when a supplier provides an inventory to trust); and other added value inclusive arrangements (e.g., the provision of additional training and related equipment)'[20].

For **wearable cardioverter defibrillator (WCD)** no information was provided.

Health products/disposables

The cost of glucose test strips depends on the brand. NHS Business Service Authority published a list of different ex-factory prices. They are updated at a monthly basis[19].

Personnel costs

Personnel costs are taken from Curtis and Burns (2018)[21]. They estimated the hourly wage of both primary care-based and hospital-based GPs and nurses.

Regarding primary care GPs, the cost elements taken into account in the calculation of hourly wage were the following: net remuneration (that is, the average income before tax)[22]; practice expenses (such as direct care staff, administrative and clerical staff), office and general business, premises, other (advertising, promotion and entertainment) and car and travel[22,23]; qualifications[24] and capital costs (premises)[25,26]. Working time of 42.8 weeks per year and 41.8 hours per week was taken from the 9th National GP Worklife Survey[27]. Therefore, the sum of value of all the previously mentioned cost elements was divided by the product of 42.8*41.8. This resulted in an hourly wage of 148£. This hourly wage can be modified according to the variety of cost elements added up to the annual net remuneration. In this line, the hourly wage when including direct care staff costs and excluding qualification costs is 125£, when excluding direct care staff costs but including qualification costs is 134£ and when excluding both direct care staff costs and qualification costs, the wage salary is 110£[21].

The cost elements considered in the calculation of hourly wage of primary care-based nurses and hospital-based medical and nursing staff were the following: wages/salary, salary oncosts, qualification costs, overheads such as management, administrative staff, estates staff and non-staff, capital overheads and travel. To calculate the average hourly wage, the sum of all cost elements was divided by the annual working hours taken from elsewhere[28]. Moreover, the hourly wage depends on band the hospital-based nurses belong to. Duties undertaken by each band can be found elsewhere[29]. In turn, hospital-based doctors are classified into foundation doctor (FY1 and FY2), registrar, associate specialist and consultant (medical, surgical and psychiatric). The average hourly wages as well as the references to costing methodology of all cost elements can be found elsewhere[21].

COMPOSITE GOODS AND SERVICES

Costs of complex processes & procedures and most of composite goods and services, as defined in the EU HCSCD, are based on DRGs, known in England as Health-Related Groups (HRGs). There are two main sources: reference costs and national tariffs.

The reference costs dataset contains costs and activity data collected annually from all NHS trusts and foundation trusts. Therefore, it covers most but independent sector's healthcare costs. It contains activity data based on finished consultant episodes (FCE), defined as time spent in the care of one consultant[30]. Additionally, the NHS uses these costs to set the tariffs (that are used as prices for reimbursement) for the activity next year. Costs and tariffs are different because tariffs contain incentives for providers to prioritize certain types of activity or to increase efficiency.

National tariffs for 2019/20 are modelled with costs taken from 2016/17 reference costs and activity data taken from 2016/17 Hospital Episode Statistics (HES) and 2016/17 reference costs[30]. The HES activity dataset consists of total of admitted patient care spells, outpatient consultations and A&E attendances from all secondary care services' providers to the NHS. The HES data are based on spell basis (hospital spell may contain one or more FCE and is defined as 'a period form admission to discharge or death'). For this reason, it is primarily used in the admitted patient care (APC) tariff calculation, as the APC is paid based on spells[30]. Full absorption costing is undertaken, therefore, all direct costs, variable and fixed overheads (including land costs) are included[31].

Outpatient visit

A **GP visit** is calculated on a basis of a GP remuneration (see personnel costs). To calculate the cost of GP visit, a GP remuneration is multiplied by ratio of face-to-face time (1:0.64). The ratio excludes travel time[21]. Therefore, the cost of a GP visit depends on the cost elements included in the GP's remuneration. The costs are estimated per hour of patient contact, per minute of patient contact of per surgery consultation lasting 9.22 minutes. The latter is estimated with or without cost corresponding to carbon emission (Supplementary Table 1). For further details see Curtis and Burns (2018)[21].

Regarding **specialist visits**, according to reference costs, the average unit cost per attendance varies across services. There are different costs for consultant-led and non-consultant-led attendances per service. In turn, both consultant- and non-consultant-led attendances are subdivided into multi professional or single professional, face-to-face contact or non-face-to-face contact and first attendance or follow-up attendance (e.g., cost of multi professional non-face-to-face follow-up consultant-led attendance at nephrology service is known)[32].

According to national tariff workbook, cost of specialist visits are calculated taking into account attendance type and clinic type, and are defined by treatment function code (TFC) instead of HRGs. TFC is defined as code for 'a division of clinical work based on main specialty, but incorporating approved sub-specialties and treatment interests used

by lead care professionals including consultants'[33]. There are separate tariffs for first and follow-up attendances as well as for single professional and multi-professional attendances for each TFC. Multi-professional attendance refers to several care professionals seeing a patient together, in the same consultation and at the same time[34]. To incentivise a change in the delivery of outpatient follow-up activity, to encourage a move to more efficient models and to free up consultant capacity, first attendances are over-reimbursed and corresponding follow-up attendances are under-reimbursed. This transfer in cost is set at a TFC level and ranges from 10% to 30%, except nephrology (0%)[30].

Regarding cost of **Accident and Emergency (A&E) department visits**, reference costs distinguish between cost of admitted and non-admitted patient. Moreover, both admitted and non-admitted patient may be of 4 types. Additionally, each type is characterized by investigation category (from 1 to 3 or no investigation) and by treatment category (from 1 to 4). A separate category is patient dead on arrival, dental care and no investigation with no treatment[32].

According to national tariffs, the cost of A&E depends on department type (from 1 to 3). This, in turn, is disaggregated into investigation and treatment categories (Supplementary Table 2)[35]. To support a more effective approach to resource and capacity planning for emergency care services, a blended payment for these services was introduced. It includes both a fixed and a variable element. In order to agree the amounts payable for emergency services by providers and commissioners, several rules are applied. They agree the level of planned activity, and calculate the value of this planned activity using the unit prices and expected casemix. If the value of actual activity is more (less) than the value of planned activity, the price payable will be the fixed price plus (minus) 20% of the difference between those values. Nonetheless, the commissioner and provider may agree amounts by which the actual activity may differ from the planned activity, but where the price payable remains at fixed price. In this case, the percentage rate will be that specified in the provision, instead of the aforementioned 20% rate [30].

Hospitalization

Reference Costs spreadsheet uses trim points to define a threshold: days that an inpatient spends in a hospital below the trim point (inlier) and days that occur above the trim point (excess). They are published and costed separately[34]. The calculation of the weighted average is described in the section Inpatient medical and surgical processes. The cost per both elective and non-elective inpatient excess bed days (those above trim point) exclude procedure cost, thus it is a good estimate of the cost per day of hospitalization. The cost per excess bed days is published for each HRG currency[32]. Additionally, the Reference Cost spreadsheet includes costs per whole hospitalization period, which is discussed in the section Inpatient medical and surgical processes.

Image diagnosis

Reference cost differs among direct access, outpatient and others. 'Direct access' means that patient was "directly referred from primary and community care to direct access service for both diagnostic assessment and treatment". 'Others' refers to those patients who were not referred by GP to the hospital to have the image diagnosis exam done. 'Outpatient' refers to image diagnosis exam performed in an outpatient clinic[33].

The unit cost of **computerized tomography scan** varies by age (5 years and under, between 6 and 18 years, 19 years and over), contrast (with contrast, without contrast, with pre- and post-contrast, with post-contrast only), and area (one, two or three areas)[32,35].

The unit cost of **ultrasound scan** varies by length of duration (less than 20 minutes, 20 minutes and over) and contrast (with or without contrast)[32,35].

Laboratory tests

Unit cost per exam at department of haematology is calculated by dividing total costs incurred by the department by total activity. Detailed data on blood and urine tests are not available[32].

Ambulance services

No distinction is made between intensive care and non-emergency patient transport. The costs are set for a call, and the activities 'hear and treat or refer', 'see and treat or refer' and 'see and treat and convey' (Supplementary Table 3).

Calls are measured by the number of emergency and urgent calls presented to the switchboard and answered, including hoax calls. Calls abandoned before they are answered, patient transport service requests and calls under any private or non-NHS contract are excluded.

The activity 'hear and treat or refer' is measured by the number of incidences, following emergency and urgent calls that were resolved by providing clinical advice by telephone or referral to a third party. 'See and treat or refer' is measured by the number of incidences, following emergency or urgent calls resolved with the patient being treated and discharged from ambulance responsibility on scene. The patient is not taken anywhere. 'See and treat or convey' is measured by the number of incidents, following emergency or urgent calls, where at least one patient is conveyed by ambulance to an alternative healthcare provider.

Further description of previously mentioned activities can be found elsewhere[36].

Diagnostic procedures

According to reference costs, the unit cost varies across services (e.g., it depends on whether it was undertaken in urology service, colorectal surgery service, upper gastrointestinal surgery service, vascular surgery service, etc.)[32]. According to national

tariffs, the cost of outpatient and inpatient diagnostic colonoscopy is identical and corresponds with best practice tariff (BPT). The idea behind paying a higher price for procedures in the outpatient setting is to create a financial incentive for providers to treat patients there[35].

Therapeutic procedures

The unit cost of haemodialysis is based on HRGs and depends on type of haemodialysis, the age of patient (19 years and over, 18 years and under) and type of setting (hospital, satellite unit, home)[32,35].

COMPLEX PROCESSES AND PROCEDURES

Inpatient medical and surgical processes

Inpatient costs are published as reference costs and tariffs based on HRGs. Both sources use trim points to define a threshold: days that an inpatient spends in a hospital below the trim point and days that occur above the trim point. They are published and costed separately[34]. Reference cost database distinguishes among cost of stay of elective inpatient, cost of excess bed day of elective inpatient, cost of non-elective long stay, cost of excess bed day of non-elective long stay and cost of non-elective short stay[32]. On the other hand, in order to promote movement to day-case settings where appropriate, most elective inpatient's tariffs are calculated as combined day case/ordinary elective spell tariffs by weighting both groups according to the activity in each of them. Separate tariff for both day case and ordinary elective patient is published for some HRGs. National tariff database also reports non-elective spell tariffs and per day long stay tariffs (for days exceeding trim point)[35].

Both reference costs and tariffs of **Heart Failure and Shock** depends on the complexity score (14+, 11-13, 8-13, 4-7, 0-3). The reference cost is defined for elective inpatient, elective inpatient excess bed days, non-elective long stay, non-elective excess bed days and non-elective short stay [32]. In turn, tariffs, are defined for combined day case/ordinary elective spell, non-elective spell and days exceeding trim point[35].

Both costs and tariffs **of Inguinal, Umbilical or Femoral Hernia Procedures** depends on age (1 year and under, between 2 and 18 years and 19 years and over). In turn, the cost/tariff of inpatients aged 19 years and over depends on the complexity score (6+, 3-5, 1-2, 0). The cost is defined for elective inpatient, elective inpatient excess bed days, non-elective long stay, non-elective excess bed days and non-elective short stay[32]. Tariffs of all the previously mentioned HRGs are defined for non-elective spell and days exceeding trim point. Moreover, the HRGs with CC Score 6+, 3-5, between 2 and 18 years and 1 year and under are defined for combined day case/ordinary elective spell, while the HRGs with CC Score 1-2 and 0 are defined for day case spell and ordinary elective spell per separate[35].

Day case procedures/Outpatient surgery

Costs of day case procedures/Outpatient surgery are published as reference costs and tariff based on HRGs. Reference costs refer to day case procedures/outpatient surgery as day case, that is defined as an admission where the patient is discharged before midnight[34]. National tariffs dataset contains day case spell tariffs and outpatient procedure tariffs, being a day case performed in a hospital and outpatient procedures in an outpatient setting. For HRGs that contain only one cost referring to both day case and outpatient procedure, the cost is independent of setting[34].

Cost/tariff of a day case **laparoscopic cholecystectomy** depends on age (19 years and over, 18 years and under) and complexity of procedure (4+, 1-3, 0)[32,35].

Outpatient laparoscopic cholecystectomy is performed only on patients aged 19 years and over with a complexity score equal to 0[32].

Cost of a day case **cataract surgery** depends on both complexity of procedure and service[32], while a day case tariff depends on the complexity of procedure only[35].

The cost of outpatient cataract surgery depends on the complexity of procedure[32]. Only one currency procedure is defined for the outpatient cataract surgery tariff[35].

FRANCE

Tariffs (SHI point of view)	https://www.ameli.fr/accueil-de-la-ccam/telechargement/index.php
Tariffs (production point of view)	https://www.atih.sante.fr/tarifs-mco-et-had
Costs (production point of view)	https://www.scansante.fr/applications/enc-mco

Two main portals for information on unit costs are the social health insurance site (*Securité Sociale l'Assurance Maladie;* Ameli)[37] and the hospital agency (*Agence Technique de l'Information sur l'Hospitalization*; ATIH)[38].

The hospital tariffs are published by ATIH, be they inpatient or hospital day cases, from the Social Health Insurance (SHI) payer's point of view based on DRGs. Most DRGs have one associated tariff (*Groupe Homogène de Séjours*; GHS). For a small subset of DGRs there can be two associated GHS tariffs which is usually due to a significant difference in the care provided such as implantable devices being used that can have an impact on costs. Conversely, a baseline tariff (GHS) may be attributable to more than one DRG.

Each baseline tariff that is associated with a DRG is for a "typical" length of stay, that is, the length in days is within a range of values for the given DRG. Should the hospital stay be below the minimum or above the maximum value stated in the GHS tariff database, the baseline tariff is modified according to equations published by the ATIH[39].

Certain expensive drugs and devices, or some daily charges such as reanimation are not included in this tariff. There are two schedules for these tariffs updated once or twice per year - one for public and not for profit establishments, and one for private establishments. These tariffs are made available in the public domain in csv and Excel formats[40]. These tariffs are an indication of the amount paid to the hospital for the hospital stays based on the DRG, but it is important to note that hospitals also receive annual lump sum funding, such as for emergency care, organ retrieval and transplants and from other allocations from public utility missions, also referred to as missions for general interest and contracting (*missions d'intérêt général et d'aide à la contractualisation;* MIGAC) that serve to fund coordination of care, plus epidemiological surveillance and expertise[41].

The ATIH database ScanSanté publishes costs from the hospital production point of view aggregated at the DRG level. Therefore, the total costs include all resources used during a hospital stay for the intervention, infrastructure as well as all fixed overheads. These average national DRG production costs per stay are calculated from a voluntary sample of public and private hospitals, who provide detailed accounting system production costs annually. These production costs include expenses of clinical activities, medical-technical expenditure, logistics and general management expenses, medical logistics expenditures and direct charges, but exclude land costs[42].

Ameli provides information from the SHI payer's point of view and includes ambulatory care patient tariffs such as consultations with GPs, specialists and nurses as well as interventions, biological examinations and imaging. In general, the different tariff components of a medical visit vary greatly depending on variables such as geographic location, time of day that the care was carried out, day of the week, the type of health professionals(s) carrying out the care[43]. It is not possible to simply add the published tariffs together to ascertain what the patient is charged or that the SHI will be reimbursing. The self-employed health professionals, who provide most of the ambulatory care, who are members of the professional category Sector 1 adhere to the statutory tariffs set out in the national agreements (conventions). Those doctors in Sector 2 have a permanent right to exceed the official tariffs via extra-billing. In general, the SHI reimburses only 70% of a consultation or 80% of a medical act. In this case, private health insurance payments or out of pocket payments are made. There are exceptions such as patients suffering from long term chronic diseases for whom the reimbursement rate is 100%.

Table 3 summarizes the main portals on unit costs.

Table 3. Sources of unit costs (France)

Portal	Perspective	Type of unit value	Type of patient
ATIH Scansanté	Social Health Insurance production	Tariff (based on DRG) Production cost (based on DRG)	Inpatient, Day case Inpatient, Day case
ameli	Social Health Insurance	Tariff	Ambulatory care, Private hospital

Source: Own elaboration
ATIH, Agence Technique de l'Information ser l'Hospitalization; DRG, Diagnosis Related Groups

PRIMARY RESOURCES

Medicines

The cost of medicines are available for consultation on the SHI ameli site. Two different prices are accessible: ex-factory price and public price[44].

Medical devices and Health products/Disposables

Theoretically, the technologies are reassessed every five years based on the documents provided by the manufacturer and on systematic literature reviews. Therefore, when a device is admitted onto list of refundable products and services, they have a time limit to be on the list until they are reassessed. However, if a device is still on the list beyond this reassessment date, it can still be reimbursed.

The public price of **sirolimus-eluting stent**, **wearable-cardioverter defibrillator** and **glucose test strips** can be found in the product listing document that is also made available on the ameli site[45].

Personnel costs

For doctors who are salaried employees in public hospitals, for the cost from the production point of view, the salary information can be difficult to find in the public domain and the financial services or accounting services of individual hospitals have to be contacted. In the case of the Paris university hospital network (*Assistance Publique Hôpitaux de Paris*; AP-HP) in order to calculate the hourly cost of hospital staff from the production point of view, 1607 annual hours worked as per the employment contracts are currently used[46]. Obviously, in terms of the real cost this approach has limits since many medical staff work more hours than appear on their contracts. For a salaried doctor at the AP-HP in 2016, the average annual salary including employer charges and taxes was 76,414€. For a university professor and practitioner, the part time average salary in 2016 including charges was 63,351€. The cost from the point of view of the SHI is bundled in the total DRG tariff for public and private not for profit hospitals. The private hospitals function in a different way that will not be covered here.

From the production point of view, the nurse's salary will depend upon the type of nurse and the type of hospital. For a nurse with the national diploma (IDE) at the AP-HP the annual salary including charges in 2017 was 48,296€.

The personnel costs for out of hospital care are calculated from the SHI payer's point of view and the information about costs has been covered above in the tariffs communicated on the ameli site. Doctors working in ambulatory care are mostly self-employed. For information, according to the report published by *Direction de la recherché, des études, de l'évaluation et des statistiques* (DREES), the average duration of a work week is 57 hours, with significant disparities among practitioners. However, doctor's activities are not only limited to the patient's care activities: it also includes training and management tasks such as accounting, and activities performed outside the office are often added, such as activities at retirement home, nursery, activities within a trade union, etc.[47]. Overall, the average cost per hour of an ambulatory self-employed doctor is rarely used in French EEs and the proxy of the tariff for a consultation is usually used in EE as an approximation of the personnel costs from a production point of view.

Since GPs and specialists who provide ambulatory care are mainly self-employed, are paid on a fee-for-service basis (supplemented by flat payments for patients with chronic conditions and pay for performance schemes), their income depends mostly on the level and composition of their activity. The SHI will usually reimburse the patient 70% of the tariff. The other 30% is either and out of pocket expense or paid by a separate insurance[48]. The coverage of patients who directly access specialists or other GPs outside of the coordinated care pathway falls to 30%[49]. Nevertheless, there are special regimes that receive 100% reimbursement (e.g., pregnant women)[50]. There is a basic cost per GP visit (without any additional examinations that would be charged separately) for more than 6 year old patients, home visit and complex home visit. Travel supplements and supplements for performing procedures are added to the basic tariff.

The amount depends on the time of day and whether the visit takes place on a working day, Sunday or public holiday. The allowance per kilometre is calculated on the basis of the type of surface (flat land, mountain or travelling on foot or by ski)[51].

The **ambulatory specialists**, are paid per consultation, and so the same procedure applies as for GPs. Under the "preferred doctor" scheme, patients are requested to register with the doctor of their choice, whom they should see to obtain a referral to a specialist. The preferred doctor is most often a GP, but it may be a specialist of any kind working sector 1 or sector 2. The cost of ambulatory specialist depends on the type of specialty, complexity of the illness, type of visit (teleconsultation, home visit, ambulatory care)[52].

The **nurses** working in ambulatory care are paid based upon the intervention/act that they carry out, type of setting (home or in clinic), time of day it is carried out, day of the week/bank holiday, etc. For example, if a nurse travels on Sunday to see a patient under 7 years old at their home 5 km away not in a mountainous region to take only a blood sample, the nurse will charge according to the following formula: Direct venepuncture sampling (1.5)*AMI (1.5*3.15€) + Fixed travel allowance (2.50€) + Kilometric allowance in flat land (5*0.35€) + supplement for acts performed on Sundays or public holidays (8.50€) + supplement for single act (1.35€) + young child supplement (3.15€) = 25.58€. Some weights and costs of nursing activities are summarized in Supplementary Table 4. The complete list can be found elsewhere[53,54].

COMPOSITE GOODS AND SERVICES

Outpatient visits

For the cost of a GP, nurse or specialist visit, all the information described in the above section on personnel costs may be applied.

The cost of simple A&E emergency visit (no imaging nor extra tests, no hospitalization) in public and private not-for profit establishments depends on whether the visit was performed during the day, night or weekends. Moreover, the cost to all payers for a visit to emergency whether public or private is also published[55].

Hospitalization

A generalised cost per day of hospitalization is not estimated. The cost and average length of stay for the whole hospitalization period from both the SHI and production point of view aggregated at DRG level is provided[40,42].

Image diagnosis

Tariffs of image diagnosis services are also made available on the SHI website ameli[43]. Supplements may be added to the basic tariff in the following cases: procedures performed urgently on Sundays and public holidays, paediatric night urgency 12-8 am,

emergency except paediatricians, patients < 5 years old, major act radiography carried out by a radiologist, a pulmonologist or a rheumatologist, etc. Type and amount of supplement depends on the type of procedure. To this tariff a technical charge is added for CT scanners and magnetic resonance imaging (MRI) scanners *(forfeit technique)* depending on the model, the age of the scanner and the region of the hospital where the scanner is located.

Laboratory tests

For routine biology, for accounting and resource management reasons, the tariff is expressed as a coefficient that has to be multiplied by a fixed value of the letter B (Biology). The coefficient of each routine biology test varies[56]. These tariffs are available on the SHI website ameli.

