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Review article

## Orthopedics coding and funding

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### ABSTRACT

The French *tarification à l'activité* (T2A) prospective payment system is a financial system in which a health-care institution's resources are based on performed activity. Activity is described via the PMSI medical information system (*programme de médicalisation du système d'information*). The PMSI classifies hospital cases by clinical and economic categories known as diagnosis-related groups (DRG), each with an associated price tag. Coding a hospital case involves giving as realistic a description as possible so as to categorize it in the right DRG and thus ensure appropriate payment. For this, it is essential to understand what determines the pricing of inpatient stay: namely, the code for the surgical procedure, the patient's principal diagnosis (reason for admission), codes for comorbidities (everything that adds to management burden), and the management of the length of inpatient stay. The PMSI is used to analyze the institution's activity and dynamism: change on previous year, relation to target, and comparison with competing institutions ~~based on~~ stay performance indicator

The T2A system improves overall care efficiency. Quality of care, however, is not presently taken account of in the payment made to the institution, as there are no indicators for this; work needs to be done on this topic.

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### 1. Introduction

Health expenditure makes up a large part of public spending. The French national health insurance system runs a recurrent deficit, which needs to be kept under control by freezing overall spending and reforming health-care facility funding so as to reflect real activity more closely.

Since 1996 [1], under a government national health insurance (*sécurité sociale*) funding law [2], the French parliament has set an annual national health insurance spending target. In 2013, this amounted to €170.8 bn with an annual increase of 2.7%, the objective being not to exceed €175.4 bn. Hospital expenditure accounted for €74.6 bn, or 46.67%. The targeted annual increase is 2.6%: i.e., €76.5 bn (46.61% of the total).

A new activity-based prospective funding system for public and private sector health-care facilities, called *tarification à l'activité* (T2A, Appendix 1), was first set up in 2004 and generalized in 2008. T2A bases institutional funding on the type and volume of activity as measured by the PMSI medical information system (*programme de médicalisation du système d'information*) using a coding system for pathologies and procedures. This description of medical activity

translates into funding and thence into expenditure, corresponding to the means available to support the activity.

The intended objectives of the system are multiple. Funding should become more transparent, being bound to the production of care, and the under-payment or persistent over-payment to which previous systems could give rise should be avoided. Expenditure should be controlled by regulation of prices and volumes. Funding should be fairer as it is independent of the type of care structure, a given service being associated to a given price. Finally, it should improve the efficiency of care by encouraging a balance to be struck between the means that are allocated and the income that is generated.

Finally, T2A provides an incentive to develop new activities, such as ambulatory surgery, and reorganize care territorially, by contracting with regional health agencies and authorizing new activities.

T2A is founded on a medical description of care activity; control of the process of production of medical information by the various medical agents is thus a major issue, conditioning the funding the agents in question will receive in order to do or to enhance their work.

The present article will first briefly present the PMSI information system and then explain how income is calculated and activity invoiced on the basis of an institution's medical activity. The way orthopedic activity is coded will be illustrated by a few concrete cases. Some examples of other uses to which PMSI information can

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**Table 1**  
Upper and lower MLS limits for two roots in version 11 (V11) of the DRG classification for health-care facilities previously under DGF package funding (public and private health-care facilities of public interest).

		Lower limit	Upper limit	National mean length of stay
08C32	Lower-limb interventions, age > 17 years			
	Level 1	3	12	5
	Level 2	4	23	9.3
	Level 3	7	40	16.3
	Level 4	9	73	29.4
	J.	0	0	0
08M10	Specific bone diseases and arthropathies			
	Level 1	0	8	3.5
	Level 2	0	24	10
	Level 3	0	35	14.2
	Level 4	6	50	20.1
	T	0	0	0

MLS: mean length of stay; DRG: drug-related group; DGF: *dotation globale de financement*, level J.: day hospital; level T.: very short stay.

be put will be given. And finally, the importance of good coding will be discussed.

## 2. The programme de médicalisation du système d'information (PMSI) medical information system: how to describe activity

The principle of the PMSI system is to classify cases managed in a health facility into treatment groups that are homogeneous with respect to medical criteria, cost and length of stay.

This requires patient information (gender, age, etc.), administrative information (ward, authorization number of the facility for the indication, date and type of admission and date and type of discharge, etc.) and medical information (diagnosis, procedures).

The health authorities require the information to be passed on to the funding bodies along with details of invoicing (type of national health insurance scheme, treatment cost reimbursements, etc.). The format and scheduling of this transmission are set by the authorities.

The physician following the patient records medical information throughout the patient's stay. At discharge, a standardized discharge report (*résumé standardisé de sortie*: RSS) is drawn up. The stay is then categorized in a diagnosis-related group (DRG) using an algorithm based on a set of binary tests on the above data.

