ORIGINAL ARTICLE

Identification of Adverse Drug Events

The Use of ICD-10 Coded Diagnoses in Routine Hospital Data

Jürgen Stausberg, Joerg Hasford

SUMMARY

Background: Adverse drug events (ADE) are a common cause of hospital admission as well as a common complication of inpatient care. The current reporting systems in Germany are of only limited use for the identification of ADE. The aim of this study is to examine the potential usefulness of ICD-10 coded diagnoses in routine hospital data for the identification of ADE.

Methods: The common, major manifestations of ADE were mapped to the ICD-10-GM, and categories in the ICD-10-GM for which a possible causal relationship with medications is explicitly mentioned were included as well. A total of 505 relevant ICD-10-GM codes were identified. An evaluation was carried out on the basis of an aggregated data set from eleven million inpatients treated in 2006.

Results: 0.7% of hospital admissions were revealed by routine data to be causally related to the administration of a drug. In 5.3% of admissions, there was at least a reason to suspect such a causal relation. Furthermore, one of the 505 relevant codes was found to be present in 9.0% of the secondary diagnoses.

Conclusions: The available ICD-10-GM codes for manifestations of ADE are used in routine hospital data in Germany. Their usefulness for the identification of ADE should be better exploited. Our results and other relevant published literature imply that this procedure will result in both false-positive and false-negative findings, which will have to be taken into account as well.

Adverse drug events (ADE) are typical consequences of using medications. According to the results of review articles and studies, some 5% to 10% of hospital admissions to wards for internal medicine are due to ADE; 5% to 10% of all hospital patients experience severe ADE, and in the Western Hemisphere, ADE range among the most common causes of death (1–5). A substantial proportion of ADE—experts assume some 30% to 40%—are classed as preventable (3, 6).

Reliable knowledge of the type, cause, and site of an ADE is required in order to develop and apply appropriate preventive measures. Since severe ADE in outpatient drug treatment by definition lead to hospitalization, and since in hospital itself severe ADE are to be expected to an even greater extent—owing to the fact that patients often have multiple comorbidities and to intensified drug therapy—studying hospital findings for signs of ADE seems an obvious step forward.

Because of legal requirements, all hospitals in Germany have a consistent set of routine data available. This comprises primarily diagnoses, coded according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, German Modification (ICD-10-GM) and Procedures, coded according to the German Procedure Classification (Operationen- und Prozedurenschlüssel, OPS). Analyses of the suitability of routine data for reporting ADE have been conducted in the United States and England (7, 8). The authors investigated the suitability of such routine data from German hospitals for the Federal Health Monitoring information system (Gesundheitsberichterstattung des Bundes), as well as for planning and evaluating measures to avoid ADE.

Materials and methods

Definitions

In accordance with the criteria laid out by the Advisory Council on the Assessment of Developments in the Health Care System (Sachverständigenrat zur Begutachtung der Entwicklung im Gesundheitswesen) (9), the authors define adverse events as follows:

- Adverse event (AE): an unintended event that is caused by treatment.

Cite this as: Dtsch Arztebl Int 2010; 107(3): 23–9
DOI: 10.3238/arztebl.2010.0023

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- Adverse drug event (ADE): Any unfavorable medical event that occurs in association with the use of a certain medication, but which is not necessarily causally related to this medication.
- Adverse drug reaction (ADR): An unintended, noxious effect of a medication, occurring through proper or improper use.
- Medication error: Adverse drug event owing to erroneous prescribing, transcribing, distribution, or application.

Since routine data do not always enable a clear distinction of the causes, the authors prefer to use the general term adverse drug events (ADE) here.