Ambulance services

For non-emergency transport, patients can be transported in several ways to or from a health facility or of a city office (or between care structures): in ambulance, in light medical vehicle (*véhicules sanitaires légers*; VSL), by approved taxi or by any other medium (public transport, personal vehicle). The patients are transported in an ambulance if they must be lying down or half-seated or supervised under oxygen or carried or transported under aseptic conditions. The patients are transported by VSL or by approved taxi if they need help to move, they risk side effect during transport or their health state requires strict compliance with hygienic rules. Patients who can travel alone or accompanied by somebody should use a personnel vehicle or a public transport. The payment of transport costs by the SHI funds requires the delivery of a medical prescription written before a transport[57].

From the SHI point of view, travel to and from hospital, as well as other journeys for medical consultation in certain situations, is reimbursed at a rate of 65% or 100% (depending on whether the patient's situation allows reimbursement or not) by the SHI after deduction of 2€ per trip each way that is the compulsory excess charge to patients (*franchise medical).* A patient who uses a personal vehicle, a tariff per kilometre driven is defined. Therefore, if a patient drove 50 km to go to a consultation, he will currently be reimbursed according to the following formula:

65% (100%)*tariff per one kilometre driven (€)*length of journey (km) – franchise (2€).

In case the patient uses public transport, he will be reimbursed for the cheapest ticket available. For example, for a 2nd class ticket that costs 50€, the patient will be reimbursed as follows: 65% (100%)*50€ - franchise (2€) = 30.5€[58].

The pricing of transport by VSL includes:

- A flat rate depending on the location of the headquarters of the medical transport company. It is applied for transport carried out in all the municipalities other than those where the care is provided. The rate applicable to each company is that of the

department where the company's head office is located. When the company carries out transport in another department, the applicable tariff remains that of the county of the company's headquarters. A flat rate includes the first 3 km travelled. Each French department falls in one of four defined zones (A, B, C, D) in order to establish the pricing to be applied by the company[59].

- A short journey valuation depending on the number of kilometres travelled. It applies, gradually, up to the 18th km travelled.

- A kilometric rate applicable to the distance travelled from the place of departure to the place of arrival, minus the first 3 km included in a flat rate, or from the 1st kilometre travelled in the case of billing for the care.

An additional charge is billable by companies located in certain municipalities in the Paris region for transport carried out within this area. The kilometres are billed from the 1st km travelled[59].

All these previously mentioned charges are summarized in Supplementary Table 6.

Diagnostic procedures

The tariffs for diagnostic services are made available on the ameli site[43].

Therapeutic procedures

The costs of hemodialysis and oxygen therapy are published by ScanSanté[42] and ATIH[40].

From the hospital production point of view -

the cost of **hemodialysis** includes the following cost elements:

- medico-technical expenses such as anesthesia, operating room, etc. (amortization, maintenance, other staff, medical staff, nursing staff)
- direct expenses (other consumables, blood, non-billable pharmaceuticals specialties, laboratory subcontracting)
- infrastructure cost (financial cost, cost of building)

The cost of **oxygen therapy** includes the following cost elements:

- clinical expenses (other clinical staff, clinical medical staff, clinical nursing staff)
- medico-technical expenses related with hyperbaric chamber (amortization, maintenance, other staff, medical staff, nursing staff)
- logistic and general management expenses (laundry, restoration, reception and patient management, general administrative services, administrative personnel services, stretchering and patient walking, maintenance, hotel services, motorized patient transport)
- medical logistics (pharmacy, biomedical engineering)
- direct expenses (other consumables, non-billable pharmaceuticals specialties, imaging subcontracting, laboratory subcontracting)
- infrastructure cost (financial cost, cost of building)

From the SHI perspective, the cost of hemodialysis differs between the type of setting (hospital, home)[40].

COMPLEX PROCESSES & PROCEDURES

Inpatient medical and surgical processes

The costs of inpatient processes are published by *ScanSanté*[42] and ATIH[40].

From the production point of view, the DRGs' four different levels of severity take into consideration a number of elements such as the severity of disease, the different medical interventions carried out during the hospital stay and the length of stay, and also include sometimes a fifth level for very short term hospital visits for lengths of stay less than 24 hours (day cases).

The cost of **heart failure** includes the following cost elements:

- clinical expenses (clinical staff, materials, maintenance and amortization for all types of clinical care outside the operating theatre including continuous monitoring, intensive care, critical care, resuscitation)
- medico-technical expenses (anesthesia, operating room, amortization, maintenance, other staff, medical staff, nursing staff)
- logistic and general management expenses (laundry, catering, reception and patient management, general administrative services, administrative personnel services, stretchering and patient walking, maintenance, hotel services, motorized patient transport)
- medical logistics (pharmacy, sterilization, biomedical engineering, hygiene and vigilance, other)
- direct expenses (other consumables, blood, specialties, other subcontracting, imaging subcontracting, laboratory subcontracting, transport subcontracting, fee-for-service staff, etc.)
- infrastructure cost (financial cost, cost of building)

The cost of **inguinal, femoral and umbilical hernia** includes the following cost elements:

- clinical expenses (clinical staff, materials, maintenance and amortization) for all types of clinical care outside the operating theatre including continuous monitoring, intensive care, critical care, resuscitation)
- medico-technical expenses (anesthesia, operating room, amortization, maintenance, other staff, medical staff, nursing staff)
- logistic and general management expenses (laundry, restoration, reception and patient management, general administrative services, administrative personnel services, stretchering and patient walking, maintenance, hotel services, motorized patient transport)

- medical logistics (pharmacy, sterilization, biomedical engineering, hygiene and vigilance, other)
- direct expenses (other consumables, plotter list of other consumables, blood, non-billable pharmaceuticals specialties, pharmaceuticals specialties, other subcontracting, imaging subcontracting, laboratory subcontracting, transport subcontracting, fee-for-service staff, etc.)
- infrastructure cost (financial cost, cost of building)

Day case procedures/Outpatient surgery

The cost of day case procedures is published by ATIH (ScanSanté production point of view)[42] and ATIH (payer's point of view)[40].

From the production point of view, the cost of **cataract extirpation** includes:

- clinical activities (caregivers, medical staff, clinical staff)
- medico-technical activities (operating room, anesthesia)
- logistics and general management (general administrative services, hotel services, staff administrative services, management information systems, maintenance, restoration)
- direct charges (other medical consumables, implantable medical device not billable in addition to hospitalization benefits, non-billable pharmaceutical products)
- medical logistic (sterilization, pharmacy, biomedical engineering)

GERMANY

Diagnosis-Related Groups	https://www.dkgev.de/fileadmin/default/Fallpauschalenkatalog_2019_180928.pdf
Outpatient procedures	https://www.kbv.de/media/sp/EBM_Gesamt___Stand_1._Quartal_2019.pdf

PRIMARY RESOURCES

Medicines

The prices are based on the selling prices of the pharmaceutical companies. They include the wholesale surcharge, the pharmacy surcharge, and a VAT rate of 19%. The reference prices are uploaded monthly[60].

Manufacturers are permitted to set whichever price they feel is appropriate for drugs falling into these classes, but the umbrella organization of health insurers (*GKV–Spitzenverband*, GKV-SV in the letters of its German acronym) establishes a limit to what individual insurers will contribute toward payment. The GKV–SV sets its payment limit for generics near the 30th percentile in the distribution of prices within each therapeutic class, high enough to ensure that patients have more than one choice but low enough to ensure that the payer is not responsible for paying the highest prices within the class. Most generic drugs fall into the reference pricing system. Approximately 34% of drugs, 80% of prescriptions, and 33% of drug spending in Germany is for drugs subject to reference pricing. There are different levels for reference price groups. These are used to regulate the range of coverage of a reference price group, which influences pricing:

- Drugs with the same active ingredients (level 1) → Paracetamol
- Drugs with pharmacologically-therapeutically comparable active ingredients, in particular with chemically related ingredients (level 2) → Atorvastatin
- Drugs with a comparable therapeutic effect, in particular, drug combinations (level 3)

The reimbursement of medicines in the outpatient and inpatient sectors is regulated differently. Within outpatient care, drugs are being reimbursed based either on reference prices or based on the manufacturers list price with several discounts and co-payments being applied. There is no internal reference price for Trastuzumab in Germany. All drug prices can be searched in the *"Lauer Taxe"* while prices might be lower, if the sickness fund has an individual agreement with the manufacturer. Prices in Germany are not confidential in general, but access to such a price list is needed.

If a drug is administered during a hospital stay, other reimbursement regulations apply. As a rule, a hospital does not receive separate reimbursement for dispensing a drug. Hospital services are subject to flat-rate cost regulation by DRGs. The costs of drugs dispensed are usually covered by a DRG. However, both the degree of innovation and

the (high) price of a drug make it necessary to reimburse hospitals for additional costs in few exceptions. At present, this applies in particular to new cancer drugs. The list of these drugs is an annually updated annex to the DRG catalog (so-called additional charges). For Trastuzumab there is an additional charge *("Zusatzentgelt")* for the year 2018. This also applies to 2019. The amount of the additional charge depends on the amount of active ingredient delivered[61].

Medical devices

In principle, there is no individual reimbursement for medical devices used during a hospital stay. Both the medical service and the product (e.g., a stent) are reimbursed at a flat rate via a DRG. In certain cases, in which a DRG is not able to reflect the high prices of consumables, additional fees are reimbursed. This applies to DES. The mentioned fees for a DES can be charged additionally to a DRG and therefore best reflects the price of this product[61]. Yet, there is no information or publicly available data about the purchasing price of a hospital. Moreover, there are so many negotiations and tendering in Germany that is difficult to know the cost structure behind that, there is no cost calculation and usually a market price is used.

At this time, the statutory health insurance companies do not finance the **WCD** in the cardiology rehabilitation clinics. The German Society for the Prevention and Rehabilitation of Cardiovascular Diseases estimates the cost of the WCD therapy to be about 2,600€/month[62].

Health products/Disposables

Annual costs for **glucose test strips** per patient are estimated by the Federal joint committee[63]. However, the maximum packing prices are agreed at the regional level and may vary slightly. Three price groups (A1, A2 and B) are formed in which basically all the market glucose test strips are classified (Supplementary Table 7). The VAT is not included. For different pack sizes, an increase or decrease in prices for the groups A1, A2 and B are agreed accordingly. The contracting parties regularly discuss the possibilities of further development of this price agreement[64].

Personnel costs

Agreements about what medical and nursing staff should earn are available. Salaries of medical staff at ambulatory care depend on negotiations. Some calculations are done, but they are not made public. They are done just to prepare negotiations that are taking part later on. Personnel costs are based on average salary including incentives, extra hours, on-call time and it is divided not by 365 days but without bank holidays and weekends.

Private insurance is important in Germany. An important percentage of population is insured with private companies instead of sickness funds. This results in two different fee schedules. Fee schedule for sickness fund is updated quite often (more than once a

year) to bring in new services, because otherwise is not possible to pay for them. This payment is based on a relative position of a new service and finally the weight is converted in value in euros. Fee schedule for private insurance is set by the Ministry of Health and it is not updated very often. New service just take the position, which is already in there. This is an analogue position and we can take it because efforts are comparable. This is not an ideal situation and it is not based on any calculation. If it is accepted or not is based on negotiation. The basis is a micro-costing but just for a sickness funds fee schedule and is not public.

From the production point of view, the average monthly salary of **specialists** working in hospitals was calculated on the basis of over 6,500 doctors and psychotherapists. The cost elements included are medical pension plan, health and long term care insurance and income tax (Supplementary Table 8)[65].

The income of **GPs** and **specialists** working in ambulatory care is budgeted quarterly. Therefore, the GPs' income (which is based on a capitation system) and specialists' income (which is fee-for-service based) is given as a quarterly gross income or as a per capita amount. The GP's and specialist's gross income and the income per patient in the last quarter of the year 2016 according to *Kassenärztliche Bundesvereinigung* report[66] is shown in Supplementary Table 9.

Regarding **nursing staff**, the median gross monthly salary and median salary per region, sex and age categories is available elsewhere[67]. According to the web page de.statista.com, the average gross monthly salary in 2018 was 3,085€. However, to access the data, the payment of a fee is required[68].

COMPOSITE GOODS AND SERVICES

Outpatient visit

In order to calculate the average cost of **A&E visit**, the cost information of 612,070 cases from 55 hospitals was used. It includes all costs incurred in other areas of the hospital that have been used as part of the emergency treatment, but only of legally insured patients that are billed to the statutory health insurance associations. Investment costs (depreciation for equipment and buildings) are not taken into account[69]. The results can be represented in the matrix structure that contains the cost centre groups in the rows, and the cost element groups in the columns. The cost matrix shows the origin and type of costs incurred (Supplementary Table 10).

80% of the case costs are incurred in the emergency room itself, 13% for radiological examinations and 5% for laboratory diagnostics. Costs incurred by other cost centres are rather insignificant (2%). Looking at the types of costs incurred in the emergency rooms, around a third are attributable to the medical service, one third to the nursing or functional service, 9% are medical material costs and 25% infrastructure costs. These include building management, administration, maintenance, central sterilization, etc.

For 55% of outpatient emergencies, costs are incurred in diagnostic or therapeutic areas outside the emergency room. For example, in 35% of emergency treatments, radiology costs averaged 46€, in 24% of cases, laboratory costs were around 26€. Some of the hospitals provided additional optional data on the age, type of assignment and mode of transport and the specialty of the emergency patient being treated, so that the costs for the relevant subgroups could be analysed. The average cost for outpatient emergency patients is 126€. The average cost in the age group under 6 years is 89€. The treatment costs increase with increasing age and amount to 160€ for very old patients. In addition, the report shows the average costs by type of assignment, type of transport, by departmental reference and diagnostic groups. The case costs of patients assigned to the emergency services are, for example, 171€, and if the patients are also accompanied to the hospital by an emergency doctor, the case costs average 242€[69].

Hospitalization

To calculate a day value is not very appropriate. Total cost of DRG can be divided by the average days for that DRG, but this is not an actual cost, because on the day of the operation the cost is much higher than on the rest of the days. It is also possible to have an overall value for cost in hospital per day (take an average cost per day for a hospital case, which is around 3000 € and divide that by the average stay in the hospital, which is about 7 days).

Nonetheless, according to the report published by *Statistisches Bundesamt (Destatis)*, the average **cost per episode** is 4,695€[70]. The resources included in the cost are described in Supplementary Table 11-Supplementary Table 13.

Image diagnosis

It is based on negotiated fee schedules. The cost of **ultrasound scan** depends on the type and area of examination. Additionally, the cost of **CT scan** depends on whether it requires contrast[71]. For inpatients, the cost of image diagnosis is included in the DRG.

Laboratory tests

The cost of different tests is based on the negotiated fee schedules[71]. For inpatients, the cost of laboratory tests is included in the DRG.

Ambulance services

Years ago, the intensive ambulance care was operated by the state. However, nowadays, each county has to do a tendering in order to set a tariff. Regarding ambulance services in Ennepe-Ruhr county, a billing-relevant operation begins with the departure of a vehicle from the rescue station/location or the start of the deployment. The scale of the fee for a journey depends the type of care (emergency rescue, emergency doctor mission, non-emergency patient transport), the corresponding use of an emergency vehicle, the number of people transported and, in the case of a journey outside the district, the kilometres travelled[72].

There are two types of **intensive care ambulance**: ambulance '*Rettungswagen'* (RTW) and emergency medical vehicle '*Notarzteinsatzfahrzeuge'* (NEF). In the RTW, the patients can be professionally supplied with oxygen and the heartbeat can be monitored using an ECG. There is also a comprehensive range of medicines. The basic fee for a journey of RTW is 520€. The NEF is staffed with a driver and an emergency doctor for the treatment/care of emergency patients. Therefore, the fee includes the provision of the vehicle including the medical staff. The fee for NEF should be paid when the emergency doctor advises, examines or treats a patient. Subsequent transport in the RTW will be invoiced separately. The basic fee for NEF is 560€ per journey.

For both RTW and NEF applies that for transports, in which the rescue equipment remains at the destination until the return transport, only a basic fee is charged. If it is not possible for the vehicle to remain for imperative reasons of use and therefore another vehicle has to carry out the return transport, a further fee must be paid. For journey outside the ambulance area of the Ennepe-Ruhr district, a lump sum of 2€ is charged form the first kilometre for a distance of more than 100 kilometres, calculated from the border of the district of ambulance area per single kilometre additionally. A surcharge of 50% is charged for each additional person being transported. The total amount will be distributed equally among the passengers[72].

The **non-emergency patient transport** (KTW, in the letters of its German acronym) has on board a stretcher and carrying chair, first aid kit and emergency backpack, a simple oxygen system and usually also an automatic external defibrillator. It takes patients who cannot drive themselves or who have to be transported lying down to the clinic, doctor or rehabilitation. A billing-relevant operation begins with the departure of a vehicle from the rescue station/location or the start of the deployment. The scale of the fee for a journey depends the type of care (emergency rescue, emergency doctor mission, patient transport), the corresponding use of an emergency vehicle, the number of people transported and, in the case of a mission outside the district, the kilometres travelled. The basic tariff for KTW is 145€[72].

Additionally, the German sickness funds also pay for taxis, if this kind of transport is necessary (which has to be certified by the doctor).

Diagnostic procedures

Diagnostic services are part of the fee schedule[71]. For sickness funds, the fee schedule is done from time to time, but they are not based on any calculation, they are negotiated.

Regarding **colonoscopy**, obligatory procedure contents consists of:

- total colonoscopy showing the cecum,
- Patient information on colonoscopy and premedication in reasonable time before the procedure,
- education and instruction of the caregiver(s),

- information about the procedure and possible polyp(s) ablation and other therapeutic measures in the same session,
- Information on the course and duration of colon cleansing,
- Delivery of all substances for colon cleansing
- Photo / video documentation (s),
- follow-up,
- Compliance with the measures for checking the hygiene quality and provision of suitable emergency equipment both in accordance with the quality assurance agreement,

Optional service content consists of:

- position control by means of an imaging process,
- coagulation tests and small blood count,
- representation of the terminal ileum,
- trial excision(s),
- Premedication, sedation, possibly with monitoring of blood pressure and pulse oximetry[71]

Therapeutic procedures

The cost of hospital **hemodialysis** is based on DRG. The reference value of 3,544.97€ has to be multiplied by the corresponding multiplication fraction that can be found elsewhere[61]. Ambulatory hemodialysis is part of the fee schedule[71]. The tariff of **oxygen therapy** includes the following services:

- Documentation,
- Expiratory oxygen measurement and mask monitoring,
- Coordination and ensuring the care of the patient between the pressure chamber treatments by a qualified institution,

Optional service content consists of:

- Wound control and dressing change,
- Photo documentation after every 10th pressure chamber treatment,
- Otoscopy,
- ECG monitoring,
- Rest spirography,
- Pre- and post-examination,
- Transcutaneous measurement(s) of the oxygen partial pressure, including provocation if necessary,
- Information about preventive fire protection measures and safety instructions before starting pressure chamber treatment, once on the day of treatment[71].

COMPLEX PROCESSES & PROCEDURES

The reimbursement of outpatient and inpatient medical services is carried out in different ways. In both sectors, there are many elements of flat-rate reimbursement (e.g. DRGs for hospitals). In outpatient sector, however, there are also many individual service payments. For this reason, it is often not possible to determine the price of a particular service, for example a radiological examination, at the hospital. It is part of a flat rate DRG for a total hospital stay. In contrast, it is easy to approximate the costs of certain disease for hospital stays (for example, the average cost of a stroke). This, in turn, is more difficult for outpatient medical services.

For a hospital stay, the overheads are included in the DRG (except for investments). For an ambulatory care visit, overheads are also included in the honorarium, but how this has been calculated is not very transparent.

Inpatient medical and surgical processes

Inpatient processes are costed based on DRGs. GRD is based on very transparent micro-costing, it is known how many personnel costs and overheads they include (investment and land costs are excluded). It is updated once a year. The main sources contains DRGs relative weights only[61]. They have to be multiplied by a reference value that was 3,544.97€ in 2019 (varying from country to county).

Regarding **heart failure**, there are four different costs depending on the complexity of a process and the length of hospital stay[61].

Day case procedure/Outpatient surgery

There are two different fee schedules (for private insurance and for sickness funds). The resources are identified at very detailed level (micro-costing). It is not possible to link a diagnosis to a certain price or fee. As an alternative, data from publications or individual contracts between physician organisations and payers are cited.

The **laparoscopic cholecystectomy** is only performed in inpatients. In the future, this should be part of fee schedules. Much more is done on the same procedure for inpatient. This makes this system quite inefficient.

The **cataract surgeries** are remunerated by a one-time flat-rate fee per case of illness and sick eye. The replacement health insurers compensate the participating ophthalmic surgeons for an outpatient surgery fee for the entire service content, including all upcoming material costs (including special lens, if applicable, as well as blue light filter lens, if the implantation of these lenses is medically indicated) in the amount of 709€ per cataract operation performed. With this surgery flat rate, all costs of the implant including procurement and storage, the visco surgical material and the material costs of the consumables for funds outside the consultation hours are covered. Any further claims against the insured are not permitted[73].

ITALY

Medicines	https://www.aifa.gov.it/liste-farmaci-a-h
Inpatient and outpatient tariffs	https://www.gazzettaufficiale.it/eli/id/2013/01/28/13A00528/sg.

Values reported for both inpatient and outpatient care are collected in the official tariff lists published by the *Servizio di Sanitá Nazionale* (SSN)[74]. More specifically, all inpatient and most of outpatient tariffs are attached to the decree *Decreto Ministeriale 18 ottobre 2012*[75]. The tariffs are defined on the basis of standard production costs and standard quotas of general overheads calculated on a representative sample of public and accredited private providers[75]. The previous decree does not mention what resources were included in the final cost. The general criteria for the definition of the welfare functions and for the determination of their maximum remuneration are established on the basis of organizational standards and predefined unit costs of the production factors, taking into account, when appropriate, the volume of the activity carried out[76]. Regional tariffs (with minimal variations) are also available[77].

Outpatient specialist activity is categorized using procedure codes derived from the Italian version of the International Classification of Disease (ICD) ICD-9-CM. Inpatient activity is organized according to DRG (version 24).

