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Changing Patient Classification System for Hospital Reimbursement in Romania

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Aim To evaluate the effects of the change in the diagnosis-related group (DRG) system on patient morbidity and hospital financial performance in the Romanian public health care system.

Methods Three variables were assessed before and after the classification switch in July 2007: clinical outcomes, the case mix index, and hospital budgets, using the database of the National School of Public Health and Health Services Management, which contains data regularly received from hospitals reimbursed through the Romanian DRG scheme (291 in 2009).

Results The lack of a Romanian system for the calculation of cost-weights imposed the necessity to use an imported system, which was criticized by some clinicians for not accurately reflecting resource consumption in Romanian hospitals. The new DRG classification system allowed a more accurate clinical classification. However, it also exposed a lack of physicians' knowledge on diagnosing and coding procedures, which led to incorrect coding. Consequently, the reported hospital morbidity changed after the DRG switch, reflecting an increase in the national case-mix index of 25% in 2009 (compared with 2007). Since hospitals received the same reimbursement over the first two years after the classification switch, the new DRG system led them sometimes to change patients' diagnoses in order to receive more funding.

Conclusion Lack of oversight of hospital coding and reporting to the national reimbursement scheme allowed the increase in the case-mix index. The complexity of the new classification system requires more resources (human and financial), better monitoring and evaluation, and improved legislation in order to achieve better hospital resource allocation and more efficient patient care.

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Under a prospective payment system (PPS), a provider receives a fixed payment, established in advance, to cover an episode of care provided during a specific period of time. The idea is to establish the payment in advance based on what it costs an efficient provider to serve the patient. Consequently, the efficient providers make money; the inefficient lose money. PPSs are increasingly used around the world to reimburse health care providers, especially hospitals (1). One option for a hospital PPS is to have a patient classification system to group hospital cases and apply predefined fees for each type of these cases. The most common patient classification system used for PPS is the system of diagnosis-related groups (DRG). The DRG relates types of patients to the amount and type of resources they consume during hospital treatment. The DRG system classifies patients with similar characteristics into the same category, and it is assumed that the patients within one category will require similar resources (2). The DRG hospital payment is seen as a way to increase hospital efficiency while keeping the same quality of services (3).

The United States Health Care Financing Administration (HCFA) first introduced the DRG system for PPS in 1983, making their own classification system named HCFA-DRG (4). Several European countries, including Portugal, Austria, and Italy, followed in the 1980s and 1990s, and they usually used locally adapted HCFA-DRG systems (5). In central and eastern Europe, Hungary was the first country to implement a DRG system in July 1993 (6). Romania started to evaluate the use of DRG system in 1999, and in 2003 it used this mechanism to reimburse 23 pilot hospitals. Subsequently the DRG hospital payment system was implemented in 185 hospitals in 2004, including all public universities, district and municipal hospitals; 276 hospitals in 2005, after inclusion of city hospitals; and 291 hospitals in 2009, after inclusion of the Ministry of Transportation hospital network. Currently, in Romania, almost all public hospitals providing acute care are reimbursed using the DRG system; exemptions are rural hospitals and the Ministry of Defense hospital network. Private hospitals are contracted by the National Health Insurance House (NHIH); they are not paid on DRGs, but on a negotiated fee-per-case basis.

Selecting a DRG classification system depends on the predefined goal: patient classification may be desirable in order to compare hospitals, departments, or even physicians, or to compare hospital reimbursement levels. It also depends on the resources available. Some DRG systems are free, being in the public domain, while others require a license (7). Most countries that have implemented DRG started with one classification scheme and updated it in subsequent years, as is the case with Hungary, Australia, and the US, but the literature on the effects of changing a DRG system within one country is scarce.

