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Implications of Diagnosis Related Groups (DRGs) for the Management of Hospitals

Patel Mahesh, Grimm Renée, Paccaud Fred, Schenker Luc.

Institut universitaire de médecine sociale et préventive, Rue du Bugnon 17, Lausanne

1. Introduction

Over the post-war period many exciting advances have been made in the medical treatment of patients. The advent of computers has enabled diagnosis to be based on 3 dimensional internal pictures of patients. New materials and techniques have enabled surgical operations such as organ transplants that were science fiction only a few years earlier.

Meanwhile, relatively minor changes have taken place in the administration of hospitals. Patients records are still usually kept on paper rather than on magnetic tape, appointments are normally made in appointment books rather than on computer terminals, and management decisions are still based on the types of information that have been available for decades such as average length of stay, and average cost per case.

Unlike medical diagnosis and treatment, the information tools available to hospital managers have remained virtually unchanged. This lack of evolution is not due to the fact that new information techniques do not exist. They do, and are extensively used in industrial concerns. Most industrial companies would find it very difficult to operate effectively if they only obtained the quality of information currently available to hospital managers.

Recent developments in hospital management techniques include the use of computers to arrange appointments, recall patients for follow-up, to organize rostering for nurses, payroll applications, and the use of DRGs for planning and financial purposes. Few of these developments are, as yet, widespread, excepting perhaps the use of computers for payroll procedures. This paper will focus on the use of DRGs for planning and finance.

2. Case Mix in Hospitals

Clearly, the costs of running a hospital depend on the complexity of the cases it treats. Some types of cases cost more than other types. The DRG approach begins by defining these types of cases. Cases are divided into 'Diagnostic Related Groups', by which is meant groups of cases that are similar both in clinical terms, in terms of the diagnosis of the patient, and the clinical procedures or treatments enacted; and also similar in terms of the quantities of hospital resources consumed.

Industrial units may be judged by their average costs per unit of output, and average length of stay has sometimes been considered to be a measure of the efficiency of hospitals. This is too simplistic, due to the wide diversity of cases that are treated in a hospital. The DRG hospital information system analyses the hospital as if it were a multiproduct firm, an industrial unit that produces an output of treated cases of different types.

One of the traditional tasks of public health managers has been to explain variations in average lengths of stay between different departments in their hospitals, and between different hospitals. The natural variation in length of stay, between patients with different needs, and hence hospitals of different types, has caused managers considerable difficulties in the past.

Early attempts to identify the reasons for these variations in average length of stay utilized indirect, or proxy, measures. Some of these examined the relationship between hospital bed size and length of stay, on the assumption that larger hospitals tended to treat more complicated and difficult cases. Others related the level of training of staff to length of stay, on the assumption that the presence of highly trained staff attracted more complex cases.

More direct measures of the complexity of cases treated were often based on diagnostic data, because it was considered that, to a certain extent, the more difficult patients could be identified by their diagnosis. The International Classification of Diseases (ICD-9) published by the WHO was too unwieldy to be used as a basis for case mix classification as it contains almost 10,000 different disease categories. Most diagnostic based measures of relative case complexity used a more restricted number of categories. In general, these categories were defined in such a manner that the cases within each category used quantities of hospital resources that were similar as possible, and that would have, as a result, relatively homogeneous lengths of stay and costs. Lave, Lave and Silverman (1) used 17 diagnostic groups. Feldstein (2) used 28 diagnostic groups. Evans (3) used 10 and 41. Paccaud (4) used 117.

A major limitation of measures of relative case complexity that were based only on diagnosis was that different cases with the same diagnosis might well vary considerably in their complexity. The diagnostic related group system is the first to systematically begin to take into account variations in complexity within a given diagnostic group in order to define homogeneous groups of consumers of hospital resources. DRG categories are defined not only on diagnosis, but also on a range of supplementary data conventionally available on hospital discharge abstracts.

In order of their significance as determinants of length of stay, these parameters are:

1. the operating room (OR) procedure,
2. the principal diagnosis (on discharge),
3. age of patient,
4. sex of patient,
5. complications or comorbidities (CC),
6. various secondary diagnoses.

The use of an operating room (OR) procedure was found to have a greater effect on length of stay that any other item of information. For this reason, the presence or absence of such creates the first partition of the group of patients for any ICD diagnostic chapter, as illustrated for 'Diseases and Disorders of the Female Reproductive System' (ICD Chapter 13), in *figure 1*.