The availability (and reliability) of cost values vary greatly across the different cost objects. Official cost values (SSN, *Agenzia Italiana del Farmaco* - AIFA) exist for selected categories only: hospital admissions, outpatients procedures (e.g., specialist visits, diagnostic and laboratory tests, therapies), prostheses (e.g., wheelchair, artificial limbs, lens) and drugs. Other items (e.g., personnel, medical devices, ambulance services) that may be used in EEs are costed using local sources or ad-hoc studies.

PRIMARY RESOURCES

Medicines

Drug prices (for drugs of class A and H that are reimbursed by SSN) result from a negotiation process between the pharmaceutical companies and *AIFA*, which evaluates the clinical and cost-effectiveness profile of the new products becoming available on the market. For Atorvastatin, the public price and reference price is available, whereas for Trastuzumab, the public price and ex-factory price is available. Paracetamol is only available in combination with Codeina or Oxicodone. Reference prices are uploaded each 6 months. The patients can choose a brand name drug instead of the generic equivalent drug, but they are asked to pay the difference between the two[78].

Medical devices

Unfortunately, there are not reference prices for all medical devices at national level. An ad-hoc study aimed to standardize auction prices of some medical devices (e.g., drug-eluting stent) and results were incorporated into national laws[79]. However, these prices are not updated and cannot be considered 'official' values for the Italian context. Local examples of purchase or leasing prices are extracted from ad hoc purchase documents and may change even for the same region.

The median base auction price of **DES** published by *Autorità Nazionale Anticorruzione* is set on 448,95€ (median value is 782,5€)[80]. According to *Decreto 11 ottobre 2007*, the base auction price is 1486€[79]. The last update of base auction price dates back to 2009.

Purchase or leasing local prices of **WCD** are extracted from ad hoc purchase documents and may also change for the same region. There is some list of medical devices reporting their auction prices[81–83].

Health products/Disposables

There are no national reference values for health products/disposables; thus, examples of prices based on local purchase documents are provided[84,85].

Personnel costs

There are three main sources of personnel costs in Italy: *Istituto Nazionale di Statistica* (ISTAT), national collective contracts and ad-hoc studies. ISTAT is an official statistics source and combines different data (social security data, registry data, etc.) aimed at evidencing the differential wages in the private sector. It reports hourly salaries by job categories (i.e., healthcare and social assistance) and job levels (e.g., intermediate technical roles). More detailed information regarding cost elements included in the concept "cost per hour of work", such as periods of on-call time, bank holidays, incentives or variations in productivity, extra hours, etc., comes from ad hoc studies/articles. Surveys/interviews with professional groups is also an alternative.

According to the national collective contract, **nurses** can work 5 day per week (7.12h/day) or 6 days per week (6h/day). Theoretically, Sunday is not included (52 days per year are mandatory days off). Also, consider 28 or 32 days of annual leave (respectively for shifts of 5 or 6 days per week) and 12 days of bank holidays. The national contract does not include incentives, night shifts, on-calls and extra-hours of work[86]. Examples of incentives for nurse working in intensive care or operating room: 4.13€ per each day of work at operating ward, intensive therapy, sub-intensive therapy or nephrology service and dialysis; 5.16€ per each day of work at infectious disease service or equivalent disciplines. Regarding domiciliary assistance, the incentives are 5.16€ or 2.58€ per day of work (depending on the nurse's category)[87]. There are 7 categories corresponding to different levels of remuneration. They have the same responsibility in any setting, just every 3 years a nurse passes to another level and get a

salary increase[86]. There can be differences in salaries across regions. The difference about wages can be explained because beside the national collective contract, there is usually an integrative contract, which is regional-based. Basically, each local healthcare practice can freely decide how much can remunerate more a health's professional. E.g., a nurse working in *Fondazione IRCCS Policlinico "San Matteo"* in Lombardia could be paid an extra annual salary of 1,533€ in 2018[87].

A nurse's salary does not depend on a health care setting (hospital, primary care, etc.).

In private sector, nurse's net monthly salary is around 1,500€. Nevertheless, considerable differences can be found from one institution to another. E.g., those who work in non-profit organizations and cooperatives can gain even just net monthly salary of 1,000€, while nurses in the emergency room and in the operating theater can gain 2,000€. Nurses holding managerial positions are paid about 3,000€ a month[88].

According to ISTAT, the hourly nurse's salary depends on the category (i.e. seniority) s/he belongs to. Part of gross annual salary consists of salary in kind (0.1%), remuneration for overtime (1.8%), compensation for thirteenth and other additional monthly payments (7.6%), remuneration for premiums and other components not payable in each pay period (1.5%)[89].

GPs' salaries are based on a capitation system. A GP can have a maximum of 1,500 patients and receive a fix capitation for each patient that is irrespective of the number of visits. According to the national collective contract, GPs are paid an annual flat-rate fee per patient of 38.62€. This quota is raised by an extra quota resulting from the multiplication of the total number of patients in charge by the tabular value determined by the intersection between the seniority of the GP and the band determined by the number of patients assisted (Supplementary Table 14). GPs are additionally compensated for each patient that has completed 75 years of age by 15.49€. There are many other incentives added to the basic quota of 38.62€ per patient per year[90].

According to an ad hoc study that combines data from ISTAT, *Conto Annuale* and local data from ENPAM, a GP earns per patient per year around 66.42€ and his hourly retribution is of 60.71€[91].

According to the national collective contract, a yearly salary of a **specialist** with permanent contract is based on 13 payments and 38 working hours per week. A yearly salary of a specialist with fixed-term contract is based on 13 payments and 28 working hours per week. The salary does not include any incentives. The retribution per extra hour of day shift is fixed at 26.61€, 30.08€ is paid for one extra hour of night shift or one extra hour of day shift on public holidays and 34.70€ is paid for one extra hour of night shift on public holidays. The annual incentives for specialists who do not practice in private sector are determined as well[92]. In order to calculate the hourly wage of a specialist with permanent contract, it should be considered that Sunday is not included (52 days per year are mandatory days off) and that 28 or 32 days of annual leave (for

shifts of 5 or 6 days per week, respectively) and 12 days of bank holidays should be subtracted.

According to the previously mentioned ad hoc study, a specialist earns per patient per year 192.89 euros in hospital and 13.58 euros in ambulatory care[91].

COMPOSITE GOODS AND SERVICES

Outpatient visits

There are no official tariffs for **GP visit**.

Tariffs of a **specialist visit** are constant across specialties[75].

Regarding the cost of **A&E visits**, the cost comes from a three-year period (2000-2003) and is based on an ad hoc study performed in 6 hospitals in the Region of Lazio[93]. In order to estimate costs, the top-down method could not be used because allocative statistics for A&E department is currently not available neither at local nor national level. Additionally, the application of the bottom-up method requires detailed information on resources consumed per individual patient. However, the hospital accounting systems do not have this information. Therefore, the study used the methodology of relative weights. The cost of all individuals treated at A&E department, admitted or not to the hospital (with the exception of programmed hospitalizations) who accessed A&E according to the following classification criteria were considered:

- Accessed without reference to any classification system
- Accessed classified according to the triage system
- Accessed classified according to the International-Refined DRG (IR-DRG) system tested in the framework of the study

The study considered the following costs:

Direct cost of A&E department:

A. Fixed cost related to the productive factors (e.g., personnel, equipment) and variable costs (e.g., drugs, health products, disposables) both used directly by A&E department, except for Radiology and Laboratory.
B. Costs determined by services not provided directly by the accident and emergency department. This refers to cost of Radiology department and Laboratory. Therefore, all costs related to activity provided by radiology and laboratory departments to the patients treated at A&E department are imputed to A&E department.

Indirect costs of A&E department:

C. Costs of the production factors attributed to accident and emergency department, but not directly used in the production of the single service. This

is the case of variable overheads such as cleaning or laundry. General operating costs of the structure to which the accident and emergency department belongs, to be attributed to the accident and emergency department itself. This is the case of fixed overheads such as cost of building or amortization of building.

Supplementary Table 15 shows the information provided by the hospitals. On average, fixed costs represent over 75% of the total costs of the A&E department. The incidence of fixed costs, however, varies between the structures from a minimum of 67% to a maximum of 95%. The main cause seems to be related to the way in which the costs of the medical personnel on duty who work both for A&E and for the department to which they belong have been determined. Some structures have attributed the cost entirely to the emergency room, while others have imputed it (but with variable proportions) partly to the emergency room and partly to the department to which they belong. A&E department is a final cost object. Supplementary Table 16 shows the average cost per each of the six hospitals included in the study. The standardized average cost per hospital, that is, the result of multiplying the previously defined average cost (Supplementary Table 16) by the corresponding weight is shown in Supplementary Table 17.

Hospitalization

Regarding cost of a **day of hospitalization at normal ward** and the cost of a **day of hospitalization at ICU**, the average cost of the whole hospitalization period is available only. It comes from an ad hoc study based on a sample of 23 hospitals and it was estimated using the activity-based costing. Hospital tariffs are associated to DRGs. The cost of a recovery period at normal ward includes cost related to the production factors such as the personnel cost (doctor, nurse, other personnel such as biologists, technicians, administrative staff, etc. related to diagnosis and treatment units, managers and directors), cost of medicines and overheads (depreciation, cleaning, laundry, wardrobe, catering, and other costs assigned to diagnosis and treatment units). All the previously mentioned costs were collected from hospitalization at normal ward, reanimation unit, operating room (operating room, delivery room, hemodynamic, electrophysiology) as well as from services from other units such as consultancy, blood transfusion, gastroenterology, etc.[94].

Image diagnosis

The cost of an **ultrasound scan** is based on a costing studies of some services performed in a sample of hospitals from 3 Italian regions: Toscana (2003-2004), Veneto (2008) and Friuli Venezia Giulia (2006)[95].

The cost of a **CT scan** is based on a costing studies of some services performed in a sample of hospitals from 4 Italian regions: Tuscany (2003-2004), Veneto (2008), Piedmont (2008) and Friuli (2007)[95].

The costs are published by the SSN in an official tariff list[75].

Laboratory tests

The cost data come from the following studies: costing studies of all laboratory services performed with the method "Costilab" in the Regions of Umbria in 2007, and Tuscany in 2004; a study using ABC methodology that was carried out by the Local Health Authority (ASL) of Cuneo in Piedmont in 2008, and a costing study of all laboratory services (except those carried out by the immuno-blotting service and pathological anatomy) done in a sample of public and private settings in Veneto using a step-down costing methodology and conducted by Bocconi University in 2007[95]. The costs are published by the SSN in an official tariff list[75].

Ambulance services

Cost values reported for an **intensive care ambulance** journey come from an ad hoc study using costing data of 5 local healthcare companies (*Azienda Sanitaria Locale*, ASL) from Region of Liguria. An ASL is a public body of the Italian public administration responsible for providing health services. The data was being obtained during 3 consecutive years (2003-2005). The triage system was used to estimate the cost of intervention according to the patient's complexity. The number of personnel per intervention was estimated on the basis of the hours worked monthly by the staff dedicated to the activities related to an ambulance intervention taken from the published results of the European Emergency Medical Services (EMS) project (see Supplementary Table 18 for the variables used). The cost components were deduced from the analytical accounting data from each of the 5 ASL. Each individual case has been broken down into three main activities: receiving emergency calls, assessment of the severity of the event and the complexity of the intervention and activation of the intervention. Cost of receiving emergency calls was determined by cost of assistants/technical operators, administrative workers and overheads. Cost of sending a vehicle is determined by cost of personnel (medical and nursing staff), services (rentals) and others (depreciation). Among costs related to the intervention at the rescue site are costs of pharmaceutical and blood products, diagnostic reagents, medical devices and other health materials and acquisition of non-health products).

Regarding cost of ambulance services, even if there is no intervention, everyone must be prepared to be ready to intervene when needed. Therefore, most costs should be considered as fixed costs. Even it is obvious that there are some variable costs such as drugs, equipment, fuel, etc., they are very low compared to the others and therefore can be safely overlooked.

The fact that data were obtained from 5 ASL constitutes a too limited number for a methodologically correct cost estimation[93].

The cost of **non-emergency patient transport** are not available.

Diagnostic procedures

Based on the official tariff list published by the SSN. Two different treatments of **colonoscopy** were identified: Colonoscopy with flexible endoscope and Colonoscopy - retrograde ileoscopy[75].

Therapeutic procedures

The tariff of **haemodialysis** is based on a study on the characteristics of assistance to patients with chronic renal failure dating from 2008[95] and is published by the SSN in the official tariff list. The tariff depends on the type of haemodialysis and on the type of setting it is delivered (hospital vs. home)[75].

The cost of **oxygen therapy** was not found in the official tariff list[75].

COMPLEX PROCESSES & PROCEDURES

Inpatient medical and surgical processes

In order to derive acute inpatient tariffs, a sample of 41 healthcare providers, either public or private (but accredited with the SSN), were selected according to the criteria of efficiency, efficacy, quality and appropriateness of care, plus the availability of robust cost data. Moreover, they were distributed in three dimensional classes (i.e. 121-350, 351-600, >600 beds), proportionally with respect to the national picture, and located in the following regions: Lombardy, Veneto, Emilia-Romagna, Liguria, Umbria, Puglia and Sicily[95].

The tariffs for hospitalizations lasting more than 1 day are determined on the basis of the full costs (DRGs). Exceptions are some DRGs, such as those relating to transplants (for which it was agreed to refer to the values of the conventional single tariff), and those relating to the paediatric area (in consideration of the recognized descriptive limits of the DRG system compared to paediatric cases). The tariffs include A&E department costs of those patients who were admitted to the hospital directly from the A&E department. The last costing exercise for hospital tariffs dates back to 2009[95].

Several tariffs associated to the inpatient medical and surgical processes are defined:

- tariff of ordinary hospitalizations with duration superior to 1 day and within the value threshold (tariff per episode of admission)
- tariff of ordinary hospitalizations with duration between 0 and 1 day, transferred or deceased (tariff per day of hospitalization)
- tariff of ordinary hospitalizations with duration between 0 and 1 day. Day case (tariff per episode of admission in case of surgical DRG, tariff per day of hospitalization in case of medical DRG).
- Tariff of days over value threshold (tariff per day of hospitalization)[95]

The tariff of **hernia inguinal, femoral, umbilical** depends on whether the process includes complications or not.

Day case procedures/Outpatient surgery

The tariffs of day case procedures were determined on the basis of the composition of the costs by macro-item and the average length of stay specific to DRG, but excluding the cost items not compatible with daytime hospitalizations (e.g. costs of intensive care and emergency room). In particular:

-The tariffs for day case procedures attributed to surgical DRGs were determined on the basis of the average cost per day, increased by the cost components relating to the surgical intervention and to the pre and post intervention services, specific to DRG.

- The tariffs of day case procedures attributed to medical DRGs were determined on the basis of the average cost per day, specific to DRG[95].

Tariffs associated to the **laparoscopic cholecystectomy** depend on whether it entails complications or not.

The tariff per day case **cataract surgery** is published only.

POLAND

Medicines	https://www.gov.pl/web/zdrowie/obwieszczenie-ministra-zdrowia-z-dnia-30-kwietnia-2019-r-w-sprawie-wykazu-refundowanych-lekow-srodkow-spozywczych-specjalnego-przeznaczenia-zywieniowego-oraz-wyrobow-medycznych-na-1-maja-2019-r
Inpatient DRG	http://www.nfz.gov.pl/zarzadzenia-prezesa/zarzadzenia-prezesa-nfz/zarzadzenie-nr-382019dsoz,6906.html
Outpatient DRG	http://www.nfz.gov.pl/zarzadzenia-prezesa/zarzadzenia-prezesa-nfz/zarzadzenie-nr-222018dsoz-tekst-ujednolicony,6924.html

PRIMARY RESOURCES

Medicines

The official prices of reimbursed drugs are updated on a regular basis every 2 months. The reimbursement list can be found elsewhere[96]. Medicines with paracetamol are commonly used in Poland, but most of them is in the over-the-counter and is not reimbursed. Therefore, the reimbursement list contains paracetamol in combination with tramadol, because it needs to be prescribed by a physician.

Medical devices

There's no list of hospitals with the cost of medical devices. Each hospital buys them by tender. According to the hospital data, the average price of DES was around 1,000 zł in 2007. Distributors provided a similar average price in 2006. According to detailed information on costs of each treated patient in two Polish hospitals, the cost of a DES can be found in Table 4. However, these prices are not publicly available. In Poland, stents are not costed separately, the cost of DES is included in the DRG referring to the whole process of implanting a DES.

Table 4. Cost of a drug-eluting stent in 2018 (Poland)

Mean	Min	Max	Median
1,179.55 zł	464.40 zł	3,888.00 zł	972.00 zł

Source: Communication with the Polish partners.

The **WCD** is currently not reimbursed in Poland.

Health products/Disposables

The official prices of reimbursed health products are updated on a regular basis every 2 months[96].

Personnel costs

An hourly wage of GP, nurse and specialist is not defined. Instead, lump sum for a year of care of 1 patient is defined, being of 159 zł for a GP and of 40.80 zł for a nurse in 2019[97].

COMPOSITE GOODS AND SERVICES

Outpatient visits

Cost of a **GP visit** is not available in Poland.

The cost of a **specialist visit** is equal across all specialties. However, cost varies depending on a severity of patient's illness. Not all specialties have the same types of severities (e.g., in cardiology, there are 8 types of patient's illness severity – 1, 2, 3, 4, 5, 7, 8 and 9). Moreover, cost of a post-hospitalization visit, visit related to a prescription only, several types of visits after cardiovascular event, etc. are defined as well[97].

Regarding cost of **A&E visit**, each hospital receives individually set lump sum for the year. This is set by National Health Fund[98] and consist of two parts: one covers the cost of infrastructure and in 2020 is 4,521 zł per day and the second depends on patients profile in a determined period of time. Therefore, the cost of the second part of A&E visit is set according to the following formula, taking into account the number of patients within the appropriate category of patient's health, based on the medical procedures performed and the weights of individual categories:

$$R_f = \frac{a}{l_d} \times \sum_{i=1}^{6} P_i \times W_i$$

Where,

a: value of point (in the hospital emergency department the value is 1 zł),

l_d: the number of days in the period adopted for the calculation (the calculation includes the period containing reporting data from the full 12 months, and in the absence of which, reporting data from a minimum of 3 consecutive months are used in the calculation),

P_i: the number of patients in each category of patient's state of health. The component includes:

1) patients qualified for categories V and VI who were suddenly admitted as a result of being transferred by a medical rescue team;

2) patients for whom the A&E service did not end in hospitalization in the same institution;

3) traumatic patients or traumatic paediatric patients for whom the benefit in the trauma centre ended up in hospitalization in the same institution and for the settlement indicated the benefit from the group T specified in the characteristics of the group from the catalogue of groups,

W_i: weight of the relevant category. The weights can be found in as specified in Supplementary Table 19.

Hospitalization

The cost of a **day of hospitalization at ICU** is set by the National Health Fund and it depends on the patient's severity of illness (measured on TISS-28 scale) and level of care (1st, 2nd or 3rd). The cost varies from 749,01 zł to 4906,14 zł for children, from 850,68 zł to 4380,48 zł in case of adults and from 952,89 zł to 4906,14 zł in case of adults of level II severity of illness. The service provider is obliged to compile in the statistical report all the detailed activities performed in patient care for each day of the patient's stay in the ward[99].

Image diagnosis

Ultrasound scan is not financed separately. Cost of **CT scan** differs among imaging area and it depends on whether the exam is done with or without contrast as well. The head examination covers all intracranial structures. In addition, as part of this procedure, depending on medical indication, the following examinations can be performed: CT of the maxillofacial region, CT scan of the temporomandibular joints, CT scan of the temporal bone, CT scan of the saddle or posterior cavity, CT of the base of the skull and CT of eye sockets. The cost of CT exams are provided on an outpatient basis and are implemented in appropriate diagnostic institutions or clinics, which are the subject of separate contracting by the National Health Fund[100].

Laboratory tests

There are no separate tariffs of blood tests. They are included in ambulatory or hospital DRGs. Nevertheless, according the Polish project partners, the commercial price of **ferritin** is 40 zł and of **creatinine** 13 zł, approximately. The same partners obtained costs from the AOTMiT's cooperating hospitals for 2018 year Table 5.

Table 5. Average cost of selected laboratory costs (Poland)

	Mean	Min	Max
Ferritin	18.51 zł	14 zł	23.08 zł
Creatinine	4.65 zł	1.9 zł	10 zł

Source: Communication with the Polish project partners

Ambulance services

Capitation system is used in order to finance a **non-emergency patient** short distance **transport** in primary care. Provision of "distant" sanitary transport in primary care, that is, a long distance transport (there and back) of 121 – 400 km is paid by a constant tariff per journey. Provision of transport longer than 400 km is paid by the previous tariff for the first 400 km plus the tariff set per each km above 400 km. The costs of the previously mentioned transport services performed from Monday to Friday, excluding public holiday can be found elsewhere[97].

Diagnostic procedures

The costs of **colonoscopy** are provided on an outpatient basis and are implemented in appropriate diagnostic institutions or clinics, which are the subject of separate contracting by the National Health Fund[100].

Therapeutic procedures

The tariff of one session of haemodialysis includes:

1) transporting the patient to a dialysis station prior to haemodialysis;

2) preparing the dialysis station, setting the apparatus, pre-rinsing, venting the system, flushing the system in case of reutilization;

3) medical examination and preparation of the patient (weighing, washing the fistula area, appointing dialysis orders, filling in the dialysis card);

4) administration of erythropoiesis stimulating agent - in the case of medical indications;

5) puncture needle insertion or connection to a dialysis catheter;

6) connecting the patient to an artificial kidney apparatus;

7) haemodialysis and control of the patient's dialysis and vital signs;

8) laboratory tests and consultations, bacteriological and biochemical tests;

9) monitoring and treatment of anaemia - erythropoiesis stimulants, administered in a dose that ensures obtaining and maintaining a haemoglobin concentration in the range of 10-12 g/dl in at least 65% of those on permanent dialysis at the dialysis station;

10) termination of the procedure (bringing in blood, stopping bleeding, determining vital signs after haemodialysis, changing the dressing around the catheter, weighing, administering drugs);

11) after dialysis: disinfection (thermal, chemical) and decalcification of the artificial kidney apparatus, waste utilization, possible reutilization of dialysers and assessment of their efficiency after this procedure;

12) preparing the position for the next patient;

13) transport of the patient after the procedure to home or to the place of stay;

14) patient's or caregiver's education in self-care.

