

## Hospital Statistics as a Tool for Obtaining Data Necessary in the Healthcare Entity Management Process

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**Abstract.** Statistical methods used by healthcare entities enable the collection of various information about the structure and characteristics of treated patients. They are an important source of knowledge, and form a database that plays an important role in entity management theory. In the presented study, we analysed the hospital stays of patients treated in all hospital wards of the 3<sup>rd</sup> City Hospital in Łódź during 2012. The following, in particular, were taken into account: admittance procedure, discharge procedure, age and sex of hospitalised persons. Patients in over 55% of cases were admitted using the sudden admittance procedure. At the same time, over 3/4 of the stays ended with a referral for further treatment in ambulatory conditions, and death occurred in approx. 5% of hospitalisations. By comparing the discharge procedures, the percentage of deaths in the Anaesthesiology and Intensive Care Wards can be seen clearly (more than 70%). Internal wards are next in turn (10.6 and 16.6%). The biggest differences in the length of hospitalisation between the studied institution and the NFZ data (which are averaged values from all medical entities in Poland) concern the E77, A49, A48, A87, A33, D18, E16, E61 and G37 groups.

### Introduction

Statistical methods used by healthcare entities enable the collection of various information about the structure and characteristics of treated patients. They are an important source of knowledge, and form a database that plays an important role in entity management theory. Unfortunately, in most cases, due to a permanent lack of time and an accumulation of current affairs, directors who manage hospitals, clinics or laboratories omit the aforementioned methods in daily operation and when making key decisions. As a consequence, they encounter significant problems in the effective analysis of various aspects of the operation of their institutions (Zieliński, 2013).

It should be mentioned that the awareness and understanding of events occurring in the managed healthcare entity enables the optimal manage-

ment of the given entity, adequate to their capabilities and resources, not only at the given moment, but also in the future due the ability to create forecasts for the future. In the situation where, for the treatment of every patient a specific amount is received (in accordance with the principles established by the NFZ National Health Fund), the issue of correct settlement of services and the possibility of indicating specific reasons, for which one hospitalisation results in losses and another in profits, is the essence of a well-operating entity. Simple statistical analyses provide the answers to basic questions and indicate the reasons for many difficulties which the institutions in question face. They also prove the existence of phenomena, which we may not have been aware of, and act as a bargaining chip in negotiations with supervisory, controlling or founding bodies (Sanak et al., 2010).

As a result of the increasing scope and detail of the data collected by medical entities, we are able to generate reports that a few years ago were out of the realm of possibility. Based on conducted hospital statistics we are able to locate the information that is important from the point of view of individual wards, departments or the management itself. Thus, the variety of conducted analyses is very large. The most known and popular list is a semi-annual and annual analysis of hospital activity, containing data about the number of beds, person-days, the number of treated persons, deaths, and mortality and bed occupancy indicator. Systematic analyses are becoming more and more important, e.g.: reasons of patient hospitalisation in individual hospital wards (Kaczor et al., 2011; Rudnicka-Drożak et al., 2010), deaths (Karwat, 2012; Wróblewska et al., 2008) or the average hospitalisation time.

## **Material and Methods**

All the data concerning the method of treatment of patients admitted to hospital are entered in the institution's IT system. What analyses we have at our disposal and how advanced the lists and comparisons we are able to obtain are dependent on the complexity of a given system and the possibility of extracting the necessary information. In this study, we have analysed the hospital stays of the patients treated at all hospital wards of the 3<sup>rd</sup> City Hospital in Lodz during 2012. In particular, the following were taken into account: admittance procedure, discharge procedure, and age and sex of hospitalised persons. Pursuant to the settlement data the DRG groups most frequently occurring in the year 2012 were also indicated, and the obtained results were compared with the information provided on the DRG statistics, 2013. For calculations, Excel spreadsheet was used along with

basic statistical functions, showing that such types of lists do not require complicated software and sophisticated knowledge.

## Results

The obtained results are presented in Tables 1–3 and Figure 1. Tables 1–3 enable the number of hospitalisations to be established in accordance with procedures of admittance, discharge, sex and age (for the entire hospital) as well as the characterization of specific organisational units, which is more important from the point of view of managers/heads of these organisational cells.

