Detection and documentation of DRG-relevant comorbidities using laboratory tests

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Abstract

Germany will soon begin per case payment by DRG, and preparations are in progress in most hospitals and insurance companies. The Academic Teaching Hospital Munich-Schwabing in Munich decided to explore coding strategies by considering the impact of diagnoses that could be detected by pathology tests.

An Australian database was analysed. We detected "discriminating" diagnoses – that is, diagnoses that could be found in level A or B DRGs, and not in the respective lower severity DRG. After isolating 584 diagnoses, they were rated by a laboratory specialist, to determine whether they could be proved by pathology tests. 187 diagnoses were selected in this way. In the next step, theoretical cases were generated and grouped. 157 diagnoses were found to produce a switch to a higher DRG. The diagnoses, the DRGs and the respective laboratory tests were then arranged in a small MS-Excel program to allow comfortable browsing. The overall success rate of 84% shows that laboratory medicine can contribute to correct coding for DRGs.

The context

On 27 June 2000, the German Diagnosis Related Groups (G-DRG) project began countrywide. This was in response to the government's decision that, from the year 2003, the treatment of all hospitalised patients in Germany will be reimbursed on a per case basis, rather than on a per day basis or according to any of the other traditional payment regimens (Rochell et al 2000). Although the time frame for this ambitious project has subsequently been relaxed, there is no doubt that from 2003 on there will be a gradual shift towards per case reimbursement with a significant impact on the performance (Wilke et al 2001) and economic wellbeing (Neubauer 2001) of German hospitals.

From a rational point of view, it seems obvious that specialized diagnostic disciplines such as pathology (called Laboratory Medicine in Germany) need to play an important role in the detection and documentation of DRG-relevant diagnoses (Gaessler 2001), but historically this role has often been underestimated whenever health care systems have changed to per case payment by DRG. Reported effects have included hospitals that have minimized their costs per case at the expense of diagnostic procedures and later realized that per case reimbursement will not cover their expenses if the diagnostic process has been insufficiently developed. Moreover, it is not economic to document every secondary diagnosis just for the fear of "undercoding" (that is, missing essential comorbidities).

The solution for this dilemma is to work out straightforward diagnostic strategies in the overall framework of clinical pathways so that useless diagnostic testing is eliminated and at the same time "undercoding" is avoided. To support this important goal, we conducted a systematic search for DRG-relevant comorbidities that can be detected by laboratory testing. We also developed a computer program, which will allow the laboratory to establish its own diagnostic pathways in a simple standard format.

Materials and methods

Our research made use of the Australian AR-DRG system (Hoffmann 2001), which was licensed by the German Federal Republic in late 2000. This system uses a matrix of principal diagnoses, procedures and comorbidities to reduce the almost infinite number of potential combinations to a set of just several hundred economically relevant DRG classes.

The principal diagnosis and the main procedure are relevant to assignment to an adjacent DRG ADRG). However, the overall weighting of complications and comorbidities (CC) which is expressed in the Patient Clinical Complexity Level (PCCL) qualifies a specific case as more or less costly and thus influences its reimbursement. The sophisticated calculation model of the AR-DRG system is outside the scope of this paper. For an overview see Wilke (2000).

Due to the economic importance of secondary diagnoses, we focussed our research on those, which potentially would have an impact on the reimbursement for a given case, such as discriminating between DRGs B68A and B68B.

Our database was the Australian Hospital Morbidity Database (1997-99), which includes about 7 million separations. We combined this with an evaluation program called DRG Kompass™ (see Internet Site www.drg-expert.de). We used Microsoft Access™ and Visual Basic for Applications (VBA™) to extract the list of diagnoses presented here. VBA™ was also used to write a software tool for visualization of the results with Excel™. Classification of diagnoses was based on ICD-10 and DRG grouping was conducted with DRGrouper™ Version 4.1 from Visasys, Australia.

Results

As a starting point for our research, we tried to identify CCs with clinical relevance. This greatly reduced the search space, but it became clear that there were still large numbers of combinations of adjacent DRGs with up to four CCs to be examined. Therefore, for this study we limited the search on "single-hit" CCs. In other words, we extracted only those candidate comorbidities that occurred in

- DRG class A but not in the corresponding class B (group 1)
- DRG class B but not in the corresponding class C (group 2)
- DRG class C but not in the corresponding class D (group 3)

This first extraction step resulted in 3021 candidate combinations (2410 in group 1, 573 in group 2, and 38 in group 3). Some of the comorbidities such as urinary tract infection or heart failure occurred in more than 100 DRGs, and others just in a single DRG. When counting each DRG just once, we obtained the distribution shown in Figure 1. Groups 1 to 3 indicate comorbidities occurring in A but not B, B but not C, and C but not D DRGs respectively. A total of about 7 million documented cases were filed for this extract.