Personnel included in one session of haemodialysis:

1) physicians - the total working time corresponding to the working time of the dialysis station:

a) a specialist doctor in the field of nephrology or during a specialization in the field of nephrology - at least one full-time equivalent, and in the case of services provided only to children when the dialysis station's working time is shorter than the one-time doctor's working time - a specialist doctor in the field of children's nephrology or during specialization in the field of paediatric nephrology - working hours equal to the working time of the dialysis station and

(b) a specialist in internal medicine or

c) a specialist in paediatrics (for the treatment of children);

2) nurses who have been confirmed by appropriate certification of training at a dialysis station or nurses after a specialist course in dialysis, or nurses after a qualifying course in the field of nephrology nursing with dialysis, or nurses holding the title of specialist in the field of nephrology nursing or internist nursing - in the total working time corresponding to the working time of the dialysis station.

Medical equipment and apparatus at the place of providing benefits:

1) haemodialysis apparatus with automatic ultrafiltration control;

2) water treatment apparatus;

3) Electrocardiogram;

4) resuscitation equipment[100]

A tariff of **oxygen therapy** can be found elsewhere[101].

COMPLEX PROCESSES & PROCEDURES

Some inpatient processes and outpatient procedures cost the same (e.g., cataract extirpation).

Inpatient medical and surgical processes

In general, cost per hospitalization period is set for almost all DRGs. However, some DRGs have three different costs: cost of a not planned hospitalization, cost of a planned hospitalization and cost of a day case surgery[99]. The cost of **heart failure** depends on the severity of the process. The cost of **abdominal hernia** surgery depends on whether is with or without implant[99].

Day case procedure/Outpatient surgery

Outpatient DRGs are used in order to set tariffs for day case procedures/outpatient surgery[100]. Tariff associated to **laparoscopic cholecystectomy** was not found among

outpatient DRGs[100]. Tariff associated to cataract surgery is defined as tariff of outpatient cataract surgery.

PORTUGAL

Medicines	http://app10.infarmed.pt/genericos/genericos_II/menu.html
Inpatient and outpatient	http://www.acss.min-saude.pt/category/acss_pt/tabelas-e-impressos/

The main source regarding unit costs used in EE is the official report published by the NHS (*Serviço Nacional da Saúde, SNS*). It sets Portuguese DRG prices for inpatient and ambulatory care[102]. DRGs make use of production costs taken from the Portuguese hospital cost database –which considers annual public hospitals cost information- and of Maryland weights. Most of the information available is partially used for setting a prospective global budget and a case payment prices for third parties.

Further information on indicative prices is commonly extracted from the guidelines for contracting between public providers (e.g. hospitals, primary care centres) and the Ministry of Health.

PRIMARY RESOURCES

Medicines

Cost for generic drugs are published by HTA agency – INFARMED[103]. Costs of some high cost drugs are collected in the centralised purchasing database[104].

Medical devices and Health products/Disposables

The cost was taken from the public bid contract and it refers to purchasing price for one specific hospital. The cost does not include VAT[105,106].

Personnel costs

Public sector monthly salaries are reflected in the salary table that is published by the Ministry of Health. Nevertheless, the **nurse**s' hourly wage is calculated by labour trade union for normal daytime working hours on working days taking into account 35 working hours by week. This calculation is based on legal terms and will address only the purposes of calculating supplements. For example, for the salary category 30, the hourly salary for day of work on working days was set on 13.35€/h. There is a supplement of 3.34€/h for day work on Saturdays after 13 pm, Sundays and bank holidays and of 6.68€/h for night work on Saturdays after 20 pm, Sundays and bank holidays. Regarding extra work, the first hour of work on working days costs 15,85€[107] (0).

In general, the salary is the main payment system for primary care GPs. However, there are three types of primary care public organizations in Portugal. In two of them, the GPs are paid by salary, while in the remaining organization, the GPs salary depends on a base salary and on the achievement of performance indicators.

Cost per hour of work of **GP and specialist** included in the EU HCSCD is taken from contract between doctors and labour trade unions. It is based on 14 annual payments. It does not include any incentives nor extra pays. Nonetheless, it depends on doctor's seniority and category, on the weekly working hours (35 or 42), on working or not in the public sector with exclusivity and on whether the contract was celebrated before or after January 1st, 2013. Any supplements (such as meal, holiday and Christmas allowances, supplement for night, weekends or holidays, extra time, supplements according to settings or incentives) are not included in the basic monthly salary. Extra hours are paid according to Supplementary Table 22.

Regarding GPs' salary, an additional supplement is added to the monthly salary and it depends on the municipality a GP belongs to and on the number of patients subscribed to each GP (Supplementary Table 21)[108].

COMPOSITE GOODS AND SERVICES

Outpatient visit

The production cost of a **GP consultation** is calculated by the National Auditing Body, and it is based on information collected on all units operating at national level in 2011 and 2012 in five regional health administrations (North, Centre, Lisbon and Tagus Valley, Alentejo and Algarve). It includes all costs related with personnel, exams, drugs and infrastructure. The cost of GP visit depends on the level of team's organizational maturation and contractual level of performance[109].

The cost of a **specialist visit** varies across hospital groups. Six groups were defined, each of them is compounded of different number of hospitals (4 hospitals in group A, 9 hospitals in group B, 14 hospitals in groups C, 7 hospitals in group D, 6 hospitals in group E and 3 hospitals in group F). Group F refers to oncology department. A separate group of psychiatric hospitals were compounded of 2 hospitals. The cost of each group includes all costs related with personnel and infrastructure. In some cases, drug costs are included as well[110].

The payment to **emergency care** entails 3 components: a fixed value according to the type of service (it covers the efficient costs related to the installed capacity of the emergency service); a performance component corresponding to 5% of the fixed value (it depends on several indicators); and a variable component for extra activity paid at a marginal price. The price has been obtained by dividing the fixed payment amount by the number of expected attendances. Three different costs of A&E visit were defined: basic emergency, medical chirurgical emergency and polyvalent emergency service[110].

Hospitalization

The average cost per **day of hospitalization at "normal" ward** was calculated as the average of a cost of a day of hospitalization of all medical DRGs[111].

The cost of a **day of hospitalization at intensive care unit** was calculated as the average of average costs that were already available for four regions instead of using each hospital information. The cost of personnel, consumptions, contracts, supply and external services and other costs are included[112].

Image diagnosis

Tariffs are set for payments to third parties. They are highly detailed (e.g., cost are reported for different parts of body). However, there is no info on detailed resources consumed during the exam[102].

Laboratory tests

Tariffs are set for payments to third parties. They are highly detailed (e.g., costs of particular blood tests are reported). However, there is no info on how prices are computed[102].

Ambulance services

Most of the **emergency transportation** is done by National Institute for Medical Emergency (INEM, in the letters of Portuguese acronyms). However, the information about how the cost are computed is lacking. In case the vehicle is not owned by INEM, the cost is fixed per km intervals and can be found elsewhere[113].

Regarding **non-emergency patient transport**, the contracted price between the Ministry of Health and private individuals, natural or legal persons, whose purpose is to provide care for health can be found elsewhere[114].

Diagnostic procedures

The tariff of diagnostic procedures is published by SNS. No rationale for setting the tariff was provided[102].

Therapeutic procedures

The tariff of **haemodialysis** is set out in the contract between the Ministry of Health via General Directorate for Health or the Regional Health Administrations and private individuals, natural or legal persons, whose purpose is to provide care for health as part of the national health care network. The tariff refers to a comprehensive price, which: (i) integrates the provision of several services (e.g., dialysis sessions, medications, MCDT, vascular hemodialysis); (ii) defines results and quality control parameters of the health services to be provided; (iii) establishes a mechanism for monitoring, monitoring and evaluation. Includes 3% reduction in price due to hemodialysis spending above 230 million euros[115].

The tariff is used for sub-contracting, therefore, it includes all cost concepts (resources used). The cost is set per patient/week for comprehensive care package of hemodialysis

with and without vascular access and it is independent of the setting (home or hospital). The cost of one session of hemodialysis is set as well without any specification regarding a type of setting[115].

COMPLEX PROCESSES & PROCEDURES

Inpatient medical and surgical processes

The inpatient tariffs vary according to severity[102]. Regarding **heart failure** and **hernia inguinal, femoral and umbilical**, four different tariffs are defined (severity 1 - 4).

Day case procedures/outpatient surgery

The outpatient tariffs vary according to severity. Three different tariffs associated to DRGs describing the severity of **laparoscopic cholecystectomy** and **cataract extirpation** are defined (severity 1 - 3). No difference between a day case surgery tariff and inpatient tariff was found. Additionally, regarding cataract extirpation, no difference between inpatient tariff and ambulatory tariff was found[102].

SLOVENIA

Medicines	https://www.jazmp.si/fileadmin/datoteke/seznami/SFE/Cene/cene_2007hist.html
Standardized production costs	http://www.zzzs.si/Zzzs/info/egradiva.nsf/o/37D1B2F27B0EC343C12583B7002DAF04?OpenDocument
Diagnosis-Related Groups	https://partner.zzzs.si/wps/portal/portali/aizv/zdravstvene_storitve/plan_in_realizacija/podatki_o_planu_in_realizaciji_zdrav_storitve

The officially used source of all the prices in health care (except for DRGs and medicines) and basis for all the contracts with the providers is General Agreement[116], which is a tripartite agreement, concluded among Ministry of Health, Health Insurance Institute of Slovenia (HIIS) and health care providers. It includes all data on quantity, type and prices of service that will be provided in a year. Therefore, the unit costs in General Agreement are based on standardized or production costs. However, updating of costs is not regular – the process is planned and HIIS does it accordingly to the needs. If for example they feel that price is not adequate, they would nominate a team to reflect on the prices and prepare a new pricelist for a procedure. Then the prices would remain valid until something happens, then HIIS would work in this specialty again.

The basis of all DRGs is the General Agreement. A 'standard DRG' (that is, valued of weight "1") includes all health care resources incurred in the carrying out an intervention (all direct costs, variable and fixed overheads)[116]. This value needs to be multiplied by the weight of DRG whose cost is wanted to be known (each DRG has different weight). The data on realization of the yearly DRG cases along with the weight of the DRG, number of cases as well as total value are published elsewhere[117]. Cost elements included in a DRG weight of value 1 are the following: 21.09 medical and nursing staff, 3.22 administrative technical workers, variable overheads, material cost, depreciation, premium for additional pension insurance, additional funding for informatization, other extra pays for anniversaries of the personnel, such as 10 years of work in the company, 20 year of work, 50 years of age, once-per-year add-on wage for holidays, sometimes it includes financing of holiday facilities, etc.[116].

PRIMARY RESOURCES

Medicines

The Agency for Drugs determines maximum prices based on external reference pricing with Germany, France and Austria as the reference countries. Maximum prices are formed based on the manufacturer's price plus wholesale margin (1.1% on ex-factory price plus 0.5€ fixed mark-up). The maximum prices are calculated in three different

procedures, depending on the type of the medicinal product (generic, originals, biosimilar). The reference prices (maximum allowed prices) of medicines are listed elsewhere[118]. The VAT is excluded.

Medical devices

The cost of all **DES** that were bought in Slovenia by hospitals can be found on the portal of public tenders[119].

Health products/Disposables

Standard unit price can be found elsewhere[120].

Personnel costs

According to the legislation, medical and nursing staff work 2,088 hours per year. The annual amount is compounded of 12 payments. To obtain cost per hour of work, the annual wages are divided by 2088 hours. The annual wages can be found elsewhere[116]. Cost elements included in 8-hour work per day includes annual leave, incentives, endangered positions (such as RTG), loyalty payment, food, transport, break time, etc. Extra time is excluded[121].

COMPOSITE GOODS AND SERVICES

Outpatient visit

There are various types of **GP visits** in Slovenia, all of them with different number of "weights". The most basic visit is a "short visit". The cases of a short visit are shown in Supplementary Table 23. All direct costs, variable and fixed overheads are included. The price of the visit is composed of a fee for service (which is 1.5 weights for a short visit)[122] and capitation. Capitation depends on the age of a patient and is, for example, 0 years (weight 1), 1-3 years (weight 0.75), 4-18 years (weight 0.5), 65-74 years (weight 1), 75+ (weight 2), disabled people with a disability of more than 70% (weight 2)[123]. In order to get a value of short visit for an x-year old, the weights of fee-for-service and capitation must be summed and the final weight must be multiplied by the value of the weight that can be found elsewhere[116]. Generally speaking, eighty per cent of a total price of the visit is paid by compulsory health insurance and twenty per cent by complementary voluntary health insurance as defined by Act on Health Care and Health Insurance. However, in some cases (e.g., diabetes mellitus) one hundred per cent is covered from compulsory health insurance.

The size of the budget for each **specialist** team differs depending on the specialty (e.g., cardiology, neurology or orthopaedics) because of differences in labour, material and infrastructure costs and is mostly based on historic cost data. However, the budget is the same for all teams within a given specialty in the country. The price of specialist attendance varies across specialties. It depends on the length of visit as well. The cost is

set out in the General Agreement for the contracting year 2019 and it includes all direct costs, variable and fixed overheads. The total resource consumption is taken from hospital accounting. Outpatient clinic service is contracted at a yearly budget set beforehand for full team and is paid if a certain number of points is achieved. Dividing a yearly budget by a number of points needed to achieve gives a value of one point of each outpatient clinic[116]. The points for each service provided are defined elsewhere[124]. The number of points depends on the duration of the consultation, personal staff involved and health care resources spent. Regarding type of institution where the specialist visit take place, most of the visits can be located separately, as ambulatory outpatient care, but can also be located in the hospital.

The distinction between **A&E visits** in primary care or hospital need to be made. In primary care, there is annual cost per team only. Unit costs are not planned and the explanation is that the emergency primary care needs to be in preparation all the time – so they need to be paid regardless whether something happens or not. There are 6 different price standards for emergency care. The difference between them is due to the cost elements included. The difference is the area where these teams serve – so, if the area is bigger and Health Insurance Institute of Slovenia feels that more staff is needed, they would add more staff. In case the area is smaller and only one physician is enough, they would only take one into account. That's why there are more standards for the same thing. Total cost include all staff involved, overheads, depreciation, material costs and are taken from hospital accounting[116]. The difference in cost across emergency care is due to historical organization of these services among the regions and the payment mechanisms just simply tried to adapt in order to cover all the situations.

The cost of A&E visits in hospital setting depends on emergency department (e.g., neurology, infectious disease, etc.) and on the length of visit. The A&E service is contracted at a yearly budget set beforehand for full team and is paid if a certain number of points is achieved. All direct costs, variable and fixed overheads are included. Dividing a yearly budget by a number of points needed to achieve gives a value of one point of each A&E service[116]. The points for each service provided are defined elsewhere[124]. The number of points depends on the duration of the consultation, personal staff involved and health care resources spent.

Hospitalization

The cost per day of hospitalization is not available. Instead, cost of the whole hospitalization period for each DRGs is calculated, depending on the diagnosis and procedures.

Image diagnosis

The cost is set out in the General Agreement for the contracting year 2019 and includes all direct costs, variable overheads and fixed overheads, e.g., personnel staff (a doctor specialist, nurse and administrative technical worker), fixed overheads (e.g., heating, water, cleaning, etc.), additional pension insurance, material costs, depreciation and

additional funding for computerization. To obtain the unit cost of an image exam, the total annual cost is divided by the total annual points needed to achieve. The cost of a **CT** varies according to the body area, which is further divided into more detailed CT exam (with or without contrast)[116].

Laboratory tests

There are no costs of individual tests. The cost of laboratory services is set out in the General Agreement and it is included in ambulatory services[116]. The list of all hematologic services is available only for evidential purposes, but not for pricing[125]. The price list of individual tests of one of the self-pay laboratories can be found elsewhere[126].

Ambulance services

The cost is set out in the General Agreement[116].

The cost of **intensive care ambulance** is defined per urgent mobile unit per year. It includes a nurse, driver, administrative technical worker.

The cost of **non-emergency patient transport** is set per kilometre. Three different types of non-emergency patient transport are defined: patient transport with escort (includes cost of rescue worker, health care technician and administrative technical worker), patient transport for dialysis (includes cost of driver and administrative technical worker) and other non-emergency patient transport (includes cost of driver and administrative technical worker).

Moreover, both intensive care ambulance and non-emergency patient transport include also cost of fixed overheads, additional pension cost, material cost, depreciation and additional funding for computerization. In conclusion, all direct costs, variable and fixed overheads are included[116].

Diagnostic procedures

The cost is set out in the General Agreement. It includes cost of health care staff (specialist, nurse and administrative technical worker), variable overheads, premium for additional pension insurance, material cost, depreciation and additional funding for computerization[116].

Therapeutic procedures

Cost of haemodialysis is set out in the General Agreement and includes personnel costs (specialist, health care technician and administrative technical worker), variable overheads, additional pension funding, material cost, depreciation and additional funding for computerization[116].

The cost of oxygen therapy is also set out in the General Agreement. However, the cost elements are not specified[116].

COMPLEX PROCESSES & PROCEDURES

Inpatient medical and surgical processes

Prices of inpatient medical and surgical processes are set out in the General Agreement for the contracting year 2019[116]. A 'standard DRG' is multiplied by a corresponding DRG weight[117].

Day case procedures/Outpatient surgery

The cost of day case procedures/outpatient surgery is set out in the General Agreement for the contracting year 2019[116].

The **cholecystectomy** in day care (laparoscopic) is paid the same amount than the classic one in the hospital – the reason for this is incentivizing providers to change from classic to laparoscopic surgery.

The cost of **cataract extirpation** includes 1.1 specialist doctor (he includes 0.1 anaesthesiologist), 1 nurse, 1 health care technician and 0.47 administrative technical worker, variable overheads, premium for additional pension insurance, material, depreciation and additional funding for computerization. Additionally, two outpatient examinations (one before and the other after surgery) are also included[116].

SPAIN

Medicines	https://botplusweb.portalfarma.com/botplus.aspx
Inpatient and outpatient GRD	https://www.mscbs.gob.es/estadEstudios/estadisticas/inforRecopilaciones/anaDesarrolloGDR.htm

The National Health System publishes production costs of inpatient processes and outpatient procedures taking into account all 17 autonomous regions (AR) and two autonomous cities (Ceuta and Melilla). They are based on DRGs. The cost of inpatient episodes are categorized into four levels of complexity[127].

However, each AR, as well as Ceuta and Melilla publish their own list with tariffs or public prices (prices, from now on). Their common feature is that the inpatient and outpatient procedures are based on GRD. However, the system or rule ARs use in order to assign prices to each GRD is unknown. They depend on the number and type of both hospital and resource use, etc. In order to homogenize hospital costs, a methodological document with several recommendations was published by the NHS[128]. The authors of this document conclude that, in order to homogenize hospital costs among AR, the inpatient costs of the hospital accounting systems should include the cost of A&E of those patients admitted to the hospital directly from the A&E department, the cost of all diagnostic and therapeutic procedures performed on inpatient during his hospital stay, the cost of organ transplant and the cost of all day case procedures that require further hospitalization. Additionally, the hospital accounting system should exclude the cost of day case procedures that do not require further hospitalization, the cost of home hospitalization and cost of outpatient drug dispensing. The authors conclude that teaching and research costs should be apportioned to a specific cost centre[128].

PRIMARY RESOURCES

Medicines and Health products/Disposables

The cost of medicines and health products/disposables can be found elsewhere[129].

Personnel costs

Andalusian Health Service publishes the annual salary of statutory medical and nursing staff in Andalusia region. It is based on 14 payments and includes the basic salary, a three-year supplement, a destination supplement corresponding with the different levels of jobs and a specific supplement associated with a position held[130]. The hourly cost of medical and nursing staff is not calculated. In order to calculate the cost per hour worked, 1,642 annual working hours should be considered[131]. Annual salary of medical and nursing staff is shown in Supplementary Table 24.

COMPOSITE GOODS AND SERVICES

The costs of composite goods and services are published by each AR. In Aragon, there is a detailed list of cost elements included in the calculation of each item[132]. In Madrid, the calculation of public prices is unknown[133].

Outpatient visit

In occasions, GP and specialist visits are subdivided into first and follow-up visits[132,134] that can be further subdivided into visits with or without complementary tests[135] or into face-to-face visits, telephone visits, home visits and telemedicine service[134].

In Aragon, the **specialist visit** includes medical staff, nursing staff, auxiliary nursing staff, routine diagnostic and therapeutic procedures indicated for each specialty, cures, consumable material and medication (if needed), and a detailed medical report at discharge[132]. In Galicia and Andalusia, the cost of specialist visit depends on first or follow-up visit. However, the cost elements taking into account in the calculation of cost are not specified[135,136]. In País Vasco, the specialist visit is divided into face-to-face visit, telephone visit and telemedicine service. Each of them can be further divided into first and follow-up visit. Their cost depends on whether the visits is led by a doctor or a nurse. Moreover, the cost of basic laboratory tests, electrocardiogram, audiometry, spirometry and all image diagnosis mentioned in *'Anexo IV'* are not included in the cost of the visit[134].

The cost of **A&E visit** may differ across different types of visit such as paediatric A&E visit, general A&E visit, traumatology A&E visit, etc.[133] and settings (primary care vs. hospital)[137]. In Aragon, the cost of A&E visit is calculated as a proportion of a standard hospitalization tariff based on DRG. The weight associated to A&E visit was 0.05 in2015. It includes medical staff, nursing staff, auxiliary nursing staff, medicines needed during the A&E visit, blood test, cures, consumable material, diagnostic and therapeutic procedures specific for each specialty and detailed medical report at discharge[132]. In Galicia, the cost of A&E visit includes all medical and/or surgical examinations and tests performed, except some special services and/or procedures[135]. In País Vasco, the cost of A&E visit includes basic laboratory tests, electrocardiogram, audiometry, spirometry and all image diagnosis mentioned in '*Anexo IV*'. All additional examinations are billed separately[134].