**Table 1. Number of hospitalisations in the year 2012 and the percentage of stays divided into procedure of admission and sex of patients**

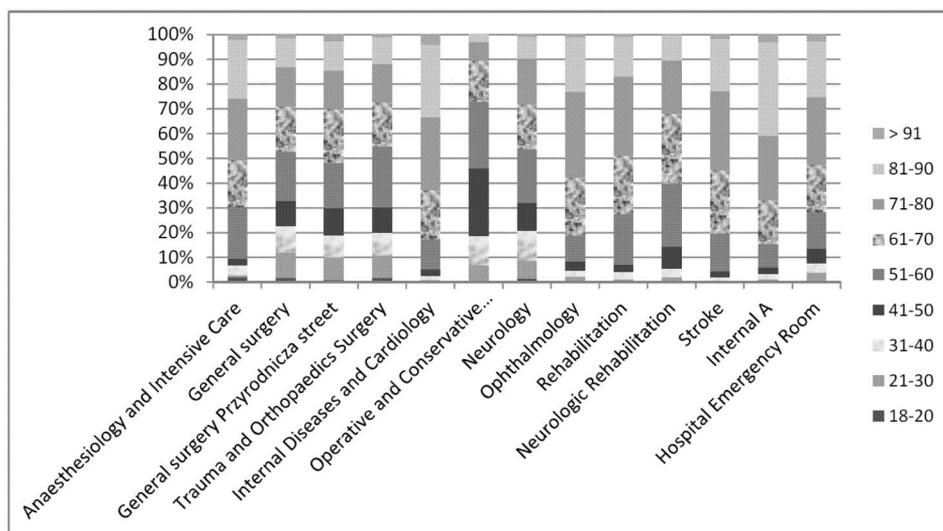
Ward	Number of finished hospitalisations in the year 2012	Admittance procedure						Sex	
		without referral	transfer from another hospital	planned with referral	planned with rights	sudden	sudden, through an EMS team	Woman	Man
Anaesthesiology and Intensive Care	148	81	3	0	0	13	51	85	63
General surgery	1783	48	15	403	1	761	555	832	951
General surgery Przyrodnicza street	110	0	1	20	0	41	48	51	59
Trauma and Orthopaedics Surgery	1647	13	5	888	1	546	194	941	706
Internal Diseases and Cardiology	2048	161	10	190	687	999	1	1212	836
Operative and Conservative Gynaecology	341	0	1	274	5	44	17	341	0
Neurology	1121	111	8	170	2	473	357	622	499
Ophthalmology	1833	2	0	1567	1	224	39	1095	738
Rehabilitation	166	1	0	165	0	0	0	97	69
Neurologic Rehabilitation	325	2	0	323	0	0	0	171	154
Stroke	421	58	1	2	0	116	244	255	166
Internal A	1239	45	2	53	0	383	756	742	497
Hospital Emergency Room	766	0	1	0	0	284	481	482	284
Total	11948	522	47	4055	697	3884	2743	6926	5022
%	100	4.37	0.39	33.94	5.83	32.51	22.96	57.97	42.03

**Table 2. Number of hospitalisations divided by discharge procedure, presented according to individual hospital wards**

Ward	Discharge procedure										
	ending the therapeutic and diagnostic process	continuing in ambulatory treatment	referral to a psychiatric hospital	continuing treatment – others	continuing in another inpatient facility	continuing in a long term care facility	discharge at own request	death	continuing in the same facility	leaving against medical advice	transfer to another ward
Anaesthesiology and Intensive Care	2	0	0	0	13	0	0	104	0	0	29
General surgery	5	1547	7	0	15	4	63	75	3	2	62
General surgery Przyrodnicza street	14	82	0	0	1	0	6	5	0	0	2
Trauma and Orthopaedics Surgery	0	1578	1	1	18	3	9	3	15	0	19
Internal Diseases and Cardiology	2	1610	4	0	109	21	17	216	16	0	53
Operative and Conservative Gynaecology	331	4	0	0	4	0	0	0	2	0	0
Neurology	489	443	4	2	35	4	45	17	9	4	69
Ophthalmology	5	1814	1	3	1	0	3	0	0	0	6
Rehabilitation	2	156	0	0	0	0	3	0	2	0	3
Neurologic Rehabilitation	4	292	2	0	3	1	8	0	3	0	12
Stroke	129	128	1	0	11	11	10	30	11	0	90
Internal A	0	871	6	1	36	44	28	205	3	0	45
Hospital Emergency Room	1	547	0	0	45	3	9	22	4	1	134
Total	984	9072	26	7	291	91	201	677	68	7	524
%	8.24	75.93	0.22	0.06	2.44	0.76	1.68	5.67	0.57	0.06	4.39