Identifying relevant ICD-10 codes

We used four sources to identify symptoms and diseases that can occur as ADE: the publication platform of the Federal Institute for Drugs and Medical Devices (the Bundesinstitut für Arzneimittel und Medizinprodukte, BfArM, www2.bfarm.de/uaw/; accessed 1 December 2008), results reported by Schneeweiss et al. (10), screening criteria of the network of regional centers for pharmacovigilance, and data collected in those centers (accessed 2 December 2008) (*eBox*). Reviewing these results individually yielded 505 ICD-10-GM 2009 codes that indicate suspected ADE.

Categorizing relevant ICD-10 codes

With regard to their predictive value for ADE and their description in the ICD-10, the identified codes were grouped into seven categories:

- The fact that ADE is induced by medication is mentioned in the description of the code (for example, G44.4, “Drug-induced headache, not elsewhere classified”, category A.1).
- The fact that the ADE is induced by medication or other causes is mentioned in the description of the code (for example, I42.7, “Cardiomyopathy due to drugs and other external agents”, category A.2).
- The event is characterized in the description of the code as drug induced poisoning. This implies unphysiological dosage (for example, T36.0 “Poisoning by systemic antibiotics: penicillins”, category B.1).
- The event is characterized in the description of the code as poisoning by—or harmful use of—drugs or other causes (for example, T50.9 “Poisoning: Other and unspecified drugs, medicaments and biological substances”, category B.2).
- Induction due to drugs is very likely (for example, A04.7 “Enterocolitis due to *Clostridium difficile*”, category C).
- Induction due to drugs is likely (for example, F52.2 “Failure of genital response”, category D).
- Induction due to drugs is possible (for example J81 “Pulmonary edema”, category E).

In categories A.2 and B.2, other substances or measures may have caused the event. For categories C to E, the description of the code does not explicitly include an association with the use of a medical drug.

Table 1 shows the distribution of ICD-10 codes in the seven categories. More than 70% of codes indicate an ADE as very likely.

Routine data

The Institute for the Hospital Remuneration System (Institut für das Entgeltsystem im Krankenhaus, InEK) provides routine data of inpatient care in the form of a Microsoft Access database (www.g-drug.de/). These data are delivered by the hospitals to the InEK on an annual basis for the purpose of the further development of the system of Diagnosis Related Groups. Among others, the data include the ICD-10-GM codes used as the primary or secondary diagnosis, with details about their frequency in patients with a normal length of stay (i.e., inliers). Data from 11 978 011 hospital inpatients from 2006 were used.

Since only one primary diagnosis is allowed to be coded for each case, the number of primary diagnoses is equal to the number of cases. Additionally, 52 222 569 secondary diagnoses are listed; this amounts to a mean of 4.36 per case.

According to German coding standards, the primary diagnosis is the diagnosis that, after evaluation, was decided to be primarily responsible for a patient’s inpatient stay (11). An ADE coded as the primary diagnosis is therefore always acquired earlier, and, with the exclusion of special cases, outside the institution providing treatment. For the secondary diagnoses, no distinction is possible between events that were present on admission or were acquired during treatment.

In ICD-10-GM 2006, drug induced obesity was not further subclassified according to body mass index. For the analysis of routine data from 2006, the number of codes identified as relevant is therefore reduced from 505 to 502.

Statistics

The data included correspond almost entirely to the target population; we therefore did not have to use inferential statistics. We report absolute and relative frequencies. Data administration was done by using Microsoft Access 2007, data evaluation by using Microsoft Excel 2007 and SPSS 16.0.

Results

Of 502 codes that were identified as relevant, 438 appeared as the primary diagnosis and 490 as the secondary diagnosis. Altogether, 10 codes were lacking, 5 in category A.1 and 5 in category B.1. Table 2 shows how the diagnoses fall into the 7 categories. As expected, categories D and E, with non-specific codes, are more common, with 88% of mentions, than categories A to C.