The second step was to singularise the ICD-10 codes found in step 1, so that each code appeared only once. In a third step we manually selected those ICD codes to which laboratory testing can make a substantial contribution.

The final list of candidate diagnoses included 187 different ICD codes in 1338 ICD-DRG combinations. Urinary tract infection (ICD N39.0) was the most frequent comorbidity occurring in 152 documented DRGs, followed by unspecific anaemia (ICD 64.9) and infection with E. coli (ICD B96.2), both occurring in 109 DRGs.

We then created virtual patient records with suitable main diagnoses and procedures and determined their DRG classes with and without the identified comorbidities. Each comorbidity that led to a switch within the ADRG was rated as "hit".

The AR-DRG System has not fully implemented PCCL Logic as the sole basis for splitting criteria. Other splitting factors include age, sameday patient, discharge type, and admission weight. We had some hits that were not caused by the respective comorbidity but by the other factors, and these were eliminated. The final list of diagnoses and the number of affected DRGs can be found in Table 2.

On the other hand, we found that some unspecific ICD codes (eg, anaemia not further classified, ICD D64.9) were over-represented in the Australian database over the more specific codes with identical effects on DRG classes (eg, aplastic anaemia D61.8). To avoid both sources of error, we manually checked each "virtual patient record", eliminated those that were not influenced by a CC, and added others that were not included in the Australian database but were reasonable candidates. We ended up with over 50,000 virtual cases, which included 187 different CCs (Table 1).

After the grouping process, we found 157 CCs having an influence on the reimbursement of 123 different ADRGs (Table 2). This suggests a positive result rate of about 84%.

The text descriptions of the DRG and ICD-10 codes are listed in the literature (Commonwealth of Australia 1998, National Centre for Classification in Health 2000) and will not be repeated here. An overview of the involved laboratory disciplines is given in Table 3. The more than 4,000 combinations of DRGs and CCs cannot be listed in detail either, but they are included in full in the program described below.

Computer program for browsing through the results

In order to make the results of our research easier to use, we developed a PC program, which will run on any computer where Microsoft Excel™ has been installed. We call it DRG Watchdog to indicate its main goal, which is to help hospitals and laboratories with their efforts for a complete documentation of all relevant CCs. It is based on the data in Table 2, which is the most relevant for laboratory physicians. The user can select a certain ICD, to which the laboratory can make a contribution and see all DRGs, which can be influenced in case of a positive laboratory test.

Figure 2 illustrates a part of the computer program. A comorbidity from Table 2 can be selected from a box in the upper left corner, and its influence on the related DRGs can be studied by clicking in the listbox below. The area to the right of the two lists shows the reimbursement details for the respective DRG with and without the comorbidity.

In the lower left corner is a list of laboratory subdisciplines (such as infectious or intestinal diseases), from which the user can select a letter to jump right to the first comorbidity in the class of interest. The right part of the screen shows any diagnostic recommendations made by the user. They are divided into two classes: text descriptions of specific testing strategies (eg, for hepatitis C) and screening tests (eg, for admission) as a list with highlighted lines indicating the selected comorbidity.

The underlying database also includes textual descriptions of DRGs and CCs as well as the cost weights (NHCDC, round 3, major urban hospitals), which are relevant for the calculation of case reimbursement according to the following formula:

reimbursement = cost weight x base rate.

Any base rate, which is the price for an average weighted separation, can be entered in any currency and the difference of reimbursement of the two DRG classes (with and without the CC) is illustrated with graphical bars.

What is more important for practical use is a table that can be filled with individual pathology test recommendations for each CC. We felt that making pathology test recommendations was not a task that we could achieve. Rather, we offer a simple spreadsheet format that any competent hospital or laboratory person could fill out according to his or her own needs and possibilities. Two different kinds of tests can be entered into the spreadsheet:

- Selective pathways to establish, support or exclude the respective diagnosis
- Screening tests performed routinely (eg, at admission of a patient).

It is up to the user to enter his recommendations into either of the two areas of the sheet. They will be handled differently by the program.

Text comments for section 1 are written into columns C, D, and E and will be presented on the screen as such, whereas test names, entered into columns higher than E will be summarized in a listbox as a screening profile with highlighted lines for the selected ICD. There is an EDIT button, which allows the user to make changes to the recommendations at any time.

This program can be provided for free in the frame of non-commercial scientific studies. Interested readers may contact our team.

Discussion

We chose the Australian AR-DRG system for our study, because no German equivalent was available at that time. This is a minor drawback, because due to the judgement of most experts in Germany, the Australian classification system will be used for quite some time in our country without major modifications (Rath 2002). Currently Round 1 of the German Cost Calculation is in progress and German cost weights are due in the near future. However, the classification and therefore the algorithms of the Grouper will not be changed before 2005.