Hospitalization

The cost of **a day of hospitalization at** both **normal ward** and **ICU** is published in the tariff list of each AR. More often than not is to publish a tariff of a day of hospitalization calculated as an average across all hospital specialties[134,135]. However, in Andalusia region, a tariff of a day of hospitalization differs across hospital specialties[138].

In Aragon, this tariff includes medical staff, nursing staff and auxiliary nursing staff; routine diagnostic and therapeutic procedures specific for each specialty and complex

diagnostic and therapeutic procedures in case of UCI; pharmacological treatment required during a hospital stay as well as blood tests and blood products; cures; food (including parenteral and enteral nutrition); consumable material; hospitalization in a shared or single room and issuance of medical report at discharge[132].

In Galicia, all costs incurred during a hospital stay are included, except those defined as specialized procedures, services and tests, epidural anaesthesia used during a delivery process and some material such as surgical prosthesis, pacemaker or other implanted material. In case an operation rooms is used during a hospital stay, there is a supplement of 1,030.13€ for the first use. From the second and each time the operating room is used for the same process that led to the stay, a 40% increase (412.05€) will be applied[135]. The cost of A&E of patients that were admitted to the hospital directly from the A&E department are excluded[139].

In País Vasco, the cost of hospitalization includes food, medication, medical and nursing staff[134].

Image diagnosis

In Aragon, the set of benefits derived from the strict fulfillment of the minimum requirements demanded for each of the image diagnosis techniques is included, including hospital admission in those techniques that are required. The material or medicines that are required for the preparation of the organ to be explored, which is not expressly specified in the list of maximum tariffs is also included, as well as the issuance of medical report[132].

In Galicia, the image diagnosis are billed at cost prices. There is a standard cost of an **ultrasound scan** and more costly ultrasound scans are determined as well. The cost of a **CT scan** is the same regardless whether includes contrast[135]. In País Vasco, the cost of different image diagnosis is calculated by multiplying the number of RVUs by the cost of the unit. The cost varies among parts of the body examined[134].

Laboratory test

The public prices used in Madrid can be found elsewhere[133].

In País Vasco, the cost of each laboratory test is determined by multiplying the number of RVUs by the cost of the unit. However, the cost of extraction (6€) and the cost of processing the request (5€) are not included in the RVU. In turn, there is a distinction between the normal and urgent analysis, as the later uses more resources. In turn, the cost of CT depends on whether is done with or without contrast[134].

Ambulance services

In Galicia, the cost of a **non-emergency patient transport** depends on whether the service is urban or interurban which in turn depends on the number of inhabitants (more than 200,000 vs. less than 200,000). Additionally, both urban and interurban service is divided into planned and not planned. The cost is set per kilometre. The cost of a waiting

time will be considered when the person driving the ambulance is warned of the need for the return of the sick person in case of interurban transfers over 40 kilometres away. The established fee will be paid after the 2nd hour of waiting and up to a maximum of 3 hours, regardless of whether the service is planned or not[135]. In Madrid, the cost of urban service is set per journey and the cost of interurban service is set per journey and per km. Additionally, the cost of waiting hour is defined[133].

Regarding **intensive care ambulance**, the cost differs between basic and advanced life support. In the case of basic life support, in Galicia, the cost per urban service, the cost per kilometre of interurban service and the cost of waiting hour is determined. In País Vasco, the cost of a journey depends on whether a nurse accompanies the vehicle or not[134].

In the case of advanced life support, in Galicia, the cost of personnel (doctor, driver), vehicle, requested medical report and the copy of clinical history is determined[135]. In País Vasco, the tariff is set per return journey of up to 100 km. For journeys longer than 100 km, an additional cost per each km above 100 km is set. No additional information on the cost elements included in the tariff[134].

In Madrid, there are three types of intensive care ambulance: non-assisted ambulance, rapid intervention ambulance (transferring the patient is not possible, a medical professional, a nurse and an emergency technician is included) and mobile emergency ambulance (transferring the patient is possible, a medical professional, a nurse and an emergency technician is included). The cost of non-assisted ambulance is set per journey, kilometre and waiting hour. The cost of both rapid intervention ambulance and mobile emergency ambulance is set per journey and kilometre[133].

Diagnostic procedures

In Aragon, the set of benefits derived from the strict fulfilment of the minimum requirements demanded for each of the diagnostic techniques is included, including hospital admission in those techniques that are required. The material or medicines that are required for the preparation of the organ to be explored, which is not expressly specified in the list of maximum tariffs is also included, as well as the issuance of medical report[132].

In País Vasco, the cost of diagnostic procedures can be added to the cost of a day of hospitalization and specialist and A&E visit[134].

Therapeutic procedures

In Aragon, the tariff of **haemodialysis** includes haemodialysis material, dialysis fluid, dialysis monitors, own cardiopulmonary resuscitation material[132].

In Galicia, the public price of haemodialysis includes routine analytical test and transfusion. The price is set per session and is the same for both outpatient and inpatient[135].

In País Vasco, these is the cost of a day case haemodialysis and the cost of haemodialysis that can be added to the cost of a day of hospitalization, and specialist and A&E visit[134].

In Aragon, the tariff of home **oxygen therapy** includes installation of the bottle and equipment necessary for the administration of oxygen in the patient's home; nasal goggles or masks for oxygen administration will be new at each facility and will be changed monthly; reception and notices 24 hours a day. Repair of breakdowns or replacement of the equipment within 24 business hours of the notice, through a technical assistance service, comprehensive review of the concentrator and liquid oxygen equipment at least annually in specialized workshops[132].

COMPLEX PROCESSES & PROCEDURES

Inpatient medical and surgical processes

In Aragon, a standard cost of a hospitalization period is based on DRG with American weights. This tariff includes valuation and treatment planning consultation; pre-anaesthesia consultation including the preoperative study, pharmacological treatment (including pre, peri and postoperative medication); cures; food (including parenteral and enteral nutrition); medical staff, nursing staff and auxiliary nursing staff; the use of an operating room and anaesthesia (if necessary); consumable material; possible complications that may occur throughout the entire care process; the re-interventions to be performed on the patient (provided they are related to the provision of the service and/or the procedure performed; hospitalization in a shared or single room; carrying out an anatomy-pathological study of the excused surgical pieces (if necessary)[132].

In Madrid, a public price of inpatient processes is based on DRG and it varies depending on the complexity of a process (from 1 to 4)[133]. The public prices are based on GRDs. However, there is not a standard cost of a relative weight '1' as in the DRG calculation. Therefore, the public prices vary differently in each DRG[140].

In País Vasco, the cost of inpatient process is based on DRG and includes all costs incurred during the hospital stay. In the interventions where the Da Vinci robot is used, the cost of DRG will be increased by 3,302€[134].

Day case procedures/Outpatient surgery

In Aragon, the cost of day case procedures/outpatient surgery includes the procedure itself; the consultation of assessment and treatment planning; pre-anaesthesia consultation including the pre-operative study; pharmacological treatment required during the care; pre-, peri- and postoperative medication; cures; food (including enteral and parenteral nutrition); medical staff, nursing staff and auxiliary health personnel; use of an operating room and anaesthesia if necessary; consumable material; an anatomy-pathological study of the excised surgical pieces if required; possible complications that may occur throughout the entire care process; re-interventions to be performed on the

patient if and only if they are related to the provision of the service and / or the procedure performed[132].

In Madrid, the calculation of public prices is unknown. Additionally, the laparoscopic cholecystectomy is performed on inpatients only[133].

In Galicia, the public prices includes the cost of first consultation, two follow-up consultations, the cost of the main procedure and all necessary additional diagnostic procedures[135].

In País Vasco, the cost of each day case procedure is calculated by multiplying the number of RVUs by the cost of a unit. The cost of those day case procedures that are not specifically mentioned is 448€ (medical day case procedures) or 1,195€ (surgical day case procedures). For all types of outpatient surgeries there is a unique cost 180€[134].

SWEDEN

Medicines	https://www.tlv.se/beslut/sok-i-databasen.html
Inpatient and outpatient	https://sodrasjukvardsregionen.se/download/regionala-priser-och-ersattningar-for-sodra-sjukvardsregionen-2020/ https://plus.rjl.se/infopage.jsf?childId=24272&nodeId=44878

There are several counties in Sweden and each of them has its own price list. This report contains price lists of two counties: *Södra*[141] (Southern medical region) and *Sydöstra*[142] (Southeast medical region).

The southern medical region is formed by 4 counties: Skåne, Blekinge, Kronoberg and Halland. Some items refer to tariffs based on DRGs (items related to inpatients and outpatients), others are tariffs based on a hospital resource use (outpatient) and some items are charged at fixed prices.

Regarding DRGs, there are two different tariffs, the one charged at the University hospital of Skåne, and the other one charged at other hospitals (Blekinge, Kronoberg and Halland). In case the patients attended at the University hospital of Skåne do not belong to the southern medical region, a tariff from the price list plus the supplement of 3.85% is charged. Other hospitals charge a supplement of 2.85% for attending patients that do not belong to the southern medical region. When DRG prices are not specified, either patient-specific prices or other pricing are applied according to the regulations. For example, 2019 prices are updated to 2020 prices using index 2020 (1.029)[141].

The southeast medical region is formed by 3 counties: Jönköpings län, Kalmar län and Östergötland. The tariffs of all procedures performed at the University Hospital in Linköping are slightly higher than the tariffs of the procedures performed at other hospitals. The University Hospital in Linköping applies prices that are either based on DRG or according to a self-developed classification system (PBE, in the letters of its Swedish acronym). For those clinics that are reimbursed under the DRG, clinic prices with weight list according to NORD-DRG CC version 2020 (based on clinical care cases) are applied. In addition, the University Hospital in Linköping has a number of products that are charged at actual cost.

At the region's county and county hospitals, charges are primarily applied with an agreed DRG price and weight list, NORD-DRG CC version 2020 (based on clinic cases). The price per point in 2020 is 59,520 kr. For psychiatry, child psychiatry and legal psychiatry, day care allowance applies. Physician visits, other contacts in primary care and some additional care services are charged according to a special price list[142].

Various DRG prices should, as a rule, cover all costs. In some cases, it is obvious that drug costs are not included. There is a one-year time lag between cost calculation and its application.

PRIMARY RESOURCES

Medicines

Current pharmacy selling prices for the medicines can be found elsewhere[143]. For all medicines, two different prices are available (purchase price and public price).

Medical devices and Health products/Disposables

No official price list for medical devices exists in Sweden. Each health care region sets out their price. In turn, a **WCD** is not financed in Sweden. A commercial price of **glucose test strips**, when purchasing at least 100 units, was 3.24 kr[144].

Personnel costs

The average monthly salary includes the labour cost, vacation, sick pay, overheads and social fees. Therefore, the hourly rates are obtained by dividing the total sum by 165 hours[145]. There are different charging principles for **specialist** and **GPs** regarding daytime and on-call time (Supplementary Table 25).

COMPOSITE GOODS AND SERVICES

Outpatient visit

The cost of a **GP visit** depends on type of visit (face-to-face, web-based). A service is charged according to a special price list[142].

The cost of a **specialist visit** depends on the complexity of the visit (complex, not complex) and specialty (liver/bile duct, circulatory tract, endocrine metabolism, etc.). In hospital setting, the tariffs are based on DRGs[141,142].

The cost of **A&E visit** is available for the Southern health care region[141].

Hospitalization

The cost of **day of hospitalization at normal ward** and **at ICU** with and without physician resources used per patient hospitalization day can be found elsewhere[141].

Image diagnosis

The cost of image diagnosis can be found elsewhere[141,142]. In turn, the cost of **CT scan** depends on part of body and on whether the CT is done with or without contrast[141].

Laboratory tests

Acute analysis has 50% supplement. Acute analysis from the specialist range (which is not normally performed urgently) can be ordered by special agreement with the laboratory for an additional cost 2,120 kr[146].

Ambulance services

There is no distinction between **intensive care ambulance** and **non-emergency patient transport**. *'Ambulans'* is only used when it is an emergency patient transport. The cost is set per kilometre. The care county council may bill the home county council the kilometre price for the entire ambulance mission, thus also the distance of travel. If the mileage is shorter than 10 km, compensation of 1,010 kr is still payable. Hourly rate of accompanying doctor and nurse is 800 kr and 425 kr, respectively. This cost is identical in Southeast medical region[142]. In Southern medical region, the compensation is paid for the entire ambulance mission, that is, the return journey. The lowest compensation for ambulance transport amounts to kilometre compensation 90 kr x 20 km = 1800 kr[141].

Diagnostic and therapeutic procedures

The cost of **colonoscopy** is available elsewhere[141,142]. The cost of acute and chronic **haemodialysis** is reimbursed per session[141]. The cost of **oxygen therapy** was not provided.

COMPLEX PROCESSES & PROCEDURES

Inpatient medical and surgical processes

Regarding Southern healthcare region, the costs are slightly higher in the University Hospital of Skåne than in the Blekinge, Kronober and Halland regions[141].

The cost of **heart failure** depends on complexity (very complex, complex and not complex)[141,142].

Additionally, the cost of **hernia inguinal, femoral and umbilical** depends on complexity (complex and not complex) and age (<18, >17)[141,142].

Day case procedures/Outpatient surgery

The cost of **laparoscopic cholecystectomy** is only defined for inpatient and it depends on complexity (very complex, complex, not complex). The cost of not complex inpatient laparoscopic cholecystectomy may be used as an approximation of cost of the outpatient laparoscopic cholecystectomy, since after the laparoscopic cholecystectomy it is not needed to spend a night at the hospital[141,142].

Similarly, the cost of cataract surgery is only per inpatient[141,142].

REFERENCES

1. HealthBASKET. *European Health Management Association* Available at: https://ehma.org/projects/past-projects/healthbasket/. (Accessed: 17th March 2020)
2. Mogyorosy, Z. & Smith, P. The main methodological issues in costing health care services: a literature review. *York: Centre for Health Economics* (2005). Available at: https://bit.ly/2RuakC3. (Accessed: 25th June 2018)
3. Drummond, M. F., Sculpher, M. J., Claxton, K., Stoddart, G. I. & Torrance, G. W. *Methods for the Economic Evaluation of Health Care Programmes*. *4th edition* (Oxford University Press, 2015).
4. Swartenbroekx, N., Obyn, C., Guillaume, P., Lona, M. & Cleemput, I. Manual for cost-based pricing of hospital interventions. *KCE Belgian Health Care Knowledge Centre* (2012). Available at: https://kce.fgov.be/en/all-reports?f%5B0%5D=pas_publication_year%3A7174.
5. Kanters, T. A., Bouwmans, C. A. M., Van Der Linden, N., Tan, S. S. & Hakkaart-van Roijen, L. Update of the Dutch manual for costing studies in health care. *PLoS One* **12**, 1–11 (2017).
6. Atkinson, A. A., Banker, R. D., Kaplan, R. S. & Young, S. M. *Management Accounting*. (Prentice Hall, 2001).
7. Study Group 1 of the Global Harmonization Task Force. *Global Harmonization Task Force Study Group 1: Definition of the Terms 'Medical Device' and 'In Vitro Diagnostic (IVD) Medical Device'*. (2012). doi:GHTF/SG1/N071:2012
8. Kaur, M. & Hall, S. *Medical supplies and equipment for primary health care. A practical resource for procurement and management*. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **96**, (2002).
9. ECRI Institute. Available at: https://www.ecri.org/library/. (Accessed: 8th January 2019)
10. Patient transport. *Ambulance Victoria.* Available at: https://www.ambulance.vic.gov.au/about-us/our-services/non-emergency-patient-transport/. (Accessed: 9th January 2019)
11. What is the EMS? *Emergency Medical Service* Available at: https://www.ems.gov/whatisems.html. (Accessed: 9th January 2019)
12. Diagnostic Test or Diagnostic Study Definition. *SPINE-health.* Available at: https://www.spine-health.com/glossary/diagnostic-test-or-diagnostic-study. (Accessed: 9th January 2019)
13. Rakel, R. E. Therapeutics. *Encyclopaedia britannica.* Available at: https://www.britannica.com/science/therapeutics. (Accessed: 9th January 2019)
14. Martin, E. & McFerran, T. *A Dictionary of Nursing*. *A Dictionary of Nursing* (Oxford University Press, 2014). doi:10.1093/acref/9780199211777.001.0001
15. DataBank. World Development Indicators. Available at: https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.DEFL.K

D.ZG&country=. (Accessed: 15th October 2020)

16. World Health Organization. *Making choices in health: WHO guide to cost-effectiveness analysis*. (2003).
17. Eurostat. HICP (2015 = 100) - annual data (average index and rate of change). Available at: https://ec.europa.eu/eurostat/databrowser/view/PRC_HICP_AIND__custom_69638/default/table?lang=en. (Accessed: 15th October 2020)
18. How to import CSV file that uses UTF-8 encoding. Available at: https://excel.officetuts.net/en/examples/how-to-import-csv-file-that-uses-utf-8-encoding. (Accessed: 20th March 2020)
19. Drug tariff. *NHS. Business Services Authority.* Available at: https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/drug-tariff. (Accessed: 16th April 2020)
20. Drug-eluting stents for the treatment of coronary artery disease. *National Institute for Health and Care Excellence.* Available at: https://www.nice.org.uk/guidance/ta152/resources/drugeluting-stents-for-the-treatment-of-coronary-artery-disease-pdf-82598311384261. (Accessed: 21st September 2019)
21. Curtis, L. Unit Costs of Health and Social Care 2018. *Pers. Soc. Serv. Res. Unit* **1**, 1–193 (2018).
22. NHS Digital. GP Earnings and Expenses Estimates 2016/17. *NHS Digital* (2018). Available at: https://files.digital.nhs.uk/AC/7BD0F9/gp-earn-exp-1617-rep.pdf. (Accessed: 18th February 2020)
23. NHS Digital. General and Personal Medical Services, England, March 2018 Final and June 2018 provisional. *NHS Digital* (2018). Available at: https://files.digital.nhs.uk/D0/35A78B/GPMS Mar Final Jun Prov 2018.pdf. (Accessed: 18th February 2020)
24. Netten, A., Knight, J., Dennett, J., Cooley, R. & Slight, A. *Development of a ready reckoner for staff costs in the NHS, Vols 1 & 2*. (1998).
25. Building Cost Information Service. *Surveys of tender prices*. (2017).
26. Ministry of Housing Communities & Local Government. Land value estimates for policy appraisal 2017. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/710539/Land_Values_2017.pdf. (Accessed: 18th February 2020)
27. Gibson, J., Sutton, M., Spooner, S. & Checkland, K. Ninth National GP Worklife Survey. *Policy Research Unit in Commissioning and the Healthcare System Manchester Centre for Health Economics, University of Manchester* (2018).
28. NHS Sickness Absence Rates - January 2018 to March 2018 and Annual Summary 2009-10 to 2017-18. *NHS Digital* Available at: https://digital.nhs.uk/data-and-information/publications/statistical/nhs-sickness-absence-rates/nhs-sickness-absence-rates---january-2018-to-march-2018-and-annual-summary-2010-11-to-2017-18. (Accessed: 18th February 2020)

29. Nursing and midwifery. *NHS Employers* Available at: https://www.nhsemployers.org/pay-pensions-and-reward/job-evaluation/national-job-profiles/nursing-and-midwifery. (Accessed: 18th February 2020)

30. 2019/20 National Tariff Payment System. *NHS Improvement.* Available at: https://improvement.nhs.uk/resources/national-tariff/#h2-201920-national-tariff-payment-system. (Accessed: 5th September 2020)

31. NHS Costing Manual. *Department of Health.* (2012). Available at: https://bit.ly/3a5yxVJ. (Accessed: 20th September 2020)

32. National Schedule of Reference Costs: Year 2017-2018. *NHS Improvement* Available at: https://bit.ly/2XzZ76S. (Accessed: 9th January 2019)

33. NHS Data Model and Dictionary. *www.datadictionary.nhs.uk* Available at: https://www.datadictionary.nhs.uk/. (Accessed: 1st October 2019)

34. NHS England and NHS Improvement. *2017/18 and 2018/19 National Tariff Payment System*. (2016).

35. Annex A: The national tariff workbook. *NHS Improvement* (2019). Available at: https://improvement.nhs.uk/resources/national-tariff/#h2-201920-national-tariff-payment-system. (Accessed: 14th January 2020)

36. 2017-18 Reference Costs Collection. *NHS Improvement.* Available at: https://digital.nhs.uk/data-and-information/data-collections-and-data-sets/data-collections/reference-costs. (Accessed: 7th November 2019)

37. Securité Sociale l'Assurance Maladie. Available at: https://www.ameli.fr/. (Accessed: 25th March 2020)

38. Agence Technique de l'Information sur l'Hospitalization. Available at: https://www.atih.sante.fr/. (Accessed: 25th March 2020)

39. Evolution de la notion de sejours bas en v10 et en v11. Available at: https://www.atih.sante.fr/sites/default/files/public/content/2138/fiche_borne_basse.pdf. (Accessed: 25th March 2020)

40. Tarifs MCO et HAD. *Agence technique de l'information sur l'hospitalisation* (2019). Available at: https://www.atih.sante.fr/tarifs-mco-et-had. (Accessed: 6th February 2020)

41. Chevreul, K., Berg Brigham, K., Durand-Zaleski, I. & Hernández-Quevedo, C. *Health Systems in Transition. France. European Observatory on Health Systems and Policies* (2015).

42. ENC MCO. *ScanSanté* (2019). Available at: https://www.scansante.fr/applications/enc-mco. (Accessed: 9th September 2020)

43. CCAM v63. *Securité Sociale l'Assurance Maladie.* Available at: https://www.ameli.fr/accueil-de-la-ccam/telechargement/index.php. (Accessed: 6th February 2020)

44. Base des Médicaments et Informations Tarifaires. Available at: http://www.codage.ext.cnamts.fr/codif/bdm_it/index.php?p_site=AMELI.