Primary diagnoses

Of all inliers, 629 987 (5.26%) had a primary diagnosis in one of the categories; 79 980 (0.67%) had a primary diagnosis within categories A to C. For the latter, a medical drug is very likely the cause of their illness and

associated inpatient stay. Of 357 codes in categories A to C, 302 were used as primary diagnoses. Of these, 208 are mentioned with less than 100 cases and only 18, with more than 1000 cases. The 10 most common codes within categories A to C occurred in 38 993 cases (Table 3). These codes thus cover more than half of all cases of very likely ADE as primary diagnosis.

Secondary diagnoses

Of 52 222 569 secondary diagnoses, 8.98% fell into one of the categories (4 691 979 diagnoses); 550 427 secondary diagnoses fell to codes within categories A to C (1.05% of all secondary diagnoses). A reverse conclusion to the number of cases is possible to a limited degree only, since different diagnoses within the same category can occur in the same patient, as can different diagnoses within different categories. Relative to a single code, the calculated number does, however, correspond to the number of treated cases. Of 357 codes in categories A to C, 345 were used as secondary diagnoses. Of these, 197 are mentioned in less than 100 cases and 62 in more than 1000 cases. The 10 most common codes of categories A to C are listed in Table 4.

Medications

In some areas, ICD-10-GM lists the medication that is associated with the event. This is consistently so for group F10–F19 “Mental and behavioural disorders due to psychoactive substance use,” category F55 “Abuse of non-dependence-producing substances,” and group T36–T50 “Poisoning by drugs, medicaments and biological substances.” Among the 297 cases with a primary diagnosis within category F55, abuse of laxatives occurred in 134 cases and of analgesics, in 121 cases. In 6608 secondary diagnoses with a code within this category, the order is reversed: The abuse of analgesics is most common, with 4054 cases, followed by laxatives in 1854 cases. Table 5 provides an overview of the most common substances in cases of poisoning within group T36–T50.

TABLE 1

Distribution of ICD-10-GM 2009 codes relevant for ADE in the defined categories

Category	Definition	No of codes	Proportion of codes
A.1	Induced by medication	104	20.6%
A.2	Induced by medication or other causes	78	15.4%
B.1	Poisoning by medication	133	26.3%
B.2	Poisoning by or harmful use of medication or other causes	15	3.0%
C	ADE very likely	30	5.9%
D	ADE likely	83	16.4%
E	ADE possible	62	12.3%
Total		505	100.0%

TABLE 2

Cases with a code for ADE in 2006 (year for which data were obtained). For secondary diagnoses, cases may be included multiple times in the same as well as in different categories

Category	Definition	Cases with code as primary diagnosis		Cases with code as secondary diagnosis	
		No	% of cases	No	% of cases
A.1	Induced by medication	14 428	0.12	108 060	0.90
A.2	Induced by medication or other causes	24 213	0.20	295 855	2.47
B.1	Poisoning by medication	13 286	0.11	25 102	0.21
B.2	Poisoning by or harmful use of medication or other causes	3832	0.03	11 607	0.10
C	ADE very likely	24 221	0.20	109 803	0.92
D	ADE likely	147 998	1.24	1 504 670	12.56
E	ADE possible	402 009	3.36	2 636 882	22.01

TABLE 3

The 10 most common primary diagnoses within categories A to C in descending order

ICD-10-GM 2006		Primary diagnosis	Category
Code	Description	No of cases	
A04.7	Enterocolitis due to <i>Clostridium difficile</i> *	9874	C
T88.7	Unspecified adverse effect of drug or medicament	5004	A.2
I95.2	Hypotension due to drugs	3720	A.1
D69.0	Allergic purpura	3526	C
T50.9	Poisoning: Other and unspecified drugs, medicaments and biological substances	3501	B.2
T78.3	Angioneurotic edema	3465	A.2
L27.0	Generalized skin eruption due to drugs and medicaments	3400	A.2
K52.1	Toxic gastroenteritis and colitis	2727	C
D70.10	Drug induced agranulocytosis and neutropenia: critical phase less than 10 days	2022	A.1
T78.4	Allergy, unspecified	1754	A.2