**Table 3. Number of hospitalisations by patients' age**

All hospital wards	Patients' age (in years)								
	18–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	> 91
Total	97	546	691	826	2012	2357	2859	2339	221
%	0.81	4.57	5.78	6.91	16.84	19.73	23.93	19.58	1.85



**Figure 1. Percentage of hospitalisations by wards, divided by patient's age**

Based on the presented data, it is clear that patients in over 55% of cases were admitted using the sudden admittance procedure (Table 1). This is a significant difficulty for the hospital, since this type of admittance has a much higher risk than planned admittance (which makes up only 1/3 of cases). They require higher financial outlays (i.e., necessary diagnostics and laboratory testing, medical advice, longer hospitalisation time, required transfers between wards etc.) and are highly unpredictable (e.g. due to bad health, co-existing diseases or the patient's age). At the same time, over 3/4 of the stays end with a referral for further treatment in ambulatory conditions, and death occurs in approx. 5% of hospitalisations (Table 2).

The age of treated patients also has an enormous impact on the hospital's financial condition (the older the person, the more co-existing diseases, the worse their health and the longer the duration of hospitalisation). The results obtained by the study confirm the generally known fact that the society is getting older, and the demand for geriatric wards will be increasing (the group of patients older than 91 years was almost 2% of the total) (Table 3).

At the same time, the analysis conducted using the criterion of division by wards shows that some of the institution's wards accept most of their patients in a planned manner (e.g. rehabilitation, ophthalmology, gynaecology or orthopaedic) (Table 1). By comparing the discharge procedures, the percentage of deaths in the Anaesthesiology and Intensive Care Wards is

clearly visible (more than 70%) (Wróblewska et al., 2008). Internal wards are next in turn (10.6 and 16.6%) (Kaczor et al., 2011). This type of situation results from the fact that the specifics of each ward vary, in addition to differences in the character of medical services (procedures) provided and the age of hospitalised persons (Figure 1).

The subsequent stage of the analysis was the attempt to indicate DRG groups with the highest significance for the studied entity. Based on the settlement data reported to the NFZ for the year 2012, the most frequent groups were nominated, their percentage share in the total was established, and the median and modal values and average of hospitalisation time were calculated. At the same time, the obtained results were compared with the data provided by DRG statistics, 2013. The complex analysis of the DRG system prepared by the NFZ concerns the services provided within the years 2009–2012 throughout the entire country of Poland. This list includes the number of provided DRG products and the average patient stay time divided by age, sex, admittance and discharge procedure, ICD-10 basic diagnosis and ICD-9 medical procedure for all DRG groups, provided in the years 2009–2012. We will be interested only in the year 2012.

Due to a high diversity of DRG groups listed by the hospital in the year 2012, this list refers only to the first 20 items. The results obtained from the studied institution and data from the NFZ system are presented in Table 4.

Analysing the data presented above, it can be clearly seen that the biggest differences in the length of hospitalisation between the studied institution and the NFZ data (which are averaged values from all medical entities in Poland) concern the E77, A49, A48, A87, A33, D18, E16, E61 and G37 groups. For these services, the length of stay of the patient in the studied hospital is approx. 2 days longer than in other institutions. This suggests it may be worth considering why other hospitals are able to treat the patients in a shorter time, and thus to bear lower expenses (for food, drugs, materials, stay etc.).