This classification is based on:

- the "principal" diagnosis, indicating such and such a major diagnostic category (MDC – very often MDC 08 in orthopedics);
- whether or not there is some classificatory procedure indicating a surgical or non-surgical DRG (DRG "C" for surgery [*chirurgie*]);
- whether or not there are any "associated" diagnoses listed as comorbidities indicating a DRG graded between 2 and 4 for severity;
- short-stay duration, indicating either DRG level J (short hospital: *hôpital de jour*) or T (very short [*très court*] stay of 0, 1 or 2 days, depending on the DRG).

Each DRG code comprises six characters: the first two designate the MDC, the third specifies the surgical, medical or interventional type of the treatment, the fourth and fifth are numerators, and the sixth grades severity. The DRG root corresponds to the first five characters.

For each DRG, the expected mean length of stay (MLS), based on national statistics, is published with upper and lower limits (Table 1).

## 3. How income is generated

The T2A system comprises three funding modalities:

- funding according to service: hospitalization, consultations (using the general professional acts nomenclature [*nomenclature générale des actes professionnelles*: NGAP]);
- package funding for missions of general interest and contracting assistance (*mission intérêt général et aide à la contractualisation*: MIGAC), and teaching, research, reference and innovation missions (*mission enseignement recherche référence et innovation*: MERRI). Missions "of general interest" include the *service d'aide médicale urgente* (SAMU) mobile emergency service and anti-poison centers. Assistance with contracts made with regional health agencies (*Agences régionales de santé*: ARS) includes assistance with meeting regional targets laid out in the regional health organization plans (*schémas régionaux d'organisation des soins*: SROS) or care quality improvement targets, and setting up networks, liaison teams, social missions (social disadvantage), telemedicine schemes, rare diseases resource centers and continuity of care schemes, etc.
- fixed-sum funding (accident and emergency, organ harvesting).

Most health facility income is from service-related funding and from hospitalization in particular. This income is generated from the PMSI medical description of hospital stay (DRG).

Each DRG has an associated hospital stay-related group price (*groupe homogène de séjour*: GHS), published annually on March 1st [3] after adjustment according to the volume recorded for the previous year (volume/price adjustment).

Prices are based on the National Common-Methodology Costs Study, involving a sample of volunteer public and private sector health facilities that use an analytic accounting system, which displays expenditure per hospital case. The costs analysis methodology is the same for public and for private sector facilities. The mean cost is calculated for each DRG, to construct a scale of costs as a basis for determining prices.

For a given root DRG, prices increase with severity.

GHS prices are national, but distinguish public and private sector facilities (medical fees not being included in private sector GHSs) (Table 2). In what follows, the various examples of pricing come from the 11th version of the DRG classification for public and private sector facilities of public interest previously funded on a package basis by the *dotation globale de financement* (DGF).

Prices are subject to revision according to particular authorizations that may be given for a particular structure. For surgical management of osteoarticular infection, for example, there are 2

**Table 2**  
Comparison of public and private sector V11 prices for 2 DRGs.

Code	DRG	Level of severity							
		1		2		3		4	
		Public (€)	Private (€)	Public (€)	Private (€)	Public (€)	Private (€)	Public (€)	Private (€)
08C48	THR other than for recent trauma	4881	3013	5757	3376	7249	4282	10,318	5196
08M07	Lower-limb fracture, sprain, dislocations, age > 17 years	1458	778	2858	1407	4096	1814	6760	2671

DRG: drug-related groups; V11: version 11.

**Table 3**  
Intervention prices for osteoarticular infection (OAI) 08C56.

	Level of severity			
	1 (€)	2 (€)	3 (€)	4 (€)
Any facility	3899	8041	10,699	15,966
OAI reference center	4377	9027	12,010	17,923

different rates depending on whether management is in a reference center or not (Table 3).

To calculate the income generated by an admission, account has to be taken of:

- the GHS;
- the duration of the stay (to implement supplements for long stays or adjustments for short-stays);
- use of intensive care and continuous surveillance units (which generate additional daily rates).

Certain implantable medical devices and drugs are also to be identified as such when they are especially onerous so as to increase GHS costs in a non-systematic manner.

#### 4. Who pays what for a hospital stay?

The national health insurance scheme pays:

- all or part of the GHS, depending on the patient's cover;
- daily supplements relating to stays in ICU or surveillance units and costs added (or subtracted) per day above the theoretic upper limit (or below the lower limit);
- costly molecules and implantable medical devices.