*Antibiotic associated enterocolitis

TABLE 4

The 10 most common secondary diagnoses within categories A to C in descending order

ICD-10-GM 2006		Secondary diagnosis	Category
Code	Description	No of cases	
T88.7	Unspecified adverse effect of drug or medicament	83 182	A.2
Y57.9	Complications of medical and surgical care: Drug or medicament, unspecified	48 276	A.2
T78.4	Allergy, unspecified	42 677	A.2
D69.58	Secondary thrombocytopenia, not described as refractory to transfusion	31 791	C
A04.7	Enterocolitis due to <i>Clostridium difficile</i> *	26 341	C
T80.1	Vascular complications following infusion, transfusion and therapeutic injection	20 742	A.2
D70.10	Drug induced agranulocytosis and neutropenia: critical phase less than 10 days	14 022	A.1
D61.10	Drug-induced aplastic anaemia due to chemotherapy	13 003	A.1
D69.59	Secondary thrombocytopenia, unspecified	12 357	C
F13.7	Mental and behavioural disorders due to use of sedatives or hypnotics: Residual and late-onset psychiatric disorders	12 153	A.2

*Antibiotic associated enterocolitis

Discussion

German routine data in 0.67% of cases indicate an ADE as the cause of inpatient admission—that is, the primary diagnosis. In slightly more than 5% of cases, an ADE is suspected. Even if we assume complete and correct coding, this represents a lower threshold. The ADE leading to inpatient admission may not be the primary diagnosis only but also the secondary diagnosis, for which no distinction is possible as to where the ADE occurred. Moreover, ADE does not appear as the primary diagnosis in patients with a disease outside categories A to E with additional codes such as Y57.9 “Complications of medical and surgical care: Drug or medicament, unspecified.”

A review of 25 prospective observational studies estimated that a proportion of 5.3% of hospital admissions was associated with ADR (4). Waller et al. studied drug-induced hospital admissions in routine data in England (8). Their analysis showed a proportion of 0.35% of cases; the ICD-10 codes that were included corresponded broadly to categories A1 and C. This means that the proportions of ADR definitely identified by ICD-10 codes are as good as identical in England (0.35%) and Germany (0.32%). The proportion of suspected cases in German routine data (5.3%) also follows the estimates by Kongkaew et al. (4). On the basis of administrative data for Western Australia the trend of repeated inpatient treatments due to ADR was studied for patients older than 60 between 1980 and 2003 (12). For the entire time period, the proportion came to some 5.9%, and an increase in the number of repeated treatments over time was notable. Zhang et al. used exclusively supplementary codes of the ICD-9 and ICD-10, such as Y57.9, to identify ADR and counted events that were present at the time of admission as well as those occurring in hospital (12).

The incidence of ADE in hospitals cannot be estimated on the basis of the data used because for secondary diagnoses, no distinction is possible for “present at the time of admission” and “acquired during hospital inpatient stay.” In the US, a so called “present on admission” indicator is therefore currently under discussion (13). Further, in the existing data, cases with several codes within categories A to E as a secondary diagnosis or one code for the primary diagnosis and another code for the secondary diagnosis are counted multiple times. If complete and correct coding is assumed, the data about overall frequency thus constitute an overestimate. If only one code within categories A to C is assumed for the primary diagnosis and secondary diagnosis, the prevalence of ADE is 5.3%. This means that the results from German routine data are of a similar order of magnitude as indicated in the retrospective review of patient's medical records by Brennan et al. (14). Brennan et al., at 19%, estimated a much lower proportion of adverse events related to the use of a medical drug; the explanation is that we omitted from our study all events that were clearly not associated with a medication. A meta-analysis, however, estimates the proportion of cases with ADR as