'Procedure Category' and 'Principal Diagnosis' within

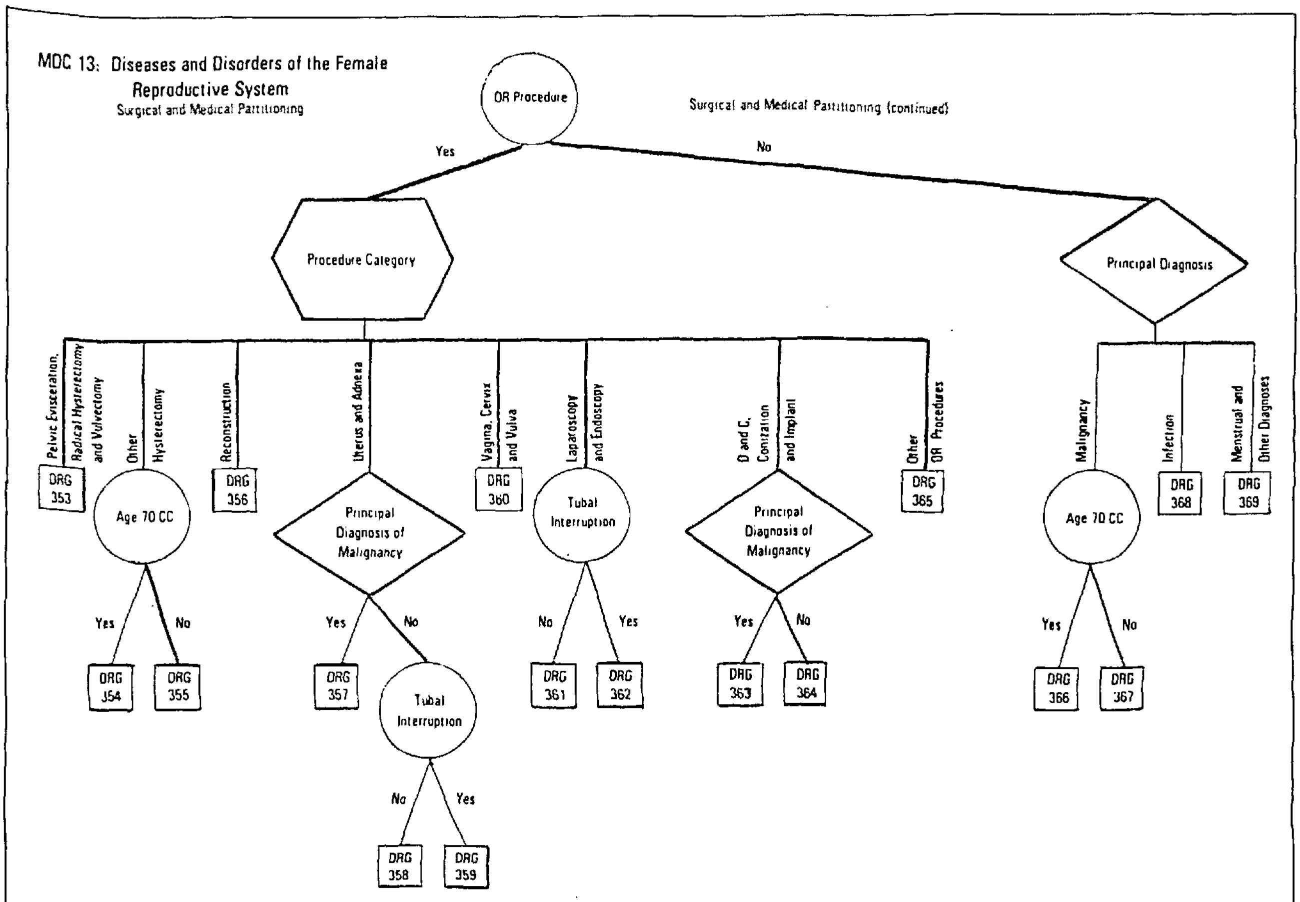

Figure 1. Example of partitioning of a major diagnostic category

this ICD Chapter are the second most important determinants of length of stay. The former creates DRGs 353 to 365, the latter DRGs 366 to 369. Numerous studies have shown that age is often related to length of stay in hospital, and so age is used to divide subcategories wherever relevant. Usually, the critical ages used are those of 18 and 70 years. Age greater than 70 years (Age 70 CC) is used, in table 1, to create DRGs number 354, 355, 366 and 367. Sex was found to affect length of stay for some diagnosis (although it is obviously not relevant to the example illustrated), and complications, co-morbidities and secondary diagnosis (CC) to affect others.

Factors that were found not to significantly influence length of stay included diagnosis on admission, diagnostic procedures, type of admission (whether the case was a readmission, or an emergency admission etc.), and the identity of the principal payer for treatment.

Creation of a new sub-category of patients (an additional DRG) by the inclusion of an additional factor is determined by a statistical rule:

a) if the total weighted variance of length of stay falls as a result of the inclusion of an additional factor,

b)if the resulting groups are not then too small to be useful, and

c) if the difference in the mean lengths of stay of the subgroups created by the division is significant;

then that factor is included. Hence, not every factor is included as a means of distinguishing every DRG from its neighbour. (The computer package used to create these groups is described in an article by Mills et al. (5)). The diagnostic related groups that result are, therefore, groups of patients that are, each one relatively homogeneous in terms of their consumption of hospital resources.

These groups are extremely useful for the planning and internal administration of hospitals as they are based, at the same time, on clinical, administrative, and economic reasoning. They are a logical interface between these three, often quite distant, disciplines, and should do much to facilitate communication between them. This paper will focus on a specific administrative and clinical application of DRGs, that of standardization of hospital costs and length of stay by case mix. It is however also expected that clinical research will increasingly be organized in terms of DRG categories, as this system is more explicitly rational that the ICD-9 itself.