The patient (or patient's complementary health insurance) pays:

- a fixed-sum called *ticket modérateur* (equal to 20% of the daily price of the service in question and including a daily fee) (*forfait journalier hospitalier*: FJH);
- the daily FJH fee: a lump sum paid by the patient or the patient's complementary health insurance, covering accommodation charges linked to the individual stay (meals, for example) or overheads such as heating, laundry, maintenance, etc.

Under certain circumstances, the *ticket modérateur* may be waived: e.g., after 31 days' hospital stay or in case of an act priced more than €120, or again for pregnant women as of the 6th month of gestation.

In private facilities, patients are also invoiced for acts according to the general medical acts classification (*classification commune des actes médicaux*: CCAM), consultations and laboratory charges. The rate of reimbursement under the national health insurance scheme depends on the patient's individual situation (100% cover or not) and on whether the CCAM acts are priced over €120 or not.

Reimbursements are based on national health insurance scheme rates.

#### 5. How to code? [4]

##### 5.1. Basics

Coding a hospital case involves giving as realistic as possible a description so as to classify the case in the right DRG and obtain the appropriate payment. For this, it is essential to understand what determines the pricing of inpatient stay: namely, the code for the surgical procedure, the patient's principal diagnosis, codes for comorbidities, and the management of the length of inpatient stay.

##### 5.1.1. The act: the tracer of surgical cases

The "act" is a basic element in coding: this is what classifies a case in a surgical DRG, which will usually be better paid than a medical DRG.

Acts are coded following the CCAM classification.

Usually, a single CCAM code is enough to describe the whole procedure; this is the principle of the "overall act": for example, prosthetic revision involves both removing the old implant and implanting the new one. Only acts allowed to be associated in the CCAM can be coded simultaneously: for example, "complementary step-1 general or locoregional anesthesia, ZZLP025" may be coded in association with some acts that are not necessarily performed under anesthesia, such as "transcutaneous non-guided upper-limb bone or joint biopsy, MZHB001" or orthopedic reduction such as "progressive orthopedic reduction of fracture of the extremity and/or shaft of the humerus by continuous skeletal traction, MBEB001".

The "act" has to be well identified so as to be classified in the right DRG. For example, Table 4 shows the differences in pricing for the treatment of osteoarthritis of the hip depending on whether it is medical (08M10), primary hip replacement (08C48) or total hip replacement (THR) revision (08C22). The labeling of the act under the CCAM is so precise that the surgeon is the person best placed to decide.

Again, in managing a hand wound, if an act is described as "wound care and/or suture of a deep skin and soft-tissue wound (QCJA001)", the case will be classified under 09M03, whereas if it is described as "wound or tendon tear suture (PCCA002)", then the case will be classified under 08C46 (Table 5).

**Table 4**  
Price comparison for OA of the hip.

Code	DRG	1 (€)	2 (€)	3 (€)	4 (€)
08M10	Specific bone disease and arthropathy (OA of hip)	1524	3520	5122	7749
08C48	THR other than for recent trauma	4881	5757	7248	10,318
08C22	Intervention for joint implant revision	6895	8302	9935	13,979

DRG: drug-related group; OA: osteoarticular; THR: total hip replacement.

**Table 5**  
Price comparison for hand wound.

Code	DRG	Day hospital (€)	Level 1 (€)	Level 2 (€)	Level 3 (€)	Level 4 (€)
08C46	Other soft-tissue interventions (osteosynthesis, 1 bone)	1157	1573	4729	7557	11,918
09M03	Skin and subcutaneous tissue trauma, age > 17 years	539	854	2427	3662	5551

DRG: drug-related group.

### 5.1.2. The principal diagnosis, often determined by the act, indicates the major diagnostic category

The principal diagnosis (PD) is the cause of admission. It is determined at the end of the patient's stay in the medical unit on the basis of all of the patient's medical data: all clinical and paraclinical examinations, and especially the pathology results in case of resection.

The PD is chosen according to the coding situation.

#### 5.1.2.1. Coding a stay in which the patient was admitted for treatment (as is usual in orthopedics). A patient presents with hip pain and reduced walking distance. Hip X-ray finds osteoarthritis, and THR is indicated; the PD here is "coxarthrosis (M16)".

A patient presents in emergency after a fall from a bicycle, with intense lower-limb pain. X-ray finds fracture of the tibial shaft and the patient is admitted for osteosynthesis; the PD is "fracture of the tibial shaft (S82.20)".

A child with disabling idiopathic juvenile scoliosis is admitted for spinal arthrodesis; the PD here is "scoliosis (M4100)".