Romania is one of the countries that experienced the transition from one DRG system to another. Romanian hospitals operating under the DRG scheme used the US HCFA-DRG (version 18) since the start of the scheme in 2003 until July 1, 2007. After a few years, Romania moved toward a new one in order to increase the accuracy of patient classification and to increase objectivity in financing by ensuring that hospital reimbursement is based on the number and type of patients actually treated and not on other criteria (8). Thus, the Australian Refined DRG (version 5) was implemented from the second half of 2007, together with a new classification of diagnoses – the International Classification of Diseases version 10 with Australian Modifications (ICD10AM). The main reasons for changing the DRG system were problems with HCFA-DRG regarding the clinical aspects of the classification and the utilization of several mapping systems for diagnoses and procedures (HCFA-DRG system requires International Classification of Diseases version 9 with US Clinical Modifications – ICD9CM, and Romania uses ICD10AM).

The DRG hospital payment in Romania is a mixture of prospective and retrospective reimbursement systems. At the beginning of the year, hospitals contract with the Health Insurance House for an annual budget based on the previous year's activity and reflected in the number of cases and case mix index (CMI). This is the prospective dimension of the reimbursement system. The CMI is an indicator that relates the resources needed by hospitals with the patients treated. A particular DRG is assigned a cost weight (CW), also known as relative weight, based on resource consumption in terms of diagnostics, therapeutics, bed services, and length of stay. A higher CW is assigned to more severely ill patients. A patient in a DRG with a CW of 2 is reimbursed twice as much as a patient in a DRG with a CW of 1. The array of patients across DRGs in a hospital is the hospital's case mix, and the average DRG weight for these patients is the hospital's case mix index (9). The CMI is calculated as the sum of all relative weights divided by the number of cases per year.

This prospectively established annual hospital budget is divided into quarters. Then, every month, the hospitals receive sums from the Health Insurance House according to the number of actually discharged patients

and the contracted (predicted) CMI. Every quarter, there is a reconciliation of the sums, based on the number of actually discharged patients and the CMI of these cases. This is the retrospective dimension of the reimbursement system. In this approach, hospitals entitled to more money based on the real quarterly reports will get that money only if the payer (the Health Insurance House) saved some money from hospitals that did not discharge as many cases as they predicted. If a hospital has fewer cases and is therefore entitled to less money than the contracted budget, it will receive funding only for the discharged cases.

This type of hospital reimbursement scheme with a retrospective dimension has led to several problems in Romania. It has created an incentive to discharge more patients or to increase the CMI in order to gain more funds at the quarterly reconciliations. We wished to examine to what extent these practices occur, and to determine how the change in the DRG system in 2007 affected these practices. We analyzed data regularly sent by hospitals to the National School of Public Health and Health Services Management and the Hospital DRG Reimbursement Database, and we conducted interviews with key health care managers. We carried out this assessment in 2009, two years after the system change, since we wanted to give hospitals at least one year to adapt to the new system.

METHODS

The study was based on data archived at the National School of Public Health and Health Services Management (NSPHHSM), formerly the National Institute for Research and Development in Health. Since 2003, this has been the central institution responsible for central coordination of the DRG system, which includes establishing standards for electronic patient data collection, receiving electronic patient records from hospitals, validation of electronic cases reported by hospitals, providing the DRG classification of patients, and computing the CMI for each department and hospital. NSPHHSM is also the institution that maintains a database of all patient admissions in Romanian hospitals (no matter which type of financing the hospitals have).

We did a qualitative analysis of the hospital environment covering: the process of data collection, the rules and regulations regarding hospital reimbursement, changes in hospital reimbursement mechanisms and changes in the hospital management environment, as well as a quantitative analysis of patient-level data and hospital financial data from 2005 through the first half of 2009.