A significant source of knowledge on hospitalisations is the information on the average time of hospital treatment (separately for each DRG group), listed along with the hospitalisations above a set number of days, which are financed as a group by the NFZ (in accordance with the catalogue of DRG groups). All stays of this extended type should be analysed for the reasons the patient remained in the hospital, and to indicate possible actions that could improve the proceedings in similar cases in the future (complications, adverse event, lack of access to diagnostics, lack of cooperation in transferring of patients to other institutions, e.g. due to lack of space or logistics difficulties) (Podlaski Urząd Wojewódzki w Białymstoku, 2012).

**Table 4. A list of DRG groups most frequently occurring in the studied hospital with the NFZ data (DRG statistics, 2013) for the year 2012**

DRG group	Number of occurrences	% of occurrence among all DRG groups	Average hospitalisation time (days)	Modal value (days)	Median value (days)	Data from DRG statistics, 2013		
						Modal value (days)	Median value (days)	
B13	Uncomplicated cataract surgery by emulsification with simultaneous lens implantation	1024	10.27	2.61	2	2	0	2
E77	Other cardiovascular diseases > 17 years of age	569	5.71	10.94	8	10	7	6
A76	Head trauma with significant brain damage, treated conservatively	268	2.69	4.54	2	2	2	3
B12	Complicated cataract surgery by emulsification with simultaneous lens implantation	256	2.57	2.96	2	2	2	2
H83	Average procedures on soft tissue	251	2.52	3.53	1	2	0	2
A49	Brain stroke – treatment > 3 days	243	2.44	12.95	8	11	7	8
A48	Complex treatment of brain stroke > 7 days on the stroke ward	227	2.28	15.66	10	12	8	10
H62	Breaks or dislocations of the pelvis or lower limb	216	2.17	9.65	4	10	4	8
H33	Average procedures on lower limb	178	1.79	3.19	2	2.5	2	2
A87	Other nervous system diseases	170	1.71	10.39	7	8	2	5
A33	Balance disorders	169	1.70	7.05	6	6	3	4
D18	Atypical viral pneumonia	166	1.67	13.51	13	12	7	8
B98	Conservative ophthalmological treatment	163	1.64	6.52	1	5	2	3
G34	Endoscopic and percutaneous procedures of bile ducts and pancreas	159	1.60	4.50	2	4	1	4
E61	Heart rhythm disorders > 69 years of age or with complications	155	1.56	7.57	2	7	2	4
G37	Acute pancreatitis	154	1.55	6.47	5	5	6	7
H64	Smaller breaks or dislocations	144	1.44	2.87	1	2	1	1
E16	Acute endomyocarditis > 69 years of age or with complications	140	1.40	10.98	7	10	4	5
F46	Abdominal diseases	139	1.39	5.53	2	4	2	3
G25	Cholecystectomy	127	1.27	3.52	2	2	3	3

## Conclusions

In summary, we can see how important statistics are, when correctly and systematically kept at medical institutions. The simplest lists and analyses frequently allow the areas that for some reasons generate additional costs to be pinpointed. The knowledge of the entire facility and of the specifics of individual wards provided by prepared reports is an indescribable source of information in an institution's management process. It is the initial point for making key decisions in order to ensure the correct operation of the entire unit, and it enables immediate reaction in crisis situations (e.g. failure of medical equipment, loss of skilled medical personnel).

A hospital, as a whole, will not be able (in the long run) to keep afloat in such difficult times on the medical services market without a thriving department of statistics or analytics. Knowledge from the scope of provided DRG groups and their participation in the costs of the entire contract for hospital treatment enables monthly limits to be planned and problems with both exceeding and not reaching the financial plan to be avoided.

Information for heads of wards/managers of individual departments which enables the characterisation of hospitalised patients, taking into account the age, sex, procedure of admittance and discharge, and the type of medical procedures conducted during the stay, is especially important to enabling the correct organisation of work of medical personnel, to meeting the demand for materials and medicine, or to ensuring free beds for emergency patients.

A series of articles published in journals (Roszkowska et al., 2002) which contain various types of hospital analyses allow for the establishment of what information is of interest to the decision-makers in other hospitals, as well as the possibility to compare the results of the given entity with the data from other institutions (Narodowy Fundusz Zdrowia, Departament Świadczeń Opieki Zdrowotnej, 2012).

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