#### 5.1.2.2. Coding a stay in which the patient was admitted for diagnosis. A patient is admitted to the day hospital with hip pain suggestive of infection; fine-needle aspiration biopsy is performed:

- if the biopsy is positive for *Staphylococcus aureus*, the PD will be: "Staphylococcal arthritis, hip (M00.05)";
- if negative, the PD will be "pain in hip (M25.55)".

#### 5.1.2.3. Coding a stay in which the patient was admitted for surveillance. A patient operated on for bone tumor and under chemotherapy is referred for surveillance. Nothing new is discovered. The PD is: follow-up examination after combined treatment for malignant tumor (Z08.4): the corresponding diagnosis is "bone tumor (malignant neoplasm of long bones of lower-limb: C40.2)".

A patient operated on for bone tumor and under chemotherapy is referred for surveillance. Pulmonary metastasis is discovered; the PD will be "pulmonary metastasis (C78.0)".

### 5.1.3. Major comorbidities (CCs): markers of severity

Any pathology treated during the stay and which added to the burden of care is said to be a comorbidity (CC): e.g., management of type-2 diabetes in a THR patient. Some comorbidities raise the level of severity of the case to a DRG of severity level 2, 3 or 4. As the price for the DRG increases with severity, CC coding is essential to correct pricing.

Treatment for pathologies coded as CCs should be recorded in the medical file, so that any coder (notably in private sector

hospitals) can find the trace and record it so that the facility will receive the correct payment for treating the patient.

N.B.: Previous cured conditions, stabilized or non-treated chronic conditions and risk factors do not count as CCs. Several CCs can be recorded for a given case on condition that they were diagnosed and/or treated during the stay.

A patient with a hip replacement is admitted with joint pain and CRP elevation. Radiographs are compatible with infection. Implant replacement is indicated. There is type-2 diabetes without complications. Surgical specimens prove positive for MRSA. While in hospital, the patient develops deep-vessel phlebitis, not involving the femoral vein. The PD here will be "Staphylococcal arthritis, hip (M00.05)". The CCs are: "infection and inflammatory reaction due to internal joint prosthesis (T84.5)", "non-insulin-dependent diabetes mellitus without complications (E11.98)", "methicillin resistant agent (U80.1)" and "Phlebitis and thrombophlebitis of other deep-vessels of lower extremities [than femoral vein] (I80.2)" (Table 6).

Any patient may have comorbidity. A child with scoliosis, for example, may also have restrictive respiratory failure (J961 + 1).

### 5.1.4. Length of stay: a marker of efficiency

The length of hospital stay is an essential element to bring under control. The shorter the more profitable, in terms of income per day. For example, in a patient aged over 17 years, admitted for lower-limb surgery (root DRG, 08C32), a severity level 3 stay will be paid €5074. For a 5-day stay at level 3, each day generates €1015 euros, which is more than for 6 days (€846) and less than for 4 (€1269).

As seen from Fig. 1, when hospital stay exceeds 4 days, it is essential to code the CCs so as to obtain a higher level of severity.

The price for ambulatory admission (without overnight stay) is €2215, exactly the same as for admission including 1 (or more) night(s) at severity level 1. Ambulatory care is thus well paid, as it involves less expenditure (e.g., no night staff).

For certain DRGs, there is an incentive for ambulatory surgery, as the prices for the ambulatory and level-1 DRGs are the same. This is, for example, the case for carpal tunnel surgery, shoulder arthroscopy or tenosynovectomy of the wrist.

Length of stay also serves to calculate performance indicators. Comparing mean observed length of stay and published target length for a given DRG gives an indication of the efficiency of management. Associating this indicator to the rate of occupation of beds contributes to optimizing bed capacity.

## 5.2. Coding in practice

It should be borne in mind that the case summary must match the patient's medical records, and that only health issues that are

**Table 6**  
Example of price impact of recording osteoarticular infection as comorbidity after spinal surgery.

Example of CC	Level of severity			
	1	2	3	4
	Non-complicated type-2 diabetes (€)	Restrictive respiratory failure (€)	Deep-vessel phlebitis (€)	1) Implant infection 2) Methicillin resistance (€)
OAI whatever facility	3899	8041	10,699	15,966
OAI in OAI reference center	4377	9027	12,010	17,923
Implant revision (without infection)	6895	8302	9935	13,979
Major spinal surgery	8384	11,073	15,816	23,894

OAI: osteoarticular infection; CC: comorbidity.

“active” during the stay and also acts performed during the stay should be coded.

For coding diagnoses, the only authorized reference is the 10th edition of the *International Classification of Diseases (ICD-10)*. If the Meary code is used, data will need transcoding into ICD-10. As the PMSI information system has been considerably overhauled since 2010 and maintaining the transcoding system is expensive, it is recommended not to use the Meary system to code diagnoses, even though its descriptions are closer to clinical reality. Mistakes in transcoding from Meary usually lead to failure to classify the cases in question and thus to nonpayment.