TABLE 5

Number of mentions of group T36–T50 summarized under the three digit codes

Poisonings in the ICD-10-GM		Primary diagnosis		Secondary diagnosis	
Three digit code	Substance	No	%	No	%
T36	Systemic antibiotics	49	0.29	134	0.46
T37	Other systemic anti-infectives and antiparasitics	13	0.08	20	0.07
T38	Hormones and their synthetic substitutes and antagonists, not elsewhere classified	247	1.47	1156	3.97
T39	Non-opioid analgesics, antipyretics and antirheumatics	1767	10.51	1025	3.52
T40	Narcotics and psychodysleptics (hallucinogens)	1008	5.99	1400	4.81
T41	Anesthetics and therapeutic gases	12	0.07	99	0.34
T42	Antiepileptic, sedative-hypnotic and antiparkinsonism drugs	3896	23.16	2820	9.69
T43	Psychotropic drugs, not elsewhere classified	2650	15.76	1343	4.61
T44	Drugs primarily affecting the autonomic nervous system	437	2.60	806	2.77
T45	Primarily systemic and haematological agents, not elsewhere classified	1038	6.17	4421	15.19
T46	Agents primarily affecting the cardiovascular system	1825	10.85	10 916	37.51
T47	Agents primarily affecting the gastrointestinal system	58	0.34	78	0.27
T48	Agents primarily acting on smooth and skeletal muscles and the respiratory system	174	1.03	681	2.34
T49	Topical agents primarily affecting skin and mucous membrane and ophthalmological, otorhinolaryngological and dental drugs	18	0.11	18	0.06
T50	Diuretics and other and unspecified drugs, medicaments and biological substances	3727	21.56	4186	14.38
T36–T50	Drugs, medicaments and biological substances	16 819	100.00	29 103	100.00

clearly higher, at 15.1%. By contrast, the German Coalition for Patient Safety (Aktionsbündnis Patientensicherheit) estimates a proportion of 5% to 10% for all adverse events (15). Most adverse events occur in the context of surgical procedures, followed by ADE and systemic factors. Adverse events related to other diagnostic, therapeutic, or invasive procedures are rarer (16). By comparison, the frequencies calculated from routine data are of a plausible order of magnitude.

The allocation of events to medications that is obvious from cases of poisoning, however, differs markedly from that in the literature on ADR. The 10 most common drug groups associated with ADR according to Davies et al. (5) correspond to 6 categories in the ICD-10-GM from *Table 5*. Opioids (T40), anti-coagulants (T45), and diuretics (T50) are also more commonly associated with ADR in the routine data studied here. Antibiotics (T36), glucocorticoids (T38), and beta-adrenoreceptor agonists (T48) are hardly mentioned at all.

The degree of precision with which ADE can be identified in routine data when non-specific ICD-10 codes within categories D and E are used remains speculative. Nebeker et al. (17) calculated the positive predictive value (PPV) for the use of specific codes of the American ICD-9 clinical modifications. For codes

describing drug induced hemorrhage/coagulation disorders, the PPV was 23.1%, for codes describing drug induced delirium or psychosis, 38.2%. A low PPV may be typical for ADE, independently of the signal detection system (18). This means that not only false-negative findings but also false-positive findings are to be expected.

Limitations in the reliability and generalizability of the results presented here can be discussed at several levels. Determining the administration of a medical drug as the cause of an event is riddled with uncertainties on the one hand, but on the other hand, it is crucially required in order to be able to use specific ICD-10-GM codes. The quality of coding of diagnoses and procedures in hospitals has reached a level that enables the use of such data for quality management and health services research, provided their origin and processing are known in detail (19). This is mainly due to the necessity of comprehensive and correct documentation, which is required for the purpose of revenue assurance. Hospitals have reacted to these requirements in an organizational manner—for example, by establishing medical controlling—and in terms of information technology infrastructure—for example, by introducing electronic patient records. While the routine data can be assumed to include complete

diagnoses and surgical procedures, their actual correctness is another matter. Further, the data provided by the Institute for the Hospital Remuneration System (InEK) also have their limitations. Thus, multiple counting of cases had to be accepted. The 505 codes used for ADE have not been externally validated. However, in spite of all this, comprehensive coverage may be assumed because the lists of codes described in the literature (8, 12, 17) were not only taken into account but also comprehensively supplemented.