(Accessed: 7th February 2020)

45. Liste des produits et prestations remboursables. *Securité Sociale l'Assurance Maladie* (2020). Available at: https://www.ameli.fr/sites/default/files/Documents/615994/document/lpp_2_janvier_2020_assurance_maladie.pdf. (Accessed: 28th January 2020)

46. Durée légale de travail. (2016). Available at: https://www.insee.fr/fr/metadonnees/definition/c1539. (Accessed: 25th March 2020)

47. Jakoubovitch, S., Bournot, M.-C., Cercier, E. & Tuffreau, F. Les emplois du temps des médecins généralistes. *DREES, Etudes et résultats* (2012).

48. Tarifs des consultations. *Securité Sociale l'Assurance Maladie* (2019). Available at: https://www.ameli.fr/assure/remboursements/rembourse/consultations/modifications-tarifs-consultations-mai-2017. (Accessed: 27th September 2019)

49. Dormont & Samson. Does It Pay to Be a General Practitioner in France? *Ann. Econ. Stat.* (2015). doi:10.15609/annaeconstat2009.119-120.149

50. Médecin généraliste ou spécialiste en médecine générale - Convention médicale 2016 - Facturation : actualisation avec prise en compte des mesures de l'avenant 6 applicables au 10 février 2019. *Securité Sociale l'Assurance Maladie* (2020). Available at: https://www.ameli.fr/medecin/exercice-liberal/remuneration/nomenclatures-codage/ngap. (Accessed: 30th January 2020)

51. Tarifs conventionnels des médecins généralistes en France métropolitaine. *Securité Sociale l'Assurance Maladie* (2019). Available at: https://www.ameli.fr/medecin/exercice-liberal/remuneration/tarifs-generalistes/tarifs-metropole. (Accessed: 30th January 2020)

52. Tarifs des médecins spécialistes en France métropolitaine. *Securité Sociale l'Assurance Maladie* (2019). Available at: https://www.ameli.fr/medecin/exercice-liberal/remuneration/tarifs-specialistes/metropole. (Accessed: 3rd February 2020)

53. Nomenclature generale des actes professionnels (NGAP) rastant en vigueur depuis la decision UNCAM de 11 mars 2005. *Securité Sociale l'Assurance Maladie* 138 (2020). Available at: https://www.ameli.fr/sites/default/files/Documents/636184/document/ngap_1er_janvier_2020_assurance_maladie.pdf. (Accessed: 5th February 2020)

54. Les tarifs applicables en métropole, dans les départements d'outre-mer et à Mayotte. *Securité Sociale l'Assurance Maladie* (2019). Available at: https://www.ameli.fr/infirmier/exercice-liberal/facturation-remuneration/tarifs-conventionnels/tarifs. (Accessed: 3rd February 2020)

55. Cour des comptes. Chambres régionales & territoriales des comptes. *Rapport public annuel 2019* (2019). Available at: https://www.ccomptes.fr/system/files/2019-02/08-urgences-hospitalieres-Tome-2.pdf. (Accessed: 28th January 2020)

56. Table nationale de codage de Biologie. *Securité Sociale l'Assurance Maladie.*

Available at: http://www.codage.ext.cnamts.fr/. (Accessed: 7th February 2020)

57. Arrêté du 23 décembre 2006 fixant le référentiel de prescription des transports prévu à l'article R. 322-10-1 du code de la sécurité sociale. *Journal Officiel de la République Française* (2006). Available at: https://www.ameli.fr/sites/default/files/Documents/5041/document/referentiel-prescription-transports_journal-officiel.pdf. (Accessed: 19th January 2020)

58. Frais de transport : prise en charge et remboursements. *Securité Sociale l'Assurance Maladie* (2020). Available at: https://www.ameli.fr/assure/remboursements/rembourse/frais-transport/frais-transport#text_73837. (Accessed: 29th January 2020)

59. VSL: les tarifs conventionnels. *Securité Sociale l'Assurance Maladie* (2019). Available at: https://www.ameli.fr/transporteur-sanitaire/exercice-professionnel/facturation/tarifs/vsl-tarifs-conventionnels. (Accessed: 29th January 2020)

60. Festbetragsarzneimittel nach § 35 SGB V sortiert nach Arzneimittelname. *Deutsches Institut für Medizinische Dokumentation und Information.* Available at: https://www.dimdi.de/dynamic/.downloads/arzneimittel/festbetraege/2019/festbetraege-20190401.pdf. (Accessed: 13th February 2020)

61. Fallpauschalen-Katalog. *Deutsche Krankenhaus Gesellschaft.* Available at: https://www.dkgev.de/fileadmin/default/Fallpauschalenkatalog_2019_180928.pdf. (Accessed: 31st May 2019)

62. Fachgesellschaft fordert Finanzierung von tragbaren Defibrillatoren in der Reha. *Ärzteblatt* (2017). Available at: https://www.aerzteblatt.de/nachrichten/76796/Fachgesellschaft-fordert-Finanzierung-von-tragbaren-Defibrillatoren-in-der-Reha. (Accessed: 12th February 2020)

63. Beschluss des Gemeinsamen Bundesausschusses uber eine Anderung der Arzneimittel-Richtlinie (AM-RL): Anlage XII – Nutzenbewertung von Arzneimitteln mit neuen Wirkstoffen nach § 35a SGB V Insulin degludec (Änderung des Beschlusses vom 16. Mai 2019 / Aufhebu. *Gemeinsamer Bundesausschuss* Available at: https://www.g-ba.de/downloads/39-261-3866/2019-07-04_AM-RL-XII_Insulin-degludec_D-405_BAnz.pdf. (Accessed: 17th April 2020)

64. Preisvereinbarung und Preisliste Blutzuckerteststreifen. *Kassenärztliche Vereinigung Westfalen-Lippe (KVWL).* Available at: https://www.kvwl.de/arzt/verordnung/arzneimittel/info/invo/blutzuckertest_preisliste_invo.pdf. (Accessed: 17th September 2019)

65. Jahresbericht 2017. *Zi-Praxis-Panel.* Available at: https://www.zi-pp.de/pdf/ZiPP_Jahresbericht_2017.pdf. (Accessed: 25th October 2019)

66. Honorarbericht. *Kassenärztliche bundesvereinigung (KBV)* (2016). Available at: https://www.kbv.de/media/sp/Honorarbericht_Quartal_4_2016.pdf. (Accessed: 13th February 2020)

67. Bundesagentur für Arbeit. *Entgeltatlas.* Available at: https://entgeltatlas.arbeitsagentur.de/entgeltatlas/faces/index?_afrLoop=1141923757706236&_afrWindowMode=0&_afrWindowId=27qms9zl7&_adf.ctrl-

state=cgboby6t7_14. (Accessed: 20th September 2019)

68. Durchschnittlicher Bruttojahresverdienst von Gesundheits- und Krankenpflegern in Deutschland im Jahr 2018. *Statista.* Available at: https://de.statista.com/statistik/daten/studie/196955/umfrage/jahresbruttogehalt-von-pflegepersonal-in-deutschland/. (Accessed: 13th February 2020)

69. Gutachten zur ambulanten Notfallversorgung im Krankenhaus. *Deutsche Krankenhaus Gesellschaft.* Available at: https://www.dkgev.de/fileadmin/default/Mediapool/2_Themen/2.2_Finanzierung_und_Leistungskataloge/2.2.3._Ambulante_Verguetung/2.2.3.4._Ambulante_Notfallvehandlung_durch_Krankenhaeuser/2015-02-17_Gutachten_zur_ambulanten_Notfallversorgung_im_Krankenhaus_201. (Accessed: 11th January 2020)

70. Gesundheit. Kostennachweis der Krankenhäuser. *Statistisches Bundesamt (Destatis).* (2017). Available at: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Gesundheit/Krankenhaeuser/Publikationen/Downloads-Krankenhaeuser/kostennachweis-krankenhaeuser-2120630177004.pdf?__blob=publicationFile. (Accessed: 10th January 2020)

71. Einheitlicher Bewertungsmaßstab (EBM). *KBV Kassenärztliche Bundesvereinigung* (2019). Available at: https://www.kbv.de/media/sp/EBM_Gesamt___Stand_1._Quartal_2019.pdf. (Accessed: 1st April 2020)

72. Gebührensatzung für den Krankentransport- und Rettungsdienst des Ennepe-Ruhr-Kreises vom 27.06.2016. *Stadt Witten* (2016). Available at: http://www.witten.de/fileadmin/user_upload/Dokumente/sta10/orecht/or3/314.pdf. (Accessed: 12th February 2020)

73. Vertrag über ambulant durchgeführte Katarakt-Operationen in der vertragsärztlichen Versorgung. *KV Nordhein* (2017). Available at: https://www.kvno.de/downloads/vertraege/katarakt_vdek.pdf. (Accessed: 12th January 2020)

74. Il sistema di remunerazione delle prestazioni nel SSN. *Ministero della Salute.* Available at: http://www.salute.gov.it/portale/temi/p2_6.jsp?lingua=italiano&id=3662&area=programmazioneSanitariaLea&menu=vuoto. (Accessed: 30th March 2020)

75. Ministero della Salute. Decreto 18 ottobre 2012. Remunerazione delle prestazioni di assistenza ospedaliera per acuti, assistenza ospedaliera di riabilitazione e di lungodegenza post acuzie e di assistenza specialistica ambulatoriale. *Gazzetta Ufficiale della Repubblica Italiana* (2012). Available at: https://bit.ly/2V7gMB4. (Accessed: 9th March 2020)

76. Decreto legislativo 30 dicembre 1992, n. 502. Riordino della disciplina in materia sanitaria, a norma dell'articolo 1 della legge 23 ottobre 1992, n. 421. Art. 8-sexies. (Remunerazione). *Ministero della Salute* (1992). Available at: https://bit.ly/2wCIcFv. (Accessed: 9th March 2020)

77. Nomenclatore tariffario regionale delle prestazioni di assistenza specialistico-

ambulatoriali. *Regione Piemonte* (2013). Available at: https://bit.ly/2wBzV4G. (Accessed: 30th March 2020)

78. Liste A e H - Aggiornamento del 15/05/2019. *Agenzia Italiana del Farmaco (AIFA)* (2019). Available at: https://www.aifa.gov.it/liste-farmaci-a-h. (Accessed: 18th October 2019)

79. DECRETO 11 ottobre 2007. Determinazione di taluni prezzi da assumere come base d'asta per le forniture al Servizio sanitario nazionale, ai sensi dell'articolo 1, comma 796, lettera v) della legge 27 dicembre 2006, n. 296. *Gazzetta Ufficiale della Repubblica Italiana* Available at: https://www.gazzettaufficiale.it/eli/gu/2007/11/13/264/sg/pdf. (Accessed: 9th September 2019)

80. Dispositivi medici. *Autorità Nazionale Anticorruzione (ANAC)* 2012 Available at: http://www.anticorruzione.it/portal/rest/jcr/repository/collaboration/Digital Assets/Pdf/DispositiviMedici01_08_2012.pdf. (Accessed: 30th September 2019)

81. Dichiarazione di inicità defibrillatore indossabile LiveVest WCD 4000. *Azienda Ospedaliera Brotzu.* Available at: https://www.aobrotzu.it/documenti/9_204_20190124111717.pdf. (Accessed: 8th September 2019)

82. Struttura Funzione Acquisti Determinazione Dirigenziale n. 568 del 01/12/2017. *ASST Mantova.* Available at: https://www.asst-mantova.it/documents/338413/5738339/Esito+%28327%29.pdf/7579a98d-eba5-89f6-2bd0-4658ed326526.

83. Noleggio per mesi uno, presso la Zoll Medical Italia srl, di defibrillatore indossabile 'Life Vest' per paziente a rischio vita. *Azienda Sanitaria Provinciale di Enna.* Available at: http://www.asp.enna.it/portale/attachments/article/3155/determina n. 243 del 21.03.2017.pdf. (Accessed: 7th September 2019)

84. Deliberazione N° 0420 del 25/05/2018. Fornitura Strisce Reattive per la determinazione della Glicemia per pazienti con esigenze particolari - Prosecuzione stanziamento per approvvigionamenti fine al 31.10.2018 nell more di adesione a nueva gara A.Li.Sa. *Sistema Sanitario Regione Liguria.* Available at: https://www.asl1.liguria.it/download.asp?id=38180. (Accessed: 10th September 2019)

85. Deliberazione della Giunta Regionale n. 279/DRG del 14/03/2017. Aggionamento dei prezzi di rimborso dei dispositivi per l'autocontrollo e l'autogestione del diabete dal 1 aprile 2017. Speremente attività inerenti la Farmacia dei Servizi. *Il portale della Regione del Veneto.* Available at: https://www.regione.veneto.it/web/sanita/prescrizione-e-dispensazione-dispositivi-per-diabetici. (Accessed: 11th October 2019)

86. Agenzia per la rappresentanza negoziale delle pubbliche Amministrazioni. Contratto Collettivo Nazionale di Lavoro Relativo al Personale del CDomparto Sanita. Triennio 2016-2018. *Agenzia per la rappresentanza negoziale delle pubbliche Amministrazioni* (2018). Available at: https://www.aranagenzia.it/attachments/article/9016/CCNL comparto SANITA'

definitivo_sito .pdf. (Accessed: 11th September 2019)

87. Contratto Collettivo Integrativo Aziendale (CCIA) 2018 della Fondazione IRCCS San Matteo relativo al CCNL del Comparto Sanità 2016-2018. *UILFPL Pavia.* Available at: http://uilfplpavia.it/fs/1/2/16/1204/4_ipotesi_ccia_firmato_2018_-_18-12-2018.pdf.

88. Ecco qual è lo stipendio medio di un infermiere in Italia. *Qui Finanza* (2018). Available at: https://quifinanza.it/lavoro/stipendio-medio-infermiere-italia/189076/. (Accessed: 6th September 2019)

89. Differenziali retributivi nel settore privato. *Instituto Nazionale di Statistica.* Available at: https://www.istat.it/it/archivio/194951.

90. Accordo collettivo nazionale per la disciplina dei rapporti con i medici di medicina generale ai sensi dell'art. 8 del d.lgs. n. 502 del 1992 e successive modificazioni ed integrazioni. *Struttura Interregionale Sanitari Convenzionati.* Available at: http://www.sisac.info/aree/www.sisac.info/resources/MEDICINA_GENERALE/ACN_testo_integrato.pdf. (Accessed: 17th April 2020)

91. Rivellini, G. & Andreoli, M. Scomporre e ricomporre la diversità delle forme contrattuali. Analisi comparata del lavoro medico in Italia. *Sanità 24* (2014). Available at: https://www.sanita24.ilsole24ore.com/pdf2010/Sanita2/_Oggetti_Correlati/Documenti/Lavoro-e-Professione/rivellini_tavola_rotonda.pdf?uuid=AbYAFdXK. (Accessed: 17th April 2020)

92. Contratto collettivo nazionale di lavoro del parsonale della dirigenza medico-veterinaria del servizio sanitario nazionale II biennio economico 2008-2009. *Agenzia per la rappresentanza negoziale delle pubbliche Amministrazioni (ARAN)* (2010). Available at: https://www.aranagenzia.it/contrattazione/aree-dirigenziali/area-iv/contratti/280-ccnl-economico-2008-2009.html. (Accessed: 17th April 2020)

93. Pronto Soccorso e sistema 118. Proposta metodologica per la valutazione dei costi dell'emergenza. *Ministero della Salute* (2007). Available at: http://www.mattoni.salute.gov.it/mattoni/documenti/11_Valutazione_costi_dell_emergenza.pdf. (Accessed: 17th April 2020)

94. Lagostena, A. & Pasdera, A. Costi standard e ricoveri anno 2010: metodo i risultati. *Sanità 24.* Available at: https://www.sanita24.ilsole24ore.com/pdf2010/Sanita2/_Oggetti_Correlati/Documenti/Regioni-e-Aziende/presentazione_nisan.pdf?uuid=AbexJUuG. (Accessed: 17th April 2020)

95. Relazione tecnica. *Quotidiano online di informazione sanitaria.* Available at: http://www.quotidianosanita.it/allegati/allegato5477154.pdf. (Accessed: 9th March 2020)

96. Obwieszczenie Ministra Zdrowia z dnia 30 sierpnia 2019 r. w sprawie wykazu refundowanych leków, środków spożywczych specjalnego przeznaczenia żywieniowego oraz wyrobów medycznych na 1 września 2019 r. *Serwis Rzeczypospolitej Polskiej* (2019). Available at: https://www.gov.pl/web/zdrowie/obwieszczenie-ministra-zdrowia-z-dnia-30-

sierpnia-2019-r-w-sprawie-wykazu-refundowanych-lekow-srodkow-spozywczych-specjalnego-przeznaczenia-zywieniowego-oraz-wyrobow-medycznych-na-1-wrzesnia-2019-r. (Accessed: 17th October 2019)

97. Zarządzenie Nr 120/2018/DSOZ prezesa Narodowego Funduszu Zdrowia z dnia 29 listopada 2018 r. w sprawie warunków zawarcia i realizacji umów o udzielanie świadczeń opieki zdrowotnej w zakresie podstawowej opieki zdrowotnej. *Narodowy Fundusz Zdrowia* (2018). Available at: http://nfz.gov.pl/zarzadzenia-prezesa/zarzadzenia-prezesa-nfz/zarzadzenie-nr-1202018dsoz,6844.html. (Accessed: 17th April 2020)

98. Zarządzenie Nr 16/2018/DSM. *Narodowy Fundusz Zdrowia* (2018). Available at: https://www.nfz.gov.pl/zarzadzenia-prezesa/zarzadzenia-prezesa-nfz/zarzadzenie-nr-162018dsm,6735.html. (Accessed: 25th February 2020)

99. Zarządzenie Nr 38/2019/DSOZ Prezesa Narodowego Funduszu Zdrowia z dnia 29 marca 2019 r. w sprawie określenia warunków zawierania i realizacji umów w rodzaju leczenie szpitalne oraz leczenie szpitalne - świadczenia wysokospecjalistyczne. *Narodowy Fundusz Zdrowia* (2019). Available at: https://www.nfz.gov.pl/zarzadzenia-prezesa/zarzadzenia-prezesa-nfz/zarzadzenie-nr-382019dsoz,6906.html. (Accessed: 17th April 2020)

100. Zarządzenie Nr 22/2018/DSOZ z załącznikami - tekst ujednolicony. Załącznik nr 1 część b. *Narodowy Fundusz Zdrowia* (2018). Available at: https://bit.ly/2xvpDnd. (Accessed: 21st July 2019)

101. ZARZĄDZENIE Nr 45/2019/DSOZ PREZESA NARODOWEGO FUNDUSZU ZDROWIA z dnia 11 kwietnia 2019 r. w sprawie określenia warunków zawierania i realizacji umów w rodzaju świadczenia zdrowotne kontraktowane odrębnie. Załącznik nr 1a. *Narodowy Fundusz Zdrowia* (2019). Available at: https://www.nfz.gov.pl/zarzadzenia-prezesa/zarzadzenia-prezesa-nfz/zarzadzenie-nr-452019dsoz,6912.html. (Accessed: 17th April 2020)

102. Tabela de preços do SNS 2018. Portaria nº 254/2018, de 7 de setembro. *Administraçao Central do Sistema de Saúde, IP.* (2018). Available at: http://www.acss.min-saude.pt/category/acss_pt/tabelas-e-impressos/. (Accessed: 24th February 2020)

103. Infarmed. Available at: http://app10.infarmed.pt/genericos/genericos_II/menu.html. (Accessed: 22nd October 2019)

104. Concurso: 61048618 - Aq. urgente Trastuzumab 600mg/5ml sol., Nivolumab. *Portal Base.* Available at: http://www.base.gov.pt/base2/rest/documentos/737159. (Accessed: 22nd October 2019)

105. Processo Nº: 82000416-Stents medicados e stents nao medicados - 2016. *Portal Base.* Available at: http://www.base.gov.pt/base2/rest/documentos/554949. (Accessed: 17th April 2020)

106. Procedimento nº 9027518 - Adquisição de Tiras Teste Coagucheck XS PT. *Portal Base.* Available at: http://www.base.gov.pt/base2/rest/documentos/380625. (Accessed: 17th April 2020)

107. Tabela salarial Enfermagem 2017, a partir de 1 Abril. *Sindicato dos Enfermeiros Portugueses.* Available at: https://www.sep.org.pt/files/uploads/2017/06/sep_23062017_TSEnfermagem_2017_35horas_a_partir_1abril.pdf. (Accessed: 22nd October 2019)

108. Sindicato Independente dos Médicos. Available at: https://www.simedicos.pt/fotos/editor2/ficheiros/tabela_salarial_2019.pdf. (Accessed: 22nd October 2019)

109. Auditoria ao desempenho de unidades funcionais de cuidados de saúde primários. *Tribunal de Contas.* Available at: https://www.tcontas.pt/pt/actos/rel_auditoria/2014/2s/audit-dgtc-rel017-2014-2s.pdf. (Accessed: 2nd October 2019)

110. Termos de Referencia para contratualização de cuidados de saúde no SNS para 2018. *Administração Central do Sistema de Saúde* (2017). Available at: http://www.acss.min-saude.pt/wp-content/uploads/2017/11/Termos-Referencia-Contratualizacao-SNS_2018.pdf. (Accessed: 2nd October 2019)

111. Parecer sobre os limites aos preços que os hospitais públicos podem praticar na sua relação com terceiros. *Entidade Reguladora de Saúde* Available at: https://www.ers.pt/uploads/writer_file/document/1010/ERS_-_Parecer_Limites_Pre_os_SNS__1.Abr.2014__pub.pdf. (Accessed: 17th April 2020)

112. Virdues dos Santos Penedo, J. M. *et al.* Avaliação da Situação Nacional das Unidades de Cuidados Intensivos. *Serviço Nacional de Saúde* (2013). Available at: https://www.sns.gov.pt/wp-content/uploads/2016/05/Avaliação-nacional-da-situação-das-unidades-de-cuidados-intensivos.pdf. (Accessed: 17th April 2020)

113. Estudo e Avalição do Sector do Transporte Terrestre de Doentes. *Entidade Reguladora da Saúde* (2007). Available at: https://www.ers.pt/uploads/writer_file/document/108/200731583312842202_original_rel.pdf. (Accessed: 17th April 2020)