The ICD-10 comprises 21 chapters [5,6]. Chapters may relate to organs, such as chapter XIII, “Diseases of the musculoskeletal system and connective tissue”, much used in orthopedics, or be transversal, such as chapter I, “certain infectious and parasitic diseases”, or chapter XIX, “Injury, poisoning and certain other consequences of external causes”, much used in traumatology.

Within a given chapter, the various ICD-10 codes are systematically presented from head to foot and proximal to distal.

5.2.1. Coding in orthopedics: examples

5.2.1.1. Coding the principal diagnosis in particular clinical situations.

5.2.1.1.1. Coding hand trauma. In this context, it is especially important to code the affected structure precisely. Rough-and-ready coding, such as “open wound of other parts of wrist and hand (S61.8)”, will not lead to classification under a surgical DRG, even

if there is a CCAM-coded surgical act (e.g., tendon suture): the case will be classified as 09M03 (“skin and subcutaneous tissue trauma, age greater than 17 years”), a low-value category (Table 7).

Thus, each affected structure must be coded:

- nervous lesion;
- vascular lesion;
- tendon or muscle lesion;
- bone lesion.

The principal diagnosis relates to the structure on which the act was performed. In case of multiple structure involvement, the medical information department physician should be consulted, using the PMSI software to choose the highest value PD/act pairing.

5.2.1.1.2. Coding hospital stay for complications. Postoperative complications may be coded during the initial stay (as CCs) or on readmission. For the latter, coding should include:

- type of complication in PD terms: e.g., “osteomyelitis (M86.x)”, “osteomyelitis of vertebra (M46.2x)”, “contusion of thigh (S70.1)”;
- the fact that it is a postoperative complication in PD terms:
  - “infection and inflammatory reaction due to internal joint prosthesis (T84.5)”,

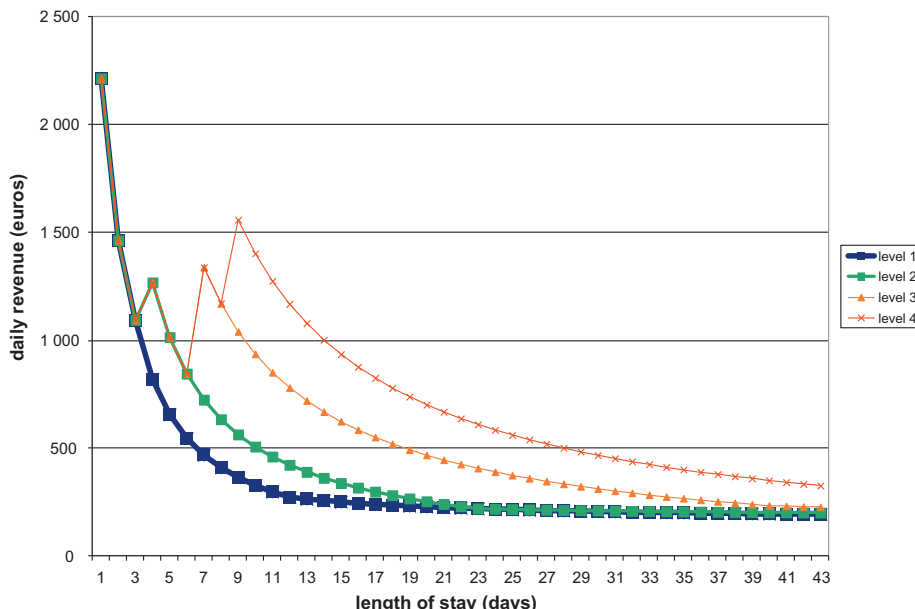


Fig. 1. Daily income associated with hospital stay for lower-limb surgery, according to level of severity.

**Table 7**  
Hand trauma drug-related groups (DRG).

Code	DRG	Day hospital (€)	1 (€)	2 (€)	3 (€)	4 (€)
21C05	Other interventions for wounds or complications of surgery	1381	2642	6916	11,417	21,368
01C08	Interventions on cranial or peripheral nerves	1956	2608	5338	9645	14,489
09C03	Skin graft and/or wound care, except skin ulcer and cellulitis	1162	2313	6115	11,424	15,858
08C43	Non-minor interventions on hand (osteosynthesis, several bones)	1808	1808	3428	5047	7597
08C46	Other soft-tissue interventions (osteosynthesis, 1 bone)	1157	1573	4729	7557	11,918
08C59	Tenosynovectomy of the wrist	1701	1701	4025	6506	8116
08C60	Wrist interventions other than tenosynovectomy	1633	2049	3732	6359	8399
09C10	Other skin, subcutaneous tissue or breast interventions	1369	1369	4624	7352	10,476
08C44	Other hand interventions	1351	1351	3358	5307	7470
09M03	Skin and subcutaneous tissue trauma, age > 17 years	539	854	2427	3662	5551

- “infection and inflammatory reaction due to internal fixation device (T84.6)”,
- “infection and inflammatory reaction due to other internal orthopedic prosthetic devices, implants and grafts (T84.7)”,
- “hemorrhage and hematoma complicating a procedure, not elsewhere classified (T81.0)”,
- “accidental puncture or laceration during a procedure, not elsewhere classified (T81.2)”.