Data sources

Data on clinical aspects were collected from the Minimum Basic Data Set (MBDS) for hospital discharges. Since 2003 in Romania, all public and private hospitals are required to submit monthly data for all hospital discharges to the MBDS (8). Reimbursement of all Romanian hospitals, not only that of DRG hospitals, is done based on the activity reports submitted to the MBDS. Data were analyzed for the following periods: 2006, the last year with complete databased on the "old" DRG system (HCFA-DRG version 18); the first half of year 2007, which was the last period when the HCFA-DRG was used; the second half of year 2007, which was the first period when the AR-DRG was used; 2008, the first complete year with data after the introduction of ARDRG; and the first half of year 2009, which was the most recent period with complete data (10-12). In 2007, both classification systems were used: HCFA-DRG in the first half of the year and ARDRG in the second half. Currently, the MBDS includes 30 variables covering administrative, demographic, and inpatient data, including diagnostics, procedures, and status at discharge.

The financial data are from 2005 through the first half of 2009, the periods for which complete data exist on DRG financing of almost all Romanian acute care hospitals (276 in 2005-2007 and 291 hospitals in 2009). These data were taken from the Hospital DRG Reimbursement Database and from public available sources of the National Health Insurance House (site: http://www.cnas.ro/?id=126). The Romanian Patient Level Database consists of all hospital discharges reported electronically by each Romanian hospital. Every year, this Patient Level Database records over 5 million discharged cases (eg, 5 137 237 discharged cases in 2007 from all hospitals). We excluded from this database the patients reported by hospitals to have chronic conditions and patients reported by non-DRG-reimbursed acute care hospitals. The analysis was done using the cases discharged in 2007 from 276 hospitals (4 153 620 cases, 2 127 426 of which were reported in the first half of 2007), and using the cases discharged in 2009 from 291 hospitals (4 375 345 cases, 2 239 798 of which were reported in the first half of 2009).

The Hospital DRG Reimbursement Database covers only the DRG-reimbursed hospitals (291 in the year 2009) and contains data on the total number of validated cases, the hospital CMI, the hospital reimbursement fees, and the hospital budgets.

The Romanian Patient Level Database queries were done using Microsoft SQL Server 2005, and then the data were processed using Microsoft Access 2003 and Microsoft Excel 2003.

Qualitative analysis

For the literature review, we looked at some Romanian articles published in local journals from 2005-2009, covering such subjects as Romanian hospitals reimbursement, development of DRG in Romania, calculating cost weights, and analyzing hospital activity based on DRGs. We conducted 6 unstructured interviews between August 2009 and December 2009 with the following 6 key health care officials: the Former President of the National Health Insurance House (in 2005-2007), the Director of the Finance Department at the National Health Insurance House, the President of a local Health Insurance House, and 3 hospital directors. In the interviews, we asked the officials about the DRG reimbursement system and the impact of DRG on hospital budgets, hospital morbidity, and hospital management. The legislation review covered the period 2005-2009 and included the most relevant rules and regulations for hospitals reimbursement and hospital management: the yearly Framework Contract regulating contracts between hospitals and the NHIH; the yearly norms of the Framework Contract describing the mechanism of hospitals reimbursement, hospital fees, DRG cost weights, and other aspects; the yearly rules for validation of hospital reported electronic cases; legislation covering coding standards for diagnosis and procedures; and legislation covering hospital electronic data reporting.

Quantitative analysis

The quantitative analysis was performed considering the events and results before and after DRG classification switch, from 2006 through 2009, using the Romanian Patient Level Database and the Hospital DRG Reimbursement Database.

The analysis was conducted using three sets of variables. The first set examined the effect on reported hospital morbidity under the new DRG system; the analysis relied mainly on the following indicators: "No. of cases with the same main diagnosis," "Number of cases with some associations between main and secondary diagnoses," "Number of cases with some associations between procedures and diagnoses," "Number of cases in each DRG category across the nation," "Number of cases in each DRG category for each hospital," and "Number of cases in each DRG category for each type of clinical department." The second set examined the effect on CWs and CMI of the new DRG system, using the following indicators: "CMI at national level," "CMI at hospital level," "CMI at department level," and "Number of cases by DRG and their CW at the hospital and national levels." The third set examined the effects on hospital reimbursement considering the following indicators: "Hospital reimbursement per case" and "Hospital budget size based on reported DRG cases."