Studies like the one described here can easily interpreted as a way of DRG gaming. In fact, our main objective was to learn about the way the AR-DRG classification works and to get information how clinical specialties like in our example laboratory medicine can contribute to an optimal coding for the DRG classification. Given the novelty for Germany, it is particularly important that the complexity of the system is understood. The more we know about it, the easier it will be for everyone when the new reimbursement scheme begins.

Moreover it is very important for us to show by analysis of real data that mastering the DRG system can only be achieved through the united effort of all clinicians. It is particularly relevant to note that, in Germany, doctors do all the coding because we do not have a clinical coding profession. There is broad acceptance of the fact that coding is a clinician's task and no one else's. As this implies more administrative work for doctors even with the use of computers, we think it is essential that they get as much support as possible.

We were gratified to discover that our study showed an overall positive result of 71% of all tested CCs. In our opinion this is a strong indicator that the Australian National Hospital Morbidity database consists of highly specific coding results. Maybe in this way we profited from the Australian system, which uses clinical coders who are well trained and results-oriented in their coding.

Finally, we believe it would be a serious error for administration officials in Germany to accept a common claim that "It's okay what Australia did, but we have to make our own experiences". Maybe we can at least avoid the known faults others did. As the Chinese philosopher Confucius said, "Man has three ways for acting wise: by reflecting (this is the most noble one), by copying (the easiest one), and by experience (the most bitter one)".

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Table 1: 123 DRGs where cases are shifted between two classes (eg, A and B) by a single complication or comorbidity (CC) to which laboratory testing can make a contribution

DRG	Relevant CCs	DRG	Relevant CCs	DRG	Relevant CCs	DRG	Relevant CCs
B03B	6	F65B	30	I64B	30	N62B	104
B04B	9	F66B	101	I66B	30	O60B	8
B06B	18	F67B	102	I67B	30	P06B	27
B07B	24	F69B	39	I68B	102	P67B	48
B61B	38	F70B	39	I68C	9	P67C	25
B67B	38	F71B	39	I71C	55	Q02B	31
B68B	102	F72B	39	I72B	30	Q60B	37
B69C	14	F73B	39	I73C	19	Q61C	10
B71B	103	F75C	22	I74C	57	R01B	23
B76B	38	G07B	6	I75C	26	R02B	23
B81B	38	G12B	23	I76C	57	R03B	13
C63B	102	G40B	4	J03B	10	R04B	13
D02B	15	G44B	2	J04B	21	R60C	19
D04B	5	G60B	41	J08B	10	R62B	103
D60B	30	G61B	41	J62C	57	T01C	29
D63B	103	G65B	103	J66B	39	T60B	35
D66B	103	G66B	103	J67B	102	T61B	43
E02C	8	G67B	41	K60B	29	T62B	99
E60B	30	G70B	103	K62C	11	T64B	44
E61B	38	H05B	18	K64B	32	U62B	28
E62C	25	H60C	9	L09C	19	U63B	28
E65B	38	H61C	21	L60C	18	X04B	14
E66C	25	H62B	37	L62B	30	X06B	19
E69C	57	H63B	37	L65B	30	X62B	101
E70B	44	H64B	103	L67C	10	X63B	43
E71B	100	I02B	16	M03B	3	X64B	101
E73C	19	I09B	4	M60B	30	Y62B	61
E74C	11	I10B	4	M61B	30	Z01B	31
E75C	26	I12C	4	M62B	100	Z60B	34
F60B	38	I28B	18	N11B	21	Z63B	33
F63B	30	I62C	15	N60B	30	Sum	4782

Table 2: 157 complications and comorbidities (CC) as defined in Table 1 that shift a case in a given DRG between two classes (eg, A and B)