There are two particular situations in which a complication can be coded as a principal diagnosis:

- mechanical complication of internal joint prosthesis (T84.0);
- complications of the amputation stump: “neuroma of amputation stump” (T87.3), “infection of amputation stump” (T87.4), or “necrosis of amputation stump” (T87.5).

5.2.1.2. *Coding comorbidity.* Coding comorbidities enables the case to be classified in one or other of the levels of severity.

The following should be coded:

- the diathesis: for example, diabetes, obesity (according to BMI), denutrition and cardiovascular risk factors. In the elderly, stroke sequelae such as spastic hemiplegia, cognitive impairment, or chronic respiratory failure following COBP (J961 + 0) should be coded;
- evolution and complications during stay:
  - the type of complication and the fact that it is a postoperative complication should always be coded:
    - for infectious complications: urinary infection, bronchitis, pneumopathy, swallowing pneumopathy, skin infection, plus the fact that it is a postoperative infection, if such is the case (T81.4),
    - for hemorrhagic complications: hematoma of the thigh, hemarthrosis, vessel rupture and the fact that it is a hemorrhage or hematoma complicating a procedure (T81.0) or an accidental puncture or laceration during a procedure (T81.2),
    - for thromboembolic complications: pulmonary embolism, phlebitis (specifying the vessels involved) and the fact that it is a vascular complication following a procedure (T81.7),
    - for nervous complications: the traumatic neural lesion and the fact that it is a postoperative trauma (T81.2), severity level 2,
    - operation wound rupture (T81.38), severity level 2,
    - for amputation stump complications (severity level 4), the code describes both the type of complication and the fact that it is a postoperative complication (“neuroma of

amputation stump [T873]”, “infection of amputation stump [T874]”, “necrosis of amputation stump [T875]”);

- multi-resistant bacteria (MRB):
  - in case of simple carriage, only prophylactic isolation (Z290), severity level 2, can be coded,
  - in case of active infection, coding should include, as well as the infection itself, the bacterium (e.g., *Streptococcus*: level 2; *Staphylococcus aureus*: level 3; *Pseudomonas*: level 4) and acquired antibiotic resistance (e.g., to penicillin: level 2; to methicillin [MRSA]: level 4);
- pressure ulcers: the stage should be coded; stage III (skin necrosis) and IV (skin necrosis with support structure involvement) pressure ulcers are severity level 4.

## 6. Use of PMSI data to describe activity

PMSI data are required for the T2A system, but also allow activity to be described, at local, regional or national level.

### 6.1. Description at facility level

#### 6.1.1. DRG distribution analysis (case-mix)

Analyzing a facility’s activity requires knowing which pathologies it manages, by analyzing the DRG distribution. The number of DRGs is high: 2642 in version 11. Analysis may proceed by grouping according to:

- major diagnostic category (MDC);
- surgical/interventional/medical structure: in any surgical department, there will always be some patients not being operated on (e.g., VAC dressing directed cicatrization) or whose intervention comes under a medical DRG (e.g., wound care in theater);
- inpatient vs. day-patient status;
- burden according to the distribution of severity levels.

These data can be crossed for fine analysis.

The ATIH technical hospital information agency groups DRGs [7] by activity domain (29), planning group (68) and activity group (198). The orthopedic and traumatologic activity domain (D02) includes 251 DRGs and is broken down into 21 planning groups and 32 activity groups (Table 8).

The DRG root provides fine analysis of pathologies managed.