RESULTS

As was expected, the number of DRGs used increased during the study period. In the first half of 2007, 493 of a total of 499 DRGs were used under the HCFA-DRG system; in the second half of 2009, 659 of 665 groups were used under the ARDRG system.

The most frequent main diagnoses were similar under the system in 2007 and the system in 2009 (Table 1). Among the 10 most frequent diagnoses in 2007, 8 were also among the 10 most frequent in 2009. The remaining 2 that were not observed in 2009 were "Chemotherapy session for neoplasm" (ICD10AM code Z51.1) and "Lumbar & other i/v disc disorders with radiculopathy" (M51.1). The diagnosis Z51.1 disappeared in 2009, which is notable because it was used for over 27 000 cases in 2007, but only for 533 cases in 2009. Interviews with hospital directors suggested that this is because hospitals understood that the CW for R63Z ("Chemotherapy") in the ARDRG, -0.1512, is much smaller than the CW for DRG 410 ("Chemotherapy

TABLE 1. Top 10 main diagnoses used in Romania in the first half of 2007*

No.	ICD10 code – diagnosis description	No. (%) of cases
1	I50.0 – congestive heart failure	58 169 (2.73)
2	O80 – single spontaneous delivery	53 091 (2.50)
3	J84.9 – interstitial pulmonary disease (not other specified)	46 609 (2.19)
4	I10 – essential (primary) hypertension	41 424 (1.95)
5	O20.0 – threatened abortion	39 021 (1.83)
6	I50.1 – left ventricular failure	36 218 (1.70)
7	J96.0 – acute respiratory failure	34 449 (1.62)
8	Z51.1 – chemotherapy session for neoplasm	27 264 (1.28)
9	Z38.0 – singleton born in hospital	24 978 (1.17)
10	M51.1 – lumbar & other i/v disc disorders with radiculopathy.	24 330 (1.14)
All diagnoses		2 127 426 (100)

*ICD10 – International Classification of Diseases, 10th version, World Health Organization (11).

w/o acute leukemia as secondary diagnosis") in the HCFA DRG, -1.1128. It appears that the hospitals started to use the neoplasm codes as the main diagnosis, even when patients were admitted only for chemotherapy. This was not consistent with the new ICD10AM coding standards adopted together with the new DRG classification system in 2007. According to these standards, a code for chemotherapy should be used as principal diagnosis only for "Same

TABLE 2. Top 10 diagnosis-related groups (DRG) in Romania during the first half of 2007 and the first half of 2009*

First half of 2007				First half of 2009			
DRG code	HCFA version 18 DRG Description	no. (%) of cases	cost weights	DRG code	ARDRG version 5 DRG description	no. (%) of cases	cost weights
127	Heart failure & shock	104 771 (4.92)	0.8219	F62B	Heart failure & shock without catastrophic complication/comorbidity	85 276 (3.81)	0.7561
243	Medical back problems	71 924 (3.38)	0.6121	B40Z	Plasmapheresis with neurologic disorders	58 456 (2.61)	0.8002
430	Psychoses	57 789 (2.72)	0.8075	O66A	Antenatal & other obstetric admissions	58 364 (2.61)	0.3654
88	Chronic obstructive pulmonary disease	50 461 (2.37)	0.6955	I68B	Non-surgical spinal disorders without complication/comorbidity	49 897 (2.23)	0.6049
70	Otitis media & upper respiratory infection, age 0-17	48 747 (2.29)	0.3544	E62B	Respiratory infection/inflammation + severe or moderate complication/comorbidity	47 013 (2.10)	0.9703
87	Pulmonary edema & respiratory failure	46 130 (2.17)	0.9906	F67A	Hypertension with complication/comorbidity	44 542 (1.99)	0.7246
134	Hypertension	45 978 (2.16)	0.4878	P67D	Neonate, weight >2499 g without significant operating room procedure without problem	41 862 (1.87)	0.3150
14	Specific cerebrovascular disorders except transient ischemic attack	44 731 (2.10)	1.0779	D63A	Otitis media & upper respiratory infection with complication/comorbidity	41 355 (1.85)	0.5293
390	Neonate with other significant problems	44 041 (2.07)	0.1721	P67C	Neonate, weight >2499 g w/o significant operating room procedure with other problem	40 736 (1.82)	0.7309
379	Threatened abortion	39 360 (1.85)	0.6140	E65A	Chronic obstructive airways disease with catastrophic or severe complication/comorbidity	39 792 (1.78)	1.1467
	All DRGs	2 127 426 (100)			All DRGs	2 239 798 (100)	