114. Despacho nº 19965/2008. *Diário da República Electrónico.* Available at: https://dre.pt/web/guest/pesquisa/-/search/924995/details/normal?q=Despacho+n.º 19965%2F2008. (Accessed: 21st February 2020)

115. Aviso n.º 3668-B/2017. *Diário da República Electrónico* (2017). Available at: https://dre.pt/web/guest/pesquisa/-/search/106955056/details/normal?q=3668-b%2F2017. (Accessed: 24th February 2020)

116. Splošni dogovor za pogodbeno leto 2019. *Zavod za zdravstveno zavarovanje Slovenije* (2019). Available at: https://bit.ly/3b9hUto. (Accessed: 25th June 2019)

117. Ralizacija SPP po izvajalcih 1-3 2020. *Zavod za zdravsteno zavarovanje Slovenije.* (2020). Available at: https://partner.zzzs.si/wps/portal/portali/aizv/zdravstvene_storitve/plan_in_realizacija/podatki_o_planu_in_realizaciji_zdrav_storitve. (Accessed: 17th November 2020)

118. Centralna baza zdravil. (2019). Available at:

http://www.cbz.si/cbz/bazazdr2.nsf/Search/$searchForm?SearchView. (Accessed: 9th October 2019)

119. Javno naročilo. *eNaročanje* (2017). Available at: https://www.enarocanje.si/objavaPogodb/PogodbaDetajli.aspx?IDPogodbeZaceten=72833. (Accessed: 20th February 2020)

120. Seznam medicinskih pripomočkov s šifrantom, medicinskimi kriteriji, pooblastili, postopki in cenovnimi standardi. *Zavod za zdravstveno zavarovanje Slovenije.* Available at: http://www.zzzs.si/egradivap/DFDC914987E44E2AC1257353003EC73A. (Accessed: 17th April 2020)

121. Zakon o načinu obračunavanja in izplačevanja plač (ZNOIP). *Pravno-informacijski sistem* (1993). Available at: http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO263#. (Accessed: 23rd March 2020)

122. Neuradno prečiščeno besedilo - priloge k sklepu Vse 3.12.2019. *Zavod za zdravenstvo zavarovanje Slovenije* (2019). Available at: https://www.zzzs.si/zzzs/info/egradiva.nsf/o/3401CB5C8BB6EB4EC1256B61003E275D?OpenDocument. (Accessed: 20th February 2020)

123. Sklep NBO neuradno prečiščeno besedilo. *Zavod za zdravenstvo zavarovanje Slovenije* (2020). Available at: https://www.zzzs.si/zzzs/info/egradiva.nsf/o/3401CB5C8BB6EB4EC1256B61003E275D. (Accessed: 27th March 2020)

124. Navodilo o beleženju in obračunavanju zdravstvenih storitev in izdanih materialov. Priloga 1.a: Šifranti za obračun Zavodu. *Zavod za zdravsteno zavarovanje Slovenije.* Available at: https://partner.zzzs.si/wps/portal/portali/aizv/sifranti. (Accessed: 12th November 2020)

125. SKLEP o načrtovanju, beleženju in obračunavanju zdravstvenih storitev. *Zavod za zdravstveno zavarovanje Slovenije.* Available at: http://www.zzzs.si/zzzs/info/egradiva.nsf/o/3401CB5C8BB6EB4EC1256B61003E275D?OpenDocument. (Accessed: 17th April 2020)

126. Cenik laboratorijskih storitev za samoplačnike. *Zdravstveni dom trebnje* Available at: https://zd-tr.si/cenik-laboratorijskih-storitev-za-samoplacnike. (Accessed: 21st January 2020)

127. Costes hospitalarios - Contabilidad Analítica. *Ministerio de Sanidad, Consumo y Bienestar Social* Available at: https://www.mscbs.gob.es/estadEstudios/estadisticas/inforRecopilaciones/anaDesarrolloGDR.htm. (Accessed: 22nd April 2020)

128. Recomendaciones para la obtención homogénea de costes de hospitalización en el SNS. *Ministerio de Sanidad, Consumo y Bienestar Social* (2013). Available at: https://www.mscbs.gob.es/estadEstudios/estadisticas/docs/REC_OBT_HOM_COST_HOSPIT_SNS.pdf. (Accessed: 5th March 2020)

129. Bot PLUS.

130. Resolución: 0004/2020. Retribuciones del personal de Centro e Instituciones Sanitarias. Ejercicio 2020. *Servicio Andaluz de Salud. Consejería de Salud y Familias* (2020). Available at: https://web.sas.junta-andalucia.es/servicioandaluzdesalud/profesionales/guia-laboral/retribuciones. (Accessed: 26th February 2020)

131. Resolución de 28 de febrero de 2019, de la Secretaría de Estado de Función Pública, por la que se dictan instrucciones sobre jornada y horarios de trabajo del personal al servicio de la Administración General del Estado y sus organismos públicos. *Ministerio de Política Territorial y Función Pública* (2019). Available at: https://www.boe.es/boe/dias/2019/03/01/pdfs/BOE-A-2019-2861.pdf. (Accessed: 26th February 2020)

132. ORDEN SAN/1221/2017, de 21 de julio, por la que se establecen los precios y tarifas máximas aplicables en la prestación de servicios sanitarios con medios ajenos al Sistema de Salud de Aragón. *Boletín Oficial de Aragón.* Available at: https://bit.ly/2XAtb26. (Accessed: 27th February 2020)

133. ORDEN 727/2017, de 7 de agosto, del Consejero de Sanidad, por la que se fijan los precios públicos por la prestación de los servicios y actividades de naturaleza sanitaria de la red de centros de la Comunidad de Madrid. *Comunidad de Madrid* (2017). Available at: http://www.madrid.org/wleg_pub/secure/quienesSomos/quienesSomos.jsf?id=2. (Accessed: 26th February 2020)

134. Tarifas para facturación de servicios sanitarios y docentes de Osakidetza para el año 2019. *Osakidetza* (2019). Available at: https://www.osakidetza.euskadi.eus/contenidos/informacion/osk_servic_para_empresas/es_def/adjuntos/tarifas_2019.pdf. (Accessed: 26th February 2020)

135. DECRETO 56/2014, de 30 de abril, por el que se establecen las tarifas de los servicios sanitarios prestados en los centros dependientes del Servicio Gallego de Salud y en las fundaciones públicas sanitarias. *Xunta de Galicia* (2014). Available at: https://bit.ly/3cbDiOM. (Accessed: 26th February 2020)

136. Boletín Oficial de la Junta de Andalucía n°210. Orden de 14 de octubre de 2005, por la que se fijan los precios públicos de los servicios sanitarios prestados por Centros dependientes del Sistema Sanitario Público de Andalucía. *Portal de la Junta de Andalucía* (2005). Available at: https://bit.ly/2XswUPg. (Accessed: 23rd July 2020)

137. Resolución de 19 de julio de 2013, del Instituto Nacional de Gestión Sanitaria, sobre revisión de precios a aplicar por los centros sanitarios del Instituto Nacional de Gestión Sanitaria en Ceuta y Melilla. *Agencia Estatal Boletín Oficial del Estado* (2013). Available at: https://www.boe.es/buscar/doc.php?id=BOE-A-2013-8240. (Accessed: 26th February 2020)

138. Orden de 8 de noviembre de 2016, por la que se modifica la Orden de 14 de octubre de 2005, por la que se fijan los precios públicos de los servicios sanitarios prestados por centros dependientes del Sistema Sanitario Público de Andalucía. *Portal de la Junta de Andalucía* (2016). Available at: https://juntadeandalucia.es/boja/2016/218/BOJA16-218-00003-19739-01_00102029.pdf. (Accessed: 27th February 2020)

139. Análisis de los sistemas de contabilidad analítica en los hospitales del SNS. *Ministerio de sanidad, servicios sociales e igualdad* (2011). Available at: https://www.mscbs.gob.es/estadEstudios/estadisticas/docs/Informe_SCA_hospitalarios_en_SNS_WEB.pdf. (Accessed: 2nd March 2020)

140. Cuarto informe AFEM. Cálculo del coste de la asistencia sanitaria especializada en Madrid. *Asociación de Facultativos Especialistas de Madrid* Available at: https://asociacionfacultativos.es/wp-content/uploads/2015/03/cuartoinformeafem.pdf. (Accessed: 2nd March 2020)

141. Regionala priser och ersättningar för södra sjukvårdsregionen. *Södra sjukvårdsregionen* (2020). Available at: https://sodrasjukvardsregionen.se/download/regionala-priser-och-ersattningar-for-sodra-sjukvardsregionen-2020/. (Accessed: 14th April 2020)

142. Priser och ersättningar för Sydöstra sjukvårds- regionen 2020. *Region Plus* (2020). Available at: https://plus.rjl.se/infopage.jsf?childId=24272&nodeId=44878. (Accessed: 14th April 2020)

143. Läkemedel. *TLV* (2020). Available at: https://tlv.se/beslut/sok-i-databasen.html. (Accessed: 14th April 2020)

144. Blodisticka glukos-ej dalarna. Available at: http://varor.lul.se/artiklar/p-glukos-snabbtest/blodsticka-glukos-ej-dalarna-49686. (Accessed: 10th February 2020)

145. Enhetliga principer för debitering av gemensamma läkarresurser. *Koncernkontoret Avdelningen för Hälso- och Sjukvårdsstyrning* (2020). Available at: https://vardgivare.skane.se/siteassets/2.-patientadministration/avgifter-och-prislistor/prislistor/interndebitering/2.1-enhetliga-principer-for-debitering-av-gemensamma-lakarresurser-2019.pdf. (Accessed: 14th April 2020)

146. Klinisk Kemi. Pris 2020 - Region Skåne samt landstingen Blekinge, Södra Halland, Kronoberg. *Vårdgivare Skåne* (2020). Available at: https://vardgivare.skane.se/patientadministration/avgifter-och-prislistor/prislistor-laboratoriemedicin/. (Accessed: 15th April 2020)

147. Hobbs, F. D. R. *et al.* Clinical workload in UK primary care: a retrospective analysis of 100 million consultations in England, 2007–14. *Lancet* (2016). doi:10.1016/S0140-6736(16)00620-6

148. Reducing the use of natural resource in health and social care. *Sustainable Development Unit.* Available at: https://www.sduhealth.org.uk/policy-strategy/reporting/natural-resource-footprint-2018.aspx. (Accessed: 17th April 2020)

149. Remboursement d'une consultation médicale. *Service-Public.fr* (2018). Available at: https://www.service-public.fr/particuliers/vosdroits/F1069. (Accessed: 26th September 2019)

150. Decreto Regulamentar n.º 16/82 de 26 de Março. *Diário da República Electrónico* (1982). Available at: https://dre.pt/application/conteudo/608202. (Accessed: 19th March 2020)

APPENDIX

Supplementary Table 1. Cost of a General Practitioner visit (England)

Unit cost 2016/2017	Including direct care staff costs		Excluding direct care staff costs	
	With qualification costs	Without qualification costs	With qualification costs	Without qualification costs
Per hour of patient contact	243 £	204 £	219 £	181 £
Per minute of patient contact	4 £	3.4 £	3.66 £	3 £
Per surgery consultation lasting 9.22 min	37 £	31 £	34 £	28 £
Par patient contact lasting 9.22 minutes (including carbon emissions (8.9 KgCO2e))	37.4 £	31.3 £	34.3 £	28.3 £

Source: Adopted from Kurtis and Burns (2018) 21
Notes: The duration of surgery consultation was taken from Hobbs at al. (2016)147
The cost of carbon emissions including patient and staff travel, electricity and gas for the building, emissions in goods and services used to provide a patient consultation was taken from NHS England report on Natural Resource Footprint148

Supplementary Table 2. Tariffs associated to Accident and Emergency care according to investigation and department categories (England)

Health Related Group (HRG) name	Type 1 and 2 Departments	Type 3 Departments
Emergency Medicine, Any Investigation with Category 5 Treatment	338 £	73 £
Emergency Medicine, Category 3 Investigation with Category 4 Treatment	338 £	73 £
Emergency Medicine, Category 3 Investigation with Category 1-3 Treatment	252 £	73 £
Emergency Medicine, Category 2 Investigation with Category 4 Treatment	227 £	73 £
Emergency Medicine, Category 2 Investigation with Category 3 Treatment	184 £	73 £
Emergency Medicine, Category 1 Investigation with Category 3-4 Treatment	130 £	73 £
Emergency Medicine, Category 2 Investigation with Category 2 Treatment	163 £	73 £
Emergency Medicine, Category 2 Investigation with Category 1 Treatment	155 £	73 £
Emergency Medicine, Category 1 Investigation with Category 1-2 Treatment	106 £	73 £
Emergency Medicine, Dental Care	99 £	73 £
Emergency Medicine, No Investigation with No Significant Treatment	73 £	73 £
Emergency Medicine, Patient Dead On Arrival	73 £	73 £

Source: Adapted from: Annex A: The national tariff workbook35

Supplementary Table 3. Cost of intensive care ambulance (England)

	Unit cost	Unit of measurement
Calls	7 £	Call
Hear and treat or refer	37 £	Patient
See and treat or refer	192 £	Incident
See and treat and convey	252 £	Incident

Source: Adapted from National Schedule of Reference costs: Year 2017-201832
Notes: Cost of a call is not included in categories mentioned in the table.

Supplementary Table 4. Weights and costs of nursing activities (France)

Professional acts	Metropolitan areas	Overseas areas and Mayotte
Acts different from nursing care	3.15 €	3.30 €
Nursing care acts	2.65 €	2.70 €
Development of a nursing care procedure	10.00 €	10.00 €
Fixed travel allowance	2.50 €	2.50 €
Kilometric allowance (flat land)	0.35 €	0.35 €
Kilometric allowance (mountain)	0.50 €	0.50 €
Kilometric allowance (foot, ski)	3.40 €	3.66 €
Night supplement for acts performed between 8 pm and 11 pm and between 5 am to 8 am	9.15 €	9.15 €
Night supplements for acts performed between 11 pm and 5 pm	18.30 €	18.30 €
Supplement for acts performed on Sundays and public holidays	8.50 €	8.50 €
Supplement for single act	1.35 €	1.35 €
Supplement for nurse coordination	5.00 €	5.00 €

Source: Adopted from: Les tariffs applicables en métrople, dans les départements d'outre-mer et à Mayotte. Available at: https://www.ameli.fr/infirmier/exercice-liberal/facturation-remuneration/tarifs-conventionnels/tarifs [54]

Supplementary Table 5. Examples of complex and very complex outpatient consultations (France)

Complex consultations
First contraceptive consultation and prevention for a 15 to 18 year girls who wants contraception Chidlhood obesity (over 3 and under 12 years old) Mandatory examintation of an infant (day 8, months 9 and 24) Infant maternity exit consultation Scoliosis Gestational diabetes First consultation for tuberculosis
Very complex consultations
Initial consultation for information and implementation of a therapeutic strategy for patients suffering from cancer, HIV, Alzheimer's disease Information for parents on fetal or congenital malformations Preparation for renal transplantation Follow-up of an under 7 year old child born very premature

Source: Remboursement d'une consultation médicale (2018)149

Supplementary Table 6. Conventional rates applicable to transport by a light medical vehicle (France)

Tariff elements	Amount
County flat rate zone A	13.85 €
County flat rate zone B	13.45 €
County flat rate zone C	12.60 €
County flat rate zone D	11.97 €
Additional charge	15.58 €
Kilometric rate (per km)	0.89 €
Short journey valuation	
journey = 7 km	6.26 €
7 km < journey ≤ 8 km	6.05 €
8 km < journey ≤ 9 km	5.53 €
9 km < journey ≤ 10 km	5.00 €
10 km < journey ≤ 11 km	4.48 €
11 km < journey ≤ 12 km	3.96 €
12 km < journey ≤ 13 km	3.44 €
13 km < journey ≤ 14 km	2.92 €
14 km < journey ≤ 15 km	2.40 €
15 km < journey ≤ 16 km	1.88 €
16 km < journey ≤ 17 km	1.36 €
17 km < journey ≤ 18 km	0.83 €

Source: VSL: les tariffs conventionnels. Available at: https://www.ameli.fr/transporteur-sanitaire/exercice-professionnel/facturation/tarifs/vsl-tarifs-conventionnels 59
Notes: The tariffs are valid as of January 1, 2015

Supplementary Table 7. Net price of blood glucose test strips of Region Westphalia-Lippe (Germany)

Number of packs (of 50 stips each)	Group A1	Group A2	Group B
1	26.10€	22.85€	20.85€
2	26.00€	22.75€	20.75€
3-5	24.25€	21.00€	19.00€
6 and more	23.25€	20.00€	18.00€

Source: Adopted from Preisvereinbarung und Preisliste Blutzuckerteststreifen (2019)[64]

Supplementary Table 8. Net income in 2016 (Germany)

	Mean	Median
Annual net income	170,351€	147,857€
-Medical pension plan*	20,654€	20,654€
-Health and nursing care insurance**	9,295€	9,295€
-Income tax***	55,002€	45,036€
Annual disposable net income	85,399€	72,871€
Monthly disposable net income	7,117€	6,073€
Net hourly rate****	39€	33€

Source: Adopted from Zi-Praxis-Panel – Jahresbericht 201765
*Note: *General supply tax of a full paying member; 14% or maximum amount 20,654 €/year*
***Contributions to health and long-term care insurance as a voluntarily insured person (childless).*
****Deductible pension expenses: 82% of pension contributions plus health and long-term care contributions*
*****For 46 working weeks per year and a working week of 48 hours*

Supplementary Table 9. Gross income and income per patient in the last quarter of 2016 (Germany)

	Gross income	Income per patient
General practitioner	55,490€	63.15€
Paediatrician	56,874€	58.58€
Specialist	55,125€	66.53€

Source: Honorarbericht[66]

Supplementary Table 10. Average costs per accident & emergency room visit (Germany)

Cost center group	Medical service	Nursing and functional service	Drugs	Health products, consumables	Medical infrastructure	Non-medical infrastructure	Total
Ordinary ward	0.49€	0.01€	0.00€	0.00€	0.02€	0.07€	0.59€
Operating room	0.02€	0.02€	0.00€	0.02€	0.02€	0.02€	0.11€
Anaesthesiology	0.37€	0.19€	0.01€	0.06€	0.02€	0.11€	0.77€
Endoscopy	0.09€	0.12€	0.01€	0.09€	0.05€	0.07€	0.42€
Radiology	4.03€	4.68€	0.04€	2.40€	1.44€	3.40€	15.98€
Labour	0.28€	1.88€	0.19€	3.01€	0.20€	0.77€	6.34€
Other	0.46€	0.37€	0.01€	0.14€	0.10€	0.24€	1.32€
Emergency room	34.87€	34.97€	1.39€	4.75€	5.20€	18.99€	100.18€
Total	40.62€	42.24€	1.65€	10.48€	7.05€	23.68€	125.71€

Source: Adapted from Gutachten zur ambulanten Notfallversorgung im Krankenhaus (2015) 69
Notes: A cost centre group "emergency room" maps the physical emergency areas in the strict sense.

Supplementary Table 11. Type of personnel costs included in the cost of a day of hospitalization (Germany)

Doctors
Nursing: nursing care, nursing and nursing staff, carers in intensive care and treatment facilities and dialysis stations
Medical-technical service: pharmacy staff, chemists, dieticians, physiotherapists, speech therapists, masseurs, medical-technical assistants, orthoptists, psychologists, typists in the medical and medical-technical field, social workers
Function service: nursing staff for the surgical service, anaesthetics, in the outpatient clinic and polyclinics, midwives and maternity assistants, occupational therapists, ambulance service.
Clinical home staff: House and cleaning staff of clinics and wards
Economic and supply service: disinfection, craftsmen and janitors, kitchens and diet kitchens (including nutritionists), businesses (e.g., butchers and gardeners), laundry and sewing room
Technical service: staff working in the following areas or with the following functions: plant engineers, heating, hot and cold water, fresh air, medical gases, electricity, maintenance (e.g., painters, upholsterers and other craftsmen).
Management service: Personnel of the narrower and wider administration, registry, and technical administration (e.g., reception and care costs department, security staff, messenger services (postal service), cash office and accounting, gatekeeper, statistical department, telephone operators, administrative staff)
Special services: pastoral worker, health care worker, co-worker, etc.
Other staff: pupils, as far as these are not counted towards the occupation of the wards with nursing staff, preschool students, trainees
Non-allocable staff costs: personnel costs that cannot be assigned to one of the abovementioned personnel groups (e.g., the contributions to be paid by the municipal hospitals for retired civil servants formerly working in the hospitals, occupational benefit contributions, severely disabled persons' fees, costs for a non-hospital occupational health service, non-personnel personnel expenses arising from presentation contracts, retirement and pensions expenses, as far as they are not divisible by personnel groups

Source: Gesundheit. Kostennachweis der Krankenhäuser70

Supplementary Table 12. Type of operating costs included in the cost of a day of hospitalization (Germany)

Food and related services: In addition to meat, sausage, fish and baked goods as well as beverages, fruits, vegetables, frozen foods and canned goods, the foods also include the usual children's nutrition, breast milk and dietetic foods. This item also includes the costs of any food sample inspections and the shipping costs associated with the deliveries. The cost item includes both the expenses for the patients and the staff.
Medical needs: The medical need consists of medicines, blood /stored blood/plasma, healing and aids, medical and nursing supplies/instruments, anaesthesia and other surgical needs, laboratory supplies, implants, transplants, dialysis needs, costs for ambulance services and other medical needs. The last three positions are not proven separately in the statistics.
Water, energy, fuels: E.g., water including sewage, electricity, district heating, oil, coal, gas.
Economic needs: Cleaning/disinfecting, laundry cleaning/care, fuels and lubricants, garden maintenance, cleaning by foreign companies, cultural and religious events (e.g., church services, patient's library, music and theatre performances).
Administrative Requirements: The administrative costs include, but are not limited to, such as ffice supplies, printing, postage, post office and bank charges, telephone and teleprinter installations, radio and television, recruitment costs, travel expenses, fares, computer and organizational expenses.
Central administrative services: services provided by central bodies of the executing agency, as far as operational and not supervisory services are concerned. It also includes services provided by facilities that the hospital operator operates independently of the hospital or in conjunction with a hospital for several of its own hospitals.
Central community services: The main Community services are community laundries, central pharmacies, central kitchens, central computer equipment, central purchasing, etc., which are operated jointly by several hospitals.
Rescued commodities: Assets with an average useful life of up to three years, such as: service and protective clothing, laundry, textiles, glass and porcelain items, breathing bags, electric blankets and pillows, image, sound and data recorded in the recovered household goods.
Nursing maintenance: Maintenance costs are costs of preserving or restoring assets of the hospital (if the asset does not substantially increase in substance, does not significantly change in substance, does not significantly extend its useful life or is not clear beyond its present state is improved, or if it is completely or predominantly replaced in structural units building parts), operational facilities and installations or outdoor facilities. Only the costs of services (here: maintenance), which were provided for the area of full and part-inpatient hospital services as well as for the deduction of benefits for pre- and post-inpatient services, are eligible for care.
Insurance: Premiums for property insurance (fire, liability, glass breakage, burglary, business interruption, etc.) are allocated to insurance costs.
Other charges: These include Municipal taxes, chimney sweep fees and garbage collection costs.
Other material costs: In this collective item, the costs of rent and lease, material expenses for continuing education and training, premiums within the scope of the employee suggestion scheme, etc. are recorded.
Noticeable expenses: Expenses for medical and non-medical personnel not employed in the hospital (e.g., fee-earners or temporary staff employed in the so-called personnel leasing procedure to support the hospital staff) as well as expenses for outsourced services, e.g., external cleaning company, Catering service for the canteen) are reported. They are already included in the aforementioned material costs and will be summarized separately here.