#### 6.1.2. Dashboards for improved navigation

Dashboards comprising a number of indicators provide medical teams and administrators with an integrated view of the situation at a given time T. They enable comparison with previous years or

**Table 8**  
Example of drug-related grouping (DRG) in orthopedics.

DRG root V11d	Root label	AD	Activity domain label	PG	Planning group label	AG	Activity group label
01C13	Release of carpal tunnel and other superficial nerves	D02	Orthopedics, traumatology	C11	Surgery other than locomotor system, amputation	G029	Hand, wrist surgery
05C12	Lower-limb amputation, other than toes, for circulation disorder	D02	Orthopedics, traumatology	C11	Surgery other than locomotor system, amputation	G028	Amputation
08C13	Localized bone resection and/or removal of internal fixation material at hip and femur	D02	Orthopedics, traumatology	C11	Surgery other than locomotor system, amputation	G027	Removal of material
08C29	Soft-tissue intervention for malignant tumor	D02	Orthopedics, traumatology	C11	Surgery other than locomotor system, amputation	G035	Soft-tissue intervention for malignant tumor
08C31	Lower-limb intervention, age > 18 years	D02	Orthopedics, traumatology	C11	Surgery other than locomotor system, amputation	G031	Lower-limb surgery
21C04	Lower-limb or wrist intervention following wounds	D02	Orthopedics, traumatology	C11	Surgery other than locomotor system, amputation	G029	Hand, wrist surgery

V11: version 11.

with targets. They contribute to explaining the evolution of activity when supplemented with qualitative data from the departments.

The most often used indicators are the following:

- exhaustiveness of coding: any lack of exhaustiveness leads to underestimation of activity and income;
- mean length of stay (MLS) and MLS performance indicator (MLS PI: comparison to national MLS on the same DRG case-mix). An MLS PI < 1 indicates shorter stay than the reference and MLS PI > 1 indicates longer stay. DRGs are constructed so as to be coherent medically, economically and in terms of length of stay; any increase in MLS is an alert for poor coding (non-coding of CCs) or exceptionally long treatment;
- the number of stays exceeding the upper limit;
- “bed blockers”: the presence of one or more bed blockers lengthens the department’s MLS, reflecting downstream difficulties;
- distribution of levels of severity: this may reflect the burden of treatment, but also the quality of coding. Variation in the distribution of levels of severity may be due to changes in coding instructions, changes in the severity imputed to each diagnosis as grouped in successive versions, or changes in exclusion of CCs according to the PD. Analyzing the distribution of levels of severity is thus not always straightforward.

Regularly updated dashboards allow comparison between departments in a given facility, identifying dynamic departments: i.e., those with increasing activity and a good MLS PI.

### 6.2. Description of activity at regional and national levels

Data from HOSPIDIAG [8], a tool developed by the national performance support agency (*Agence nationale d’appui à la performance*: ANAP), sheds light on a given facility, bringing together data from different bases (PMSI, annual institutional statistics, etc.) in a single tool.

This also enables comparison with other facilities in the same region, facilities with similar activity and facilities with the same legal status.

Data are presented graphically and dynamically (comparison over 3 years, comparison with other facilities). HOSPIDIAG provides performance indicators such as short-stay (medicine-surgery-obstetrics) market share, development of ambulatory surgery, development of oncology, and referral to reference or other centers.

HOSPIDIAG can process data regionally or in terms of the facility’s catchment.

PMSI feeds (available on regional health agency websites) and certain commercial software applications provide analysis by local health-service area. It is also possible to analyze a single DRG.

Regional and national PMSI databases, available from the ATIH technical hospital information agency, also enable study of patient care pathways (only as concerns hospital stay data, as the PMSI does not record consultation data).

### 7. Why code carefully?

The analysis of activity and hospital stay-related income is essentially based on the PMSI data. Coding should describe patient management as well as possible, determining the value of the stay.

Stay-related income amounts to about 75% of a facility’s overall income. The coding of hospital cases is a key element in ensuring funding.

Coding that reflects the patient’s overall management also provides good indicators. Associated to a medical project, that can help clinicians argue for maintaining the post of a retiring hospital practitioner, or recruiting a new one to be able to develop activity.

To achieve high-quality coding, the whole coding operation (including comorbidities) may be performed by the clinicians (who know the patient best). This is decentralized coding. Alternatively, the whole coding operation (apart from coding acts) may be performed by the medical information department (which knows coding rules, severity levels per diagnosis and grouping effects best). This is centralized coding and, in that case, all patient data (hospital case report, surgical report, medical file, anesthesia file) need to be complete and quickly available.

Incomplete coding leads to undervaluation and jeopardizes the facility’s financial balance. Over-coding may be detected on health insurance inspection, and lead to reimbursement of excess invoicing and to financial penalties. The distinction between day hospital admission (with invoicing of a GHS) and outpatient management (with invoicing of a consultation and the technical act performed) is defined in the so-called “frontier circular”, instruction n° DGOS/R/2010/201 of June 15, 2010 [9]. The day hospital is subject to regular health insurance inspection.

Complete coding ensures good description of activity. Comparison with other health facilities becomes meaningful, allowing medical policy and strategy to be developed.