*Abbreviations: HCFA – the United States Health Care Financing Administration classification system (4); ARDRG – Australian Refined Diagnosis-related Groups.

TABLE 3. Top 5 diagnosis-related groups (DRG) in pediatric ear, nose, and throat (ENT) wards in Romania, for the first half of 2007 and first half of 2009

First half of 2007				First half of 2009			
DRG code	DRG description	no. (%) of cases	cost weights	DRG code	DRG description	no. (%) of cases	cost weights
060	Tonsillectomy and/or adenoidectomy only, age 0-17	4956 (46.0)	0.4335	A41B	Intubation age <16 without complication/comorbidity	5278 (47.3)	1.6508
058	Tonsils & adenoids procedures, except tonsillectomy and/or adenoidectomy only, age 0-17	2099 (19.5)	0.5829	A41A	Intubation age <16 with complication/comorbidity	1649 (14.8)	4.1332
070	Otitis media & upper respirator infection age 0-17	988 (9.2)	0.3543	D11Z	Tonsillectomy, adenoidectomy	923 (8.3)	0.4284
087	Pulmonary edema & respiratory failure	492 (4.6)	0.9905	D63B	Otitis media & upper respiratory infection without complication/comorbidity	702 (6.3)	0.3024
074	Other ear, nose, mouth & throat diagnoses age <17	420 (3.9)	0.5228	D63A	Otitis media & upper respiratory infection with complication/comorbidity	534 (4.8)	0.5293
	All DRGs	10 771 (100)			All DRGs	11 154 (100)	

Day Hospitalization," while for continuous care the cancer code should be the main diagnosis, and chemotherapy merely an additional one (13).

Comparison of the 2007 and 2009 data shows that the percentage of cases having a secondary diagnosis remained nearly the same: 82.9% in the HCFA-DRG system and 81.7% in the ARDRG system.

Comparison of the 10 most frequently used DRGs between 2007 and 2009 suggested a marginal shift in classification, with more cases in better-paid DRGs (Table 2). The cardiovascular DRGs remain the ones most frequently associated with Romanian hospital morbidity, followed by the obstetrical and neonatal DRGs, and finally respiratory and mental disorder DRGs. The new classification brought a better system for mental disorders and consequently the HCFA DRG 430 ("Psychoses"), located in the third position in 2007, was split into several groups in the ARDRG system (U61, U62, U63, and U64) and therefore did not appear anymore in the top 10 for 2009.

The code in second place in the top 10 DRGs in 2009, B40Z ("Plasmapheresis with neurologic disorders"), also needs an explanation (Table 2). The frequency of this code reflects the fact that coding standards were not always followed by the hospitals. One procedure ("Collection of blood for diagnostic purposes," ICD10AM code 13839-00) together with a neurologic main diagnosis, was commonly miscoded, leading to a high frequency for B40Z.

Another obvious example of incorrect coding is the utilization of the procedures related with intubation ("Endotracheal intubation, single lumen," code 90179-00) together with the procedures for "General anesthesia" and "Sedation." Consequently, all of the cases reported in pediatric ear, nose, and throat wards, were coded differently between 2007 and 2009, and actually no longer accurately reflected the type of patients treated in those departments (Table 3).