Source: Gesundheit. Kostennachweis der Krankenhäuser70

Supplementary Table 13. Other costs included in the cost of a day of hospitalization (Germany)

Interest and similar expenses
These include interest on commercial and residential buildings and interest on facilities and interest on other debt. Be shown separately: Interest on working capital loans = Short-term interest rates borrowed to bridge short-term liquidity difficulties.
Taxes
The taxes include property tax, vehicle tax, but not wage, church, turnover and land transfer tax, since these are already covered elsewhere.
Costs of the training centers
The costs of the training centers are reported separately from the costs of the remaining hospital in order to achieve a better comparability of hospitals with and without training centers. The costs of the training centers include the costs of the staff and the material costs of the training centers.
Expenses for the training fund

Source: Gesundheit. Kostennachweis der Krankenhäuser[70]

Supplementary Table 14. General practitioner's increase to be added to the annual flat-rate fee per patient according to the doctor's seniority and number of patients attended (Italy)

Nº of patients attended	General practitioner's seniority (years)			
	From 0 to 13 years	From 13 to 20 years	More than 20 years	More than 27 years
Up to 500	13.73 €	15.56 €	17.26 €	18.46 €
up to 600	11.50 €	13.19 €	14.98 €	16.21 €
up to 700	9.10 €	10.82 €	12.61 €	13.83 €
up to 800	7.54 €	9.05 €	10.86 €	12.10 €
up to 900	5.96 €	7.75 €	9.50 €	10.75 €
up to 1000	4.94 €	6.75 €	8.53 €	9.74 €
up to 1100	4.10 €	5.91 €	7.67 €	8.91 €
up to 1200	3.42 €	5.20 €	6.99 €	8.23 €
up to 1300	2.84 €	4.63 €	6.43 €	7.65 €
up to 1400	2.35 €	4.15 €	5.93 €	7.14 €
more than 1400	1.91 €	3.70 €	5.49 €	6.73 €

Source: Adapted from Accordo Collettivo Nazionale per la Disciplina dei Rapporti con i Medici di Medicina Generale ai sensi dell'art. 8 del D.LGS. n. 502 del 1992 e successive modificazioni ed integrazioni[90]

Supplementary Table 15. Cross-departmental variation of fixed and variable costs over the total costs of Accident & Emergency Department (Italy)

	Fixed costs	Variable costs
A. Directly attributed costs	94.99%	5.01%
B. Radiology	5.09%	94.91%
C. Laboratory	23.62%	76.38%
D. Overheads	66.86%	33.14%
Total	75.57%	24.43%

Source: Ministero della Salute[93]

Supplementary Table 16. Average cost of Accident & Emergency room (Italy)

Hospital	Average cost
A	226.57€
B	262.34€
C	237.40€
D	206.48€
E	153.37€
F	353.10€
Average cost of a sample	241.05€

Source: Ministero della Salute[93]
Notes: A to F corresponds with 6 different hospitals that took part in the study.

Supplementary Table 17. Standardized average cost of Accident & Emergency room (Italy)

Hospital	Average weight for access classified according to IR-DRG	Average cost per standardized case*
A	0.5935	239.99€
B	0.6383	258.12€
C	0.6031	243.88€
D	0.6159	249.06€
E	0.5965	241.23€
F	0.5613	226.99€
Average cost of a sample	0.5987	242.09€

Source: Ministero della Salute93
Notes: The weights are based on the activity and cost data of Maryland (US) and they relate to 2002 year.
**Average cost per standardized case is the result of multiplying the previously defined average cost (see Supplementary Table 16) by the corresponding weight, that is the average weight for access classified according to IR-DRG.*
IR-DRG, International-Refined Diagnosis-Related Groups

Supplementary Table 18. Analysis of the information capabilities of the key indicators of the ambulance intervention suggested in the European Emergency Medical Services (EMS) Project

What we want to measure	Variables required	Formula
Resource indicator	Annual number of hours of personnel available for the entire population for ambulance emergency	Total annual hors staff/ 100,000 inhabitants
Indicator of satisfaction of needs (outcome indicator)	Prehospital intervention time for patients who are life threatening	% of red colour interventions met within x minutes
Indicator of population needs (state of risk)	Incidence of emergencies for so-called "quintet of the first hour" (cardiac arrest, coronary syndrome, stroke, respiratory crisis and severe trauma)	number of emergencies of this type/ 100,000 inhabitants
Complexity indicator welfare	Percentage of "complex" interventions on total intervention (to define what is meant be complex, e.g. if drug administration, assisted ventilation or intubation is necessary, etc.)	Number of complex interventions/total interventions

Source: Ministero della Salute93

Supplementary Table 19. Weights of services provided to patients at the accident and emergency consultation (Poland)

Category	The scope of services provided to patients	Weight
1	Assessment of the patient's condition (triage), basic diagnostics (laboratory tests - basic package, ECG), medical advice, nursing care, pharmacotherapy	93
2	Extended diagnostics (laboratory tests - additional package, review X-ray, ultrasound), consultation, small procedures	248
3	Extended imaging diagnostics, monitoring of basic vital functions, pharmacotherapy (intravenous, intramedullary), small outpatient surgery, invasive examination (lumbar puncture, puncture of body cavities), other additional tests	342
4	Activities related to maintaining vital functions, extended diagnostics, intravenous infusions, endoscopy, resuscitation (advanced life support (ALS) using mechanical devices)	498
5	One-day hospitalization of the patient at A&E - monitoring of vital functions, expanded imaging diagnostics (angiotomography, trauma scan, CT under general anesthesia in children)	746
6	One-day hospitalization of a patient at intensive care unit - monitoring of the patient's vital functions according to the card of increased supervision - constituting Annex 8 and 9, respectively, monitoring, artificial ventilation, pharmacotherapy, further diagnostics, damage control	871

Source: Zarządzenie Nr 16/2018/DSM (2018)98

Supplementary Table 20. Monthly and hourly salary of nursing staff depending on the salary category (Portugal)

		35 working hours per week								
		Normal work/hour			Extra work					
		Day work on working days	Night work on working days and day work on Saturdays after 1 pm, Sundays and public holidays	Night work on Saturdays after 8 pm, Sundays and public holidays	Day work on working days		Night work on working days and day work on Saturdays after 1 pm, Sundays and public holidays		Night work on Saturdays after 8 pm, Sundays and public holidays	
Salary category	Monthly salary 2017				First hour	Following hours	First hour	Following hours	First hour	Following hours
15	1.201,48 €	7,92 €	1,98 €	3,96 €	9,41 €	10,89 €	12,38 €	13,86 €	15,54 €	16,83 €
19	1.407,45 €	9,28 €	2,32 €	4,64 €	11,02 €	12,76 €	14,50 €	16,24 €	18,21 €	19,72 €
23	1.664,91 €	10,98 €	2,75 €	5,49 €	13,04 €	15,10 €	17,16 €	19,22 €	21,55 €	23,33 €
27	1.819,38 €	12,00 €	3,00 €	6,00 €	14,25 €	16,50 €	18,75 €	21,00 €	23,55 €	25,50 €
30	2.025,35 €	13,35 €	3,34 €	6,68 €	15,85 €	18,36 €	23,86 €	23,36 €	26,20 €	28,37 €
33	2.179,83 €	14,37 €	3,59 €	7,19 €	17,06 €	19,76 €	22,45 €	25,15 €	28,20 €	30,54 €
36	2.385,80 €	15,73 €	3,93 €	7,87 €	18,68 €	21,63 €	24,58 €	27,53 €	30,87 €	33,43 €
39	2.488,78 €	16,41 €	4,10 €	8,21 €	19,49 €	22,56 €	25,64 €	28,72 €	32,20 €	34,87 €
42	2.591,76 €	17,09 €	4,27 €	8,55 €	20,29 €	23,50 €	26,70 €	29,91 €	33,54 €	36,32 €
45	2.746,24 €	18,11 €	4,53 €	9,06 €	21,51 €	24,90 €	28,30 €	31,69 €	35,54 €	38,48 €
48	2.849,22 €	18,79 €	4,70 €	9,40 €	22,31 €	25,84 €	29,36 €	32,88 €	36,88 €	39,93 €

Source: Adopted from Tabela salarial enfermagem 2017107
Notes: The salary table published by a Ministry of Health contains 115 salary categories. The categories in this table refers to nursing staff.

Supplementary Table 21. Monthly salary supplement according to the group the general practitioner belongs to and a number of patients subscribed (Portugal)

Nº of patients subscribed to each general practitioner	Group A	Group B	Group C	Group D
Up to 1750	326.85 €	228.38 €	181.24 €	104.76 €
1751-2000	353.04 €	254.04 €	205.89 €	129.90 €
More than 2000	375.57 €	278.13 €	229.42 €	156.10 €

Source: Adopted from Sindicato Independente dos Médicos108
Notes: Letters A-D refer to different municipalities that are listed elsewhere150

Supplementary Table 22. Hourly remuneration of medical staff (Portugal)

	Normal work	Extra work
Day work on working days (from 08:00 to 20:00 in case of unionized doctors; including Saturdays from 08:00 to 13:00)	R	First hour - 1.25 R
		Following hours - 1.5 R
Night work on working days (from 20:00 to 08:00 in case of unionized doctors)	1.5 R	First hour - 1.75 R
		Following hours - 2 R
Day work on Saturdays after 13:00, Sundays and public holidays	1.5 R	First hour - 1.75 R
		Following hours - 2 R
Night work on Saturdays after 20:00, Sundays and public holidays	2 R	First hour - 2.25 R
		Following hours - 2.5 R

Source: Adopted from Sindicato Independente dos Médicos108
Notes: R depends on whether a doctor is a general practitioner or specialist and whether he works 35 or 42 hours per week. Thus, R corresponds to 14.86€ or 16.34 (general practitioner) and 26.17 or 28.79 (specialist).

Supplementary Table 23. Types of a "short outpatient visit" (Slovenia)

Shorter telephone or electronic consultation between doctor and patient
Blood pressure measurement or parenteral administration of the drug if one or the other is performed by a nurse on the order of a physician
Re-prescription of prescription(s) to regulated chronic patients for long-term therapy (renewable prescription is calculated only once in the current year)
Inability to work on the basis of a letter of discharge or a medical examiner with clinical findings and prescribed therapy that clearly dictates an inability to work
Issue referrals in the case of commissioned supervision by a specialist after the first, urgent specialist examination or hospitalization
Re-prescribing a medical device under the responsibility of a personal physician

Source: Splošni dogovor za pogodbeno leto 2019116

Supplementary Table 24. Annual salaries of medical and nursing staff in 2020 (Spain)

	Annual salary
General practitioner	44,779.05 €
Paediatrician	44,779.05 €
Midwife	32,033.23 €
Nurse	29,827.10 €
Specialist	53,190.92 €

Source: Adapted from Resolución: 0004/2020. Retribuciones del personal de Centro e Instituciones Sanitarias. Ejercicio 2020.(2020)130

Supplementary Table 25. Average monthly salary of specialist and non-specialist doctor (Sweden, region of Skåne)

	Specialist	Non-specialist	Specialist	Non-specialist
Average montly salary			78,544 kr	46,100 kr
Vacations	15.50%	13.00%	12,174 kr	5,993 kr
Sick pay	0.90%	0.90%	707 kr	415 kr
Overheads	25.00%	25.00%	22,856 kr	13,127 kr
Social fees	47.78%	47.78%	48,051 kr	27,597 kr
Total			162,300 kr	93,200 kr

Source: Adopted from: Enhetliga principer för debitering av gemensamma läkarresurser (2019)145
Notes: Vacations: Assessment of the number of vacation days for specialist doctors and non-specialist doctors. The specialist doctors are older than the non-specialist doctors and thus have more vacation days.
Sick pay: Standard rate of 0.9% based on the approximate the ratio of sick pay/salary in recent years previously used for to calculate this premium.
Overheads: Allowance for training costs, administration for the service and personnel social initiatives such as occupational health, wellness and tutorial.
Travel costs are invoiced separately by the seller and correspond to real cost. Whether traveling time should be outside or within working hours is decided by individual assessment of each selling and buying manager. Special agreement must be reached if exceptions are to be made which means that medical staff travel during working hours.
Invoicing of worked hours during on-call time by specialist doctors and non-specialist doctors corresponding to real cost and with transparency surcharge as above.

GLOSSARY OF TERMS USED IN THE EU HCSCD DATABASE

Ad hoc study cost: costing data taken from ad hoc studies.

Ambulance service: Service provided by a vehicle which can transport patients to the treatment site or back to their place of residence, and in some instances will also provide out-of-hospital medical care to the patient during the transportation. This subcategory is further divided into non-emergency patient transport and intensive care ambulance.

Brand: Proprietary/commercial name occasionally used to assist in the identification of the regulated medicines, medical devices and/or disposables/reusable. Therefore, this field applies to medicines, medical devices and health products/disposables.

Code: refers to the combination of letters and/or numbers each costing item is described with in the original source.

Complex processes & interventions: Activities that aggregate several simpler procedures, "goods and services" and primary resources.

Composite goods and services: Are bundles of several primary resources that are consumed jointly. For example, a day in hospital will include some staff activity (nursing, doctors ward rounds), some amenity services (catering, laundry) and often more general overheads (energy, general maintenance, portering, etc.).

Currency: is the currency of the unit price of the country the items refers to (e.g., SEK for Swedish Krone, PLN for Polish złoty, etc.).

Day case procedure/Outpatient surgery: A patient or case that comes into hospital for a surgical procedure and is dealt with and released in the course of one day.

Diagnostic procedures: A type of test used to help diagnose a disease or condition. (Adapted from: https://www.spine-health.com/glossary/diagnostic-test-or-diagnostic-study).

Ex-factory price: price set at the level of manufacturer (Adopted from: http://gabi-journal.net/understanding-the-components-of-pharmaceutical-expenditure-overview-of-pharmaceutical-policies-influencing-expenditure-across-european-countries.html).

Health products/Disposables: Items designed for single use or those that may be used more than once after proper cleaning and sterilisation and/or disinfection. (Adapted from http://apps.who.int/medicinedocs/documents/s20282en/s20282en.pdf).

Hospitalization: Admittance to the hospital as an inpatient. (Adapted from: https://www.ecri.org/library/care-settings/hospital-inpatient).

Image diagnosis: Radiography, sonography, and other technologies used to create a graphic depiction of the body for diagnosis or therapeutic purposes (Adapted from: https://www.ecri.org/library/care-settings/imaging-center).

Inpatient medical and surgical processes: Require patients stay the night following or not the surgery.

Intensive care ambulance: Well-equipped ambulances that provides emergency medical care. Once it is activated by an incident that causes serious illness or injury, the focus of intensive care ambulance is emergency care of the patient(s). (Adapted from: https://www.ems.gov/whatisems.html).

Item in local language: The language of the country the resource is taken from.

Laboratory tests: Services provided by medical laboratories for the diagnosis of disease. (Adapted from: https://www.ecri.org/library/clinical-specialties/clinical-laboratory).

Leasing price: the amount of many paid for rental of a costing item during a certain period of time.

Local price: refers to the each item's unit price in the national currency.

Local price (CPI applied): refers to the local price after applying the last CPI available

Local price (GDP deflator applied): refers to the local price after applying the last GDP deflator index available

Medical device: An article, instrument, apparatus or machine that is used in the prevention, diagnosis or treatment of illness or disease, or for detecting, measuring, restoring, correcting or modifying the structure or function of the body for some health purpose. (Source: https://www.who.int/medical_devices/definitions/en/).

Medicine: A drug or other preparation for the treatment or prevention of disease.

Model: value used to represent one medical device or a family of medical devices to group many variations that have shared characteristics. This field applies to medical devices and health products/disposables.

Non-emergency patient transport: Transport for patients who require clinical monitoring or assistance but do not need a time-critical emergency ambulance (Source: https://www.ambulance.vic.gov.au/about-us/our-services/non-emergency-patient-transport/).

Notes: optional field. May be used for explanations or notes relevant to the information contained in the remaining fields corresponding to a particular item.

Number of units: refers to the number of items delivered in the year of observation that are included in unit price. The purpose of this field is to know how reliable a certain value – usually an average - is.

Outpatient visit: Visit of a patient who is not hospitalized overnight but who visits a hospital or clinic for diagnosis or treatment (Adapted from: https://www.ecri.org/library/care-settings/hospital-outpatient). The difference between the cost of general practitioner visit and the cost of general practitioner relies on the fact that the cost of general practitioner visit includes the cost of general practitioner plus overheads, such as electricity, heating, laundry, administration, rent of building, etc.

Personnel: Labour time of health care professionals (e.g., workers employed in health care institutions or processes).

Price in euros: is the previously mentioned price in local currency converted to euros.

Price in euros (CPI applied): refers to 'local price (CPI applied)' converted into euros.

Price in euros (GDP deflator applied): refers to 'local price (GDP deflator applied)' converted into euros

Primary resources: A "basic" or "indivisible" input to healthcare.

Production cost: represents real healthcare facility expenses on a specific costing item.

Public price (items different from medicines): price used for those procedures, exams, processes, etc. paid to a public health insurance system by private or external users that are not authorised to receive these services as regular beneficiaries.

Public price (medicines): the selling price of individual drugs (i.e. same active principle, different brands; e.g. Codamol, Tachidol) at pharmacy for the general public. Also called 'pharmacy retail price', 'consumer price' or 'end price' (Adopted from: http://gabi-journal.net/understanding-the-components-of-pharmaceutical-expenditure-overview-of-pharmaceutical-policies-influencing-expenditure-across-european-countries.html).

Purchase price: price set at the level of wholesaler (Adopted from: http://gabi-journal.net/understanding-the-components-of-pharmaceutical-expenditure-overview-of-pharmaceutical-policies-influencing-expenditure-across-european-countries.html).

Reference of cost data: a publication, a web page or any report where the cost is mentioned (e.g., https://www.gov.uk/government/collections/nhs-reference-costs).

Reference price: the maximum reimbursement price (for all drugs containing the same active principle, e.g. paracetamol) paid by National Health Service (NHS) (Adapted from: https://www.commonwealthfund.org/publications/issue-briefs/2018/sep/pharmaceutical-reference-pricing-future#:~:text=Reference%20pricing%20is%20an%20emerging%20structure%20of%20benefit%20design%20under,the%20patient%20pays%20the%20remainder).

Source of cost data: refers to the institution the cost originates from, that is, the institution responsible for communicating or publishing the costing information (e.g., Department of Health and Social Care).

Strength: the amount of a drug in a given dosage form, measured as the number of micrograms per millilitre (Adapted from: https://www.pharmacy-xpress.co.uk/manuals/training-handbook/4-strength-dosage-timing-and-frequency-medicines#:~:text=The%20strength%20of%20a%20medicine,the%20amount%20of%20a%20liquid!). This field applies only to medicines.

Tariffs: prices paid by a public or private insurer to a health care provider for those services that are free or subsidized for other users.

Therapeutic procedures: Medicine or therapy used to cure disease or pain by the involvement and intercession of proactive, therapeutic practice. (Adapted from: https://www.wingatewildernesstherapy.com/Glossary/Therapeutic-intervention/).

Type of institution: type of the centre the patients are attended at.

Type of institution (Ambulatory care): is used for outpatient procedures that do not require a hospitalization and that may be performed in a hospital or in an outpatient clinic (we usually use this terminology when the cost of an outpatient procedure is independent from a setting).

Type of institution (Home): is used for procedures performed at patient's home.

Type of institution (Hospital): is used for all procedures and processes that require hospitalization (hospital stay > 1 day, day case –hospital stay = 1 day–), or those procedures that are performed in a hospital even if that they do not require patient's admission such as intensive care ambulance or A&E visit.

Type of institution (Outpatient clinic): a setting independent from a hospital where outpatient procedures are performed.

Type of institution (Primary care): is used for patient's visits that implies curing of common diseases.

Type of unit: refers to the way the units are delivered (e.g., box). This field applies to medicines and health products/disposables.

Type of unit value (Method of valuing resource use): type of monetary value that is placed on each of the resources used (e.g., public price, reference price, leasing price, production cost, tariff, etc.).

Unit of measurement: refers to the unit that can be acquired at an observable price or the unit that is used by each health care centre/hospital.

Wholesale price: ex-factory price plus the wholesaler margin (Adapted from: https://www.drugs.com/article/average-wholesale-price-awp.html).

Year: refers to the year when the cost registration took place or when the cost was observed, not to the year of cost publication.

Year (Consumer Price Index (CPI)): refers to the year of the last CPI available.

Year (GDP deflator): refers to the year of the last GDP deflator available