ICD-10	Affected DRGs	ICD-10	Affected DRGs	ICD-10	Affected DRGs	ICD-10	Affected DRGs
A09	27	C79.2	21	I12.0	77	N13.3	23
A31.0	63	C79.5	37	I20.0	27	N17.9	64
A41.2	65	C79.6	2	I21.1	12	N18.90	47
A41.51	64	C79.82	21	I21.3	63	N30.2	60
A41.9	63	C80	37	I25.9	1	N30.9	60
B00.9	1	C90.00	5	I27.9	1	N39.0	87
B17.1	34	C91.00	52	I42.8	26	O13	21
B18.1	33	C91.01	52	I63.5	64	O14.0	30
B18.2	30	C91.10	21	I74.3	7	O24.3	1
B24	24	C92.00	62	I74.5	7	O24.4	1
B34.8	1	D50.0	26	J10.1	6	O99.0	20
B37.0	35	D50.9	45	J15.1	64	P07.3	1
B37.1	65	D61.8	35	J17.2	69	P61.0	3
B44.9	65	D61.9	8	J18.0	64	Q90.9	2
B95.0	1	D62	49	J18.8	108	R31	43
B95.2	96	D64.9	2	J36	20	S01.0	1
B95.3	64	D68.9	27	J44.8	31	S02.3	5
B95.42	64	D69.5	27	J84.1	24	S22.2	4
B95.48	74	D69.6	28	J90	12	S32.5	12
B95.6	102	D70	39	K26.5	5	S42.22	4
B95.7	90	E10.90	30	K56.5	9	S52.51	1
B95.8	17	E11.91	23	K57.20	1	S72.08	12
B96.2	103	E44.1	28	K65.0	90	S72.11	12
B96.3	80	E46	27	K70.3	29	T81.4	57
B96.4	78	E86	2	K72.9	5	T82.7	13
B96.5	99	E87.1	28	K74.6	6	T82.8	5
B96.88	2	E87.2	28	K80.10	13	T83.5	38
C19	29	E87.5	43	K80.40	7	T84.0	6
C20	29	E87.6	35	K80.50	22	T84.6	6
C34.9	24	E87.7	44	K83.0	29	T85.78	34
C50.9	2	F10.0	22	K85	27	T86.0	6
C77.0	32	F10.2	28	K86.2	6	T86.1	41
C77.1	22	F10.4	37	K92.1	59	T86.81	14
C77.3	31	F10.5	4	K92.2	13	T87.4	73
C77.4	24	F11.2	21	L01.0	40	Z49.2	1
C77.5	24	F15.9	21	L03.3	11	Z85.8	1
C78.2	27	G35	19	M00.96	33	Z99.2	27
C78.5	21	G45.9	1	M10.99	1		
C78.7	37	G70.0	32	M54.5	1		
C79.1	24	H66.3	20	N08.8	1	Sum	4782

Table 3: laboratory subdisciplines making a contribution to DRG classification

Laboratory subdiscipline	ICD-10 classes (initial letters)
Infections and septicaemia	A, B, H, L, M, T
Malignancies, leukaemias and lymphomas	C
Blood count and coagulation abnormalities	D
Diabetes, malnutrition, mineral disorders	E
Alcohol and drugs	F
Encephalitis disseminata, myasthenia gravis	G
Infarctions and vessel diseases	I
Respiratory tract disorders	J
Intestinal diseases (incl. liver, pancreas and gall bladder)	K
Joint diseases	M
Renal and urinary tract diseases	N, R
Diseases of pregnants and newborns	O, P
Postoperative complications	T
Nephrodialysis	Z

Figure 1: number of candidate comorbidities evaluated in the study

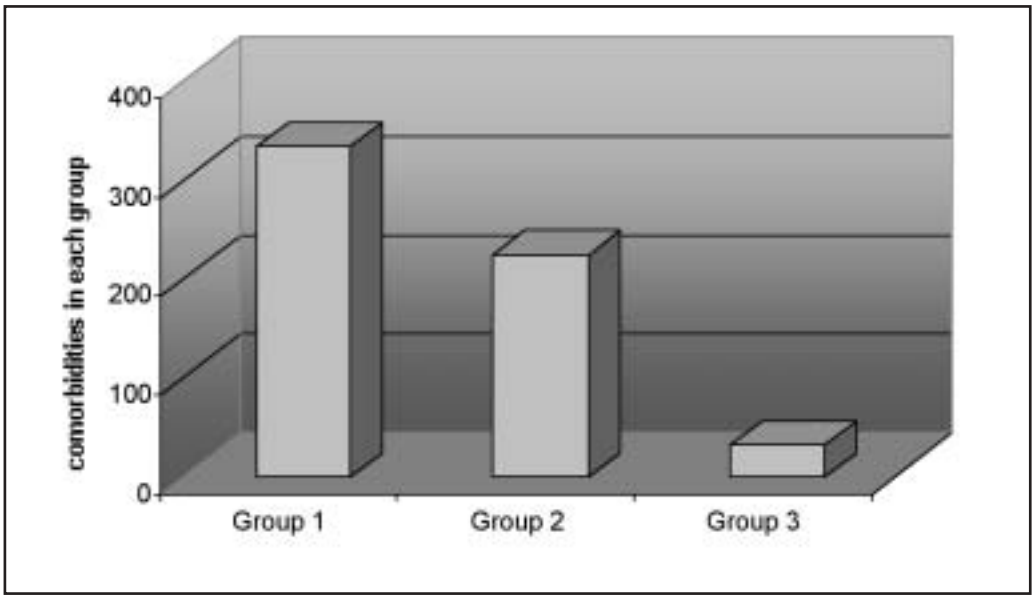

Figure2: Screenshot of DRG Watchdog.xls