The lack of a Romanian system for calculation of local CWs meant that CW values had to be imported. A set of CWs computed in 2002 in the US was used under the HCFA-DRG system, and an Australian set of CWs calculated in 2006 was used under the ARDRG. In order to keep the national CMI at the same value (0.8020) when the classification system was changed in 2007, Romanian officials adjusted this set of Australian CWs, but kept the same internal structure: in other words, they adjusted the absolute values of the CWs, but maintained the relative differences among different DRGs. This final set of CWs for ARDRG changed the weights for some pathologies, which means that the most and least expensive DRGs varied widely from one DRG system to another. As a result, the CMI changed dramatically for some hospitals, though they had the same patients. The consequence of changing the classification system and the CWs in 2007 caused an immediate change in many hospitals' CMI. Out of 276 hospitals, the CMI increased in 185 (67%) and decreased in 91 (33%). The hospitals with a higher CMI were the pediatrics and obstetrics-gynecology hospitals, and the hospitals with a lower CMI were the oncologic and tertiary hospitals (Table 4).

In order to have patients assigned to better-paid DRGs, ie, the DRGs with higher CWs, the hospitals attributed more

TABLE 4. The top 10 hospitals with the highest case mix index increase from 2006 to 2009 in Romania*

#	Hospital code	Hospital name	Case mix index				
			2006 HCFA	2007 ARDRG	2008 ARDRG	first half of 2009	2009 vs 2006
1	BV04	Spitalul boli infectioase Brasov	0.6309	0.7682	1.202	1.4395	228%
2	MS01	Spitalul clinic judetean de urgenta Mures	0.9088	1.1093	1.8467	1.9133	211%
3	BV03	Spitalul de pediatrie Brasov	0.6908	0.7667	1.5848	1.4084	204%
4	IS05	Spitalul de OBG "Cuza-Voda" Iasi	0.5111	0.7518	0.8932	1.0212	200%
5	BC10	Spitalul de pediatrie Bacau	0.6091	0.6816	0.9899	1.2166	200%
6	B_05	Spitalul clinic de urgenta pentru copii Bucuresti	0.6279	0.8916	1.129	1.1906	190%
7	SB08	Spitalul de pediatrie Sibiu	0.7557	1.035	1.4033	1.4024	186%
8	B_42	Spitalul clinic "Nicolae Malaxa" Bucuresti	0.6237	0.7113	0.9314	1.1136	179%
9	PH20	Spitalul de boli infectioase Ploiesti	0.6135	0.8239	1.0509	1.0911	178%
10	AG02	Spitalul de pediatrie Pitesti	0.5778	0.5866	0.909	1.0276	178%

*Abbreviations: HCFA – the United States Health Care Financing Administration classification system (4); ARDRG – Australian Refined Diagnosis-related Groups.

importance to the codification of diagnosis and procedures. Based on the interviews we had with hospital directors and on the feedback from hospitals sent to NSPHHSM, we found that some of the hospitals started to get offers from "DRG consulting" firms, some with and others without experience in ARDRG, who were offering software for "DRG optimizing." In the absence of any clear regulations regarding the activity of these firms, more and more hospitals paid for so-called "DRG auditing." This phenomenon is becoming more and more important and favors Romanian "DRG creep" – changes in hospital record-keeping practices to increase case mix indexes and reimbursement (14).

The national CMI evolution for the last 5 years shows an increase of 33%, from 0.7561 in 2005 to 1.0039 in 2009 (Table 5).

This increase in the CMI by nearly one-third in 5 years, was especially noticeable in the 2 years after the ARDRG implementation. From our interviews with key managers and our legislation review, we found that the causes lay not only in the above mentioned hospital "DRG auditing" private firms, but also in 1) the lack of adequate monitoring and control from the payer; 2) the lack of knowledge and training in coding at hospital level; 3) the insufficient regulations to combat "errors and fraud;" 4) the decrease in central agencies' capacity to support case mix development; 5) the introduction of CMI increase as a hospital manager performance indicator; and 6) the huge pressure from hospitals to increase their budgets.