The T2A system has an impact on the organization of care. It is an incentive to greater efficiency and the establishment of good practice. It can, however, have undesirable side-effects such as premature discharge and “slicing” of hospital stay, etc. The possibility of including care quality indicators in health facility financing is presently under consideration [10].

## 8. Conclusion

With the T2A system, the level of activity generates income, allowing expenditure on means, enabling a certain level of activity, generating income, and so on.

It is thus obviously essential to code properly, respecting the coding rules and describing the patient's overall management as finely as possible. Activity so described will correspond to the facility's real activity.

Comparison with other facilities becomes feasible, and rich in lessons for the facility's medical strategy.

The T2A system improves overall efficiency of care. As, however, adequate indicators are lacking for care quality, it is as yet not included in facility funding. This is a line of study worth developing.

## Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

## Appendix 1. Glossary – PMSI medical information system and funding.

ARS	<i>Agence régionale de santé</i> : regional health agency
ATIH	<i>Agence technique de l'information hospitalière</i> : technical hospital information agency
CC	Comorbidity
CCAM	<i>Classification commune des actes médicaux</i> : general medical acts classification. Allows coding of surgical and radiological acts in particular
DGF	<i>Dotation globale de financement</i> : package-based funding
DRG	Diagnosis-related group: classification of a hospital case by act, diagnosis and severity
FJ	<i>Forfait journalier</i> : fixed patient contribution to costs related to accommodation, heating, laundry, etc.
GHS	<i>Groupe homogène séjour</i> : price associated to a DRG

ICD-10	International classification of diseases-10
MDC	Major diagnostic category
MERRI	<i>Mission enseignement recherche référence et innovation</i> : teaching, research, reference and innovation missions. Complementary hospital funding based on scientific and research work by medical teams
MIGAC	<i>Mission intérêt général et aide à la contractualisation</i> : missions of general interest and contracting assistance
MLS	Mean length of stay
PD	Principal diagnosis
PMSI	<i>Programme de médicalisation des systèmes d'information</i> : medical information system
RSS	<i>Résumé standardisé de sortie</i> : standardized discharge report, drawn up for each stay
SROS	<i>Schéma régional d'organisation des soins</i> : regional health organization plan
T2A	<i>Tarifcation à l'activité</i> (2004): funding method attributing public and private sector health facility resources according to type and volume of activity as measured from the PMSI data
<i>Ticket modérateur</i>	Part of the daily fee paid by patient (or patient's complementary health insurance)

## References

- [1] Ordonnance n° 96-346 du 24 avril 1996 portant réforme de l'hospitalisation publique et privée: <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=LEGITEXT000005620817&dateTexte=20110523>
- [2] Projet de loi de financement de la sécurité sociale: [http://www.securite-sociale.fr/IMG/pdf/projet-loi\\_lfss2013.pdf](http://www.securite-sociale.fr/IMG/pdf/projet-loi_lfss2013.pdf)
- [3] Arrêté tarifaire du 22 février 2013 fixant pour 2013 les éléments tarifaires mentionnés au I et IV de l'article L162-22-10 du code de la sécurité sociale et au IV et V de l'article 33 modifié de la loi de financement de la sécurité sociale pour 2004: [http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000027115074&dateTexte=&categorieLien=idD\\_2013](http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000027115074&dateTexte=&categorieLien=idD_2013)
- [4] Guide méthodologique de production des informations relatives à l'activité médicale et à sa facturation en médecine, chirurgie, obstétrique et odontologie: <http://www.atih.sante.fr/index.php?id=00024000B9FF>
- [5] WHO ICD-10 Version 2008 (French): <http://apps.who.int/classifications/icd10/browse/2008/fr>
- [6] ICD-10 with updates and extensions: <http://i3se011b.univ-brest.fr/IRMA/CIM10/CIM10.php>
- [7] DRG root groups in V11d: <http://www.atih.sante.fr/index.php?id=0002500038FF>
- [8] HOSPIDIAG: <http://www.anap.fr/les-projets-de-lanap/une-culture-partagee-de-la-performance/loutil-hospi-diag/>
- [9] Instruction n° DGOS/R/2010/201 DU 15 JUIN 2010: [http://www.sante.gouv.fr/fichiers/bo/2010/10-07/ste.20100007\\_0100\\_0136.pdf](http://www.sante.gouv.fr/fichiers/bo/2010/10-07/ste.20100007_0100_0136.pdf)
- [10] Qualité des soins et T2A: pour le meilleur ou pour le pire? Zeynep Or (IRDES), Unto Häkkinen (THL): <http://www.irdes.fr/EspacePresse/CommuniquésDePresse/ComPresseDocTravail/ComPresseDT53.htm>