Using routine data in the context of a health monitoring system for ADE is possible with limitations, as is shown by our own results. In this way, information from clinical and epidemiological studies, as well as from spontaneous reporting systems about the type and frequency of ADE may be usefully complemented. However, in order to be able to automatically generate reports in the context of pharmacovigilance, information on the medication would be needed. The ICD-10-GM describes these only partially—for example, for poisonings and adverse effects of psychoactive substances. Where routine data are evaluated with relation to individual patients, a high rate of false positive and false negative results is to be expected. Further studies of the reliability and validity of coded diagnoses are required—for example, by means of comparisons with patient files. To improve data quality, careful adherence to the corresponding, special coding guidelines (11) should be promoted. In suspect diagnoses, coding software should provide the available supplementary code Y57.9 or indicate the possibility of a relation to a medication. Future studies will need to examine and monitor these results in greater detail.

Acknowledgement

The authors thank Monika Darchinger for her support in compiling the manuscript and statistician (Dipl-Stat) Marianna Rottenkolber for evaluating the database of the network of regional pharmacovigilance centers at the Institute for Medical Informatics, Biometry and Epidemiology (Institut für Medizinische Informationsverarbeitung, Biometrie und Epidemiologie, IBE) in Munich. The study received financial support from the Berlin-based company ID Information und Dokumentation im Gesundheitswesen GmbH & Co. KGaA (ID Information and Documentation in Health Care).

Conflict of interest statement

The authors declare that no conflict of interest exists according to the guidelines of the International Committee of Medical Journal Editors.

Manuscript received on 17 March 2009, revised version accepted on 3 June 2009.

Translated from the original German by Dr Birte Twisselmann.

REFERENCES

- Muehlberger N, Schneeweiss S, Hasford J: Adverse drug reaction monitoring—cost and benefit considerations. Part I: frequency of adverse drug reactions causing hospital admission. *Pharmacoepidemiol Drug Saf* 1997; 6 Suppl 3: 71–7.
- Lazarou J, Pomeranz BH, Corey PN: Incidence of adverse drug reactions in hospitalized patients: a meta-analysis of prospective studies. *JAMA* 1998; 279: 1200–05.
- Pirmohamed M, James S, Meakin S, et al.: Adverse drug reactions as cause of admission to hospital: a prospective analysis of 18820 patients. *BMJ* 2004; 329: 15–9.

KEY MESSAGES

- In 5% to 10% of cases in hospital inpatients, adverse events are to be expected.
- Studies and spontaneous notification systems provide information about the frequency of adverse drug events (ADE)
- The ICD-10 contains many codes relating to adverse medical events related to the use of a medical drug.
- Routine data from hospitals have shown that ADE are the cause of inpatient admission in 0.7% of all cases; altogether, ADE is suspected in 5.3% of inpatient admissions.
- Routine data from hospitals can provide important information for the purposes of pharmacovigilance and health monitoring.