TABLE 5. Changes in the case mix index in Romania, 2005-2009*

Year	2005	2006	2007	2008	First half of 2009
Diagnosis-related groups (DRG) system used	HCFA DRG	HCFA DRG	ARDRG	ARDRG	ARDRG
Case mix index	0.7561	0.7627	0.8020	0.9333	1.0039
Case mix index increase from the previous year (%)	-	+0.9	+5.2	+16.4	+7.6

*Abbreviations: HCFA – the United States Health Care Financing Administration classification system (4); ARDRG – Australian Refined Diagnosis-related Groups.

TABLE 6. Changes in the funding levels of hospitals in Romania, 2005-2009

Year	2005	2006	2007	2008	2009
Total hospital funds (billion Romanian Lei)	4.80	4.96	5.96	7.52	6.58
Total number of contracting hospitals	462	464	475	486	514
Total number of diagnosis-related group hospitals	276	276	276	276	291

"DRG creep" was very obvious for some hospitals, where the CMI increased quite dramatically by over 200% (Table 4). The analysis of their CMI increase done by the NSPHHSM showed that some of the coding standards were not respected, especially in the area of neurologic diseases, infectious diseases, and anesthesiology. For example, we found that in the first half of 2009, 248 hospitals (85%) out of 291 hospitals had at least one miscoding for neurologic diseases, 188 hospitals (65%) had at least one miscoding for neoplasm, 187 hospitals (64%) had at least one miscoding for infectious diseases, and 117 hospitals (40%) had at least one miscoding for anesthesiology. Also, the shift in most frequent DRGs in the same ear, nose, and throat wards from 2007 to 2009 strongly suggests diagnostic miscoding (Table 3).

In terms of hospital budgeting, the NHIH funds allocated toward hospital sector increased over time, with a peak in 2008 (Table 6). This increase in funding at the national level was counterbalanced at the level of individual DRG hospitals because the number of hospitals in the DRG system increased over the same period (Table 6). Since 2007, more and more small private hospitals, non-DRG reimbursed, have been asking for contracts with NHIH. Romanian legislation directs the NHIH to give a contract to every provider, regardless of whether it is private or public, as long as it passes an evaluation done by the NHIH.

DISCUSSION

This study indicates that the new DRG system led to a better accuracy from clinical point of view, because having 166 new DRG groups in the ARDRG system meant that the morbidity spread over more groups; consequently, the volume of cases in the most frequent DRG groups decreased.

Also, the switch in DRG system did not achieve the goal of better hospital reimbursement, and the complexity of the new system brought new problems. In the absence of a good system for monitoring of the coding standards, the entire process of reporting hospital pathology tends to be driven by the reimbursement system and not by the actual pathology.

Few studies have examined the change of one imported DRG system with another, though it is known that most countries use one of the following two approaches: they either start from an imported DRG version, and then adapt it locally, or they build from the beginning a DRG system appropriate for the local situation. Romania chose to adopt

TABLE 7. The principal results and the critical aspects of changing the patient classification system in Romania from HCFA DRG to ARDRG*

Principal results	Critical aspects
Introduction of a modern and functional system for clinical coding of diagnosis and procedures (ICD10 AM), as the base for the new ARDRG system	No intensive coding training in ICD10 AM coding standards for hospitals No central institution with authority for implementing the coding standards
No more mapping problems from Romanian Diagnosis and Procedures codes toward ICD9CM codes	No clear rules regarding the hospital DRG auditing by external organizations, using hospital few resources!
More clinical diversity for some specialties (obstetric-gynecology, pediatrics, trauma etc)	Few monitoring and evaluation efforts at payer level to control the coding process
Less complains from clinicians regarding the coding of diagnosis and procedures.	No regulatory efforts to define the "errors and fraud" in coding and reporting patient data
Less complains from clinicians regarding the structure of DRG groups	Poor incentives for correct coding (regulatory incentives to increase CMI)
	No clear strategy and policy for hospital reimbursement after the new DRG system in place
	Utilization of imported cost-weights
	Weaknesses of central institutions regarding the case-mix system through frequent political changes

*Abbreviations: ICD10AM = International Classification of Diseases, 10th version, Australian Modifications; ICD9CM = International Classification of Diseases, 9th version, Clinical Modifications, U.S; HCFA – the United States Health Care Financing Administration classification system (4); ARDRG – Australian Refined Diagnosis-related Groups; CMI – case-mix index.

the US HCFA-DRG system and after 4.5 years, it decided to adopt a more complex DRG system, the Australian ARDRG, hoping that it would improve the hospital reimbursement.

"DRG creep" is a well-known and widespread phenomenon among countries with a DRG system for hospital reimbursement, but in Romania the magnitude of this phenomenon should raise concerns at the decision-making level. Nevertheless, the present study shows that changing the DRG system and the associated CWs produced a decrease in CMI for some hospitals. The hospitals with the highest CMI decrease from 2006 to 2009 were from the field of oncology and tertiary hospitals. The explanation for oncologic hospitals lies in a decrease in the CW for chemotherapy, while for tertiary hospitals the reason probably lies in inaccurate coding of the most complex and severe cases. In order to support proper use of the coding standards, from April 1, 2010, some of the coding standards are now considered "validation rules." These validation rules are formally established by the National Health Insurance House (the payer of hospitals), so if hospitals use some diagnoses or procedures codes inappropriately, the cases with inappropriate coding will be invalidated and hospitals will not be reimbursed for them.

In terms of hospital reimbursement and budgeting, the transition from one classification system to another should have been accompanied by 1) the redefinition of hospital reimbursement policy, 2) the normalization of the national CMI value to 1, and 3) the recalculation of hospital fees. Unfortunately, the policy makers had no good understanding of the system and they asked hospitals to maintain the same fee structure instead of normalizing the CMI to 1. Consequently, in order to keep the same hospital budgets during this transition, a recalculation of hospital fees per case was done, but the decrease in fees compared with the first half of 2007 was not taken into account. Indeed, the lack of a clear policy for hospital reimbursement fees after the DRG switch was reflected in the fact that the fees established at the end of 2007 were also used in 2008 and 2009.

All these aspects of poor results in having an objective and correct hospital reimbursement based on the patients actually treated by hospitals, rather than based on reported patients shows that the NHIH resource allocation toward hospital is not very efficient and the scarce resources available in Romania for the health sector, around €200-250 per inhabitant (15,16), are not used in the best appropriate way.

The solutions of these problems require not only monitoring and evaluation mechanisms, but also the development of a system for hospital cost calculation, in order to have locally produced cost weights for DRGs.

Without them, hospitals can always claim that they have been incorrectly paid and they will have incentives to report increased pathology, no matter what kind of DRG system is used.

We believe that the switch in Romania from one form of DRG classification to another is a valuable experience with poor results, because of some weak decisions taken. It was a good experience in terms of lessons learned and the steps to be repeated or avoided by Romania or other countries in the future. Table 7 summarizes the strong and weak points of the Romanian process of switching from one DRG classification to another covering clinical, coding, hospital reimbursement, and health policy aspects.

Our main recommendations for other countries that plan an introduction or the change of the DRG system are: 1) establish from the beginning a clear goal and a strategy to follow during the process of such a change; 2) if CWs are imported, adjust them as soon as possible based on the local cost structure of hospital care; 3) predict the costs of introducing the new system; 4) build on a continuity of good human resources; 5) maintain and continuously improve communication with hospitals; and 6) develop institutions able to cope with the complexity of newly introduced systems.

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