- Kongkaew C, Noyce PR, Ashcroft DM: Hospital admissions associated with adverse drug reactions: a systematic review of prospective observational studies. *Ann Pharmacother* 2008; 42: 1017–25.
- Davies EC, Green CF, Taylor S, Williamson PR, Mottram DR, Pirmohamed M: Adverse drug reactions in hospital in-patients: a prospective analysis of 3695 patient-episodes. *PLoS ONE* 2009; 4: e4439.
- Goettler M, Schneeweiss S, Hasford J: Adverse drug reaction monitoring—cost and benefit considerations. Part II: cost and preventability of adverse drug reactions leading to hospital admission. *Pharmacoepidemiol Drug Saf* 1997; 6 Suppl 3: 79–90.
- Solberg LI, Hurley JS, Roberts MH, et al.: Measuring patient safety in ambulatory care: potential for identifying medical group drug—drug interaction rates using claims data. *Am J Manag Care* 2004; 10: 753–9.
- Waller P, Shaw M, Ho D, Shakir S, Ebrahim S: Hospital admissions for 'drug-induced' disorders in England: a study using the Hospital Episodes Statistics (HES) database. *British Journal of Clinical Pharmacology* 2004; 59: 213–9.
- Sachverständigenrat zur Begutachtung der Entwicklung im Gesundheitswesen: Kooperation und Verantwortung. Voraussetzungen einer zielorientierten Gesundheitsversorgung. Gutachten 2007. www.svr-gesundheit.de/ (last accessed on December 16, 2008).
- Schneeweiss S, Hasford J, Göttler M, Hoffmann A, Riethling A-K, Avorn J: Admissions caused by adverse drug events to internal medicine and emergency departments in hospitals: a longitudinal population-based study. *Eur J Clin Pharmacol* 2002; 58: 285–91.
- Deutsche Krankenhausgesellschaft, Spitzenverbände der Krankenkassen, Verband der privaten Krankenversicherung, Institut für das Entgeltsystem im Krankenhaus: Allgemeine und Spezielle Kodierrichtlinien für die Verschlüsselung von Krankheiten und Prozeduren, Version 2006. Institut für das Entgeltsystem im Krankenhaus 2005.
- Zhang M, Holman CD'AJ, Preen DB, Brameld K: Repeat adverse drug reactions causing hospitalization in older Australians: a population-based longitudinal study 1980–2003. *Br J Clin Pharmacol* 2006; 63: 163–70.
- Houchens RL, Elixhauser A, Romano PS: How often are potential patient safety events present on admission? *The Joint Commission Journal on Quality and Patient Safety* 2008; 34: 154–63.
- Brennan TA, Leape LL, Laird NM, et al.: Incidence of adverse events and negligence in hospitalized patients. Results of the Harvard Medical Practice Study I. *NEJM* 1991; 324: 370–6.
- Aktionsbündnis Patientensicherheit (eds.): Agenda Patientensicherheit 2007. Witten: April 2007.

16. Schrappe M, Lessing C, Schmitz A, et al. (eds.): Agenda Patientensicherheit 2008. Witten: November 2008.
17. Nebeker JR, Yarnold PR, Soltysik RC, et al.: Developing indicators of inpatient drug events through nonlinear analysis using administrative data. *Medical Care* 2007; 45: 81–8.
18. Field TS, Gurwitz JH, Harrold LR, et al.: Strategies for detecting adverse drug events among older persons in the ambulatory setting. *J Am Med Inform Assoc* 2004; 11: 492–8.
19. Stausberg J: Die Kodierqualität in der stationären Versorgung. *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz* 2007; 50: 1039–46.
20. Stausberg J, Dahmen B, Drösler SE: A methodological framework for the conversion of procedure classifications. *Meth Inf Med* 2005; 44: 57–65.

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eBOX

Development of ADE catalogue

Adverse drug events (ADE) were either already coded according to the Medical Dictionary for Regulatory Activities (MedDRA) Version 11.1G or were coded subsequently by using the MedDRA browser, version Beta 2.0.2. Deduplication of records yielded a list with 96 entries. These were mapped to the ICD-10-GM 2009 by using the coding tool ID DIACOS 2008, version 6.80.3. For a MedDRA code, those classes of the ICD-10-GM were identified that constituted a match in terms of their meaning (according to the concept based approach from [20]). The mapping was successful for 87 entries. For 9 entries, no suitable ICD-10-GM code was identified.

The ICD-10 itself provides different classes for drug related diseases, among others in the chapters XIX, "Injury, poisoning and certain other consequences of external causes" and XX "External causes of morbidity and mortality." These classes were identified by means of a text search and literature review.