3. Standardization by Case Mix

Table 1 illustrates a standardization exercise. Once groups of patients that are homogeneous with respect to their average length of stay (ALOS) or average cost per case (AC/C) have been obtained, standardization for case mix is not a difficult exercise. The procedure followed is similar to that used to obtain standardized mortality ratios. The result is a standardized length of stay (SLOS), or cost per case (SC/C), that represents what the average would have been for a given hospital, if that hospital had treated the same 'standard mix' of cases. The 'standard mix' of cases is, in fact, just the national (regional or departmental) average proportion of cases of each type.

A hypothetical standardization exercise of this type is illustrated in *table 1*.

	Lengths of stay by hospital				Costs per case by hospital			
Hospital	ALOS	%AL	SLOS	%SL	AC/C	%AC	SC/C	%SC
1	12	103	11	95	3000	77	4000	102
2	14	120	12	103	4500	115	5000	120
3	9	78	10	86	2000	51	3500	90
4	10	86	12	103	4000	102	3000	76
5	13	112	13	112	6000	154	5500	141
Average	11.6	100	11.6	100	3900	100	3900	100

Table 1. Standardization of length of stay and costs by case mix figures (hypothetical data).

This table shows the average length of stay (ALOS) for 5 hospitals. These are also illustrated as percentages of the overall average length of stay (%AL). The lengths of stay for each hospital are then standardized and the length of stay that each hospital would have had, if it treated the national average mix of cases of similar type, is presented as the standardized length of stay (SLOS). The relationship of these, to the national average, is presented as %SL.

Hospital 2, for example, appears to have an average length of stay (of 14 days) that is well above (20 % higher than) the regional average of 11.6 days. This apparent excess length of stay almost disappears, once the fact that this hospital treats a more difficult mix of cases is taken into account. The standardized length of stay for hospital 2 is only 3% more than the regional average.

Hospital 1 would appear to have an average cost per case that is 27% less (%AC) than the national average, only SFR 3,000 per case (AC/C) as opposed to the average of SFR 3,900 per case. Once the fact that this hospital usually treats a relatively 'easy', or low cost, mix of cases is taken into account (SC/C, %SC), its costs are in fact quite close to the national average (only 2% higher).

This striking hypothetical example is of course only one illustration of the potential application of this method. The same technique could also be applied to compare different departments within a hospital, or to compare departments of a similar type in different hospitals.

The research project on Diagnostic Related Groups currently underway at the Institut Universitaire de Médecine Sociale et Préventive, Lausanne, expects to be able to furnish participating hospitals and cantons with information of this type during the course of the year 1988.

It is hoped that information of this type will be useful to hospital managers responsible for planning decisions, and that it will result in discussions concerning differences in lengths of stay and costs per case that are relatively well informed and result in decisions that are increasingly objectively justifiable. Conversely, it will also be true that clinicians wishing to discuss administrative decisions, will have more objective evidence on which to base their arguments.

It should however be stressed that it is not expected that DRGs will ever provide the sole input to hospital decision making. Naturally a host of other factors would be relevant to planning decisions. What the DRG system provides is simply the best available information on the effects of case mix on hospital lengths of stay and cost. Interpretation of this information, and the use made of it, would naturally be the responsibility of the hospitals and cantons concerned.

4. Conclusions

Although tremendous advances have been made in the diagnosis and treatment of patients, hospital administrative systems have progressed relatively slowly. The types of information available to managers in industrial sectors are not available in the health sector. For this reason, many phenomena, such as the variations of average costs and lengths of stay between different hospitals, have remained poorly explained.

The DRG system defines groups of patients that consume relatively homogeneous quantities of hospital resources. On this basis, it is possible to standardize average lengths of stay and average hospital costs in terms of the differences in case mix treated. Thus DRGs can serve as an explanation of variations in these factors between different hospitals.

It should also be noted that, while DRGs have been used to reimburse hospitals in the USA, there have been a number of critiques published concerning their use in this manner. While DRG projects exist in most European countries including, Austria, Belgium, France, the Federal Republic of Germany, Holland, Norway, Portugal, Sweden, Switzerland and the UK (6), none of these countries has adopted the American system of paying hospitals according to predetermined costs for each DRG (adjusted by hospital type and local economic conditions).

This project is, of course, ready to respond to all enquiries on this subject. Future papers in this journal will describe the progress of the Swiss DRG research program.

Summary

Although tremendous advances have been made in the diagnosis and treatment of patients, hospital administrative systems have progressed relatively slowly. The types of information available to managers in industrial sectors are not available in the health sector. For this reason, many phenomena, such as the variations of average costs and lengths of stay between different hospitals, have remained poorly explained.

The DRG system defines groups of patients that consume relatively homogeneous quantities of hospital resources. On the basis, it is possible to standardize average lengths of stay and average hospital costs in terms of the differences in case mix treated. Thus DRGs can serve as an explanation of variations in these factors between different hospitals, and also (but not only) for prospective reimbursement schems. As in a number of other European countries, a project has been set up in Switzerland to examine the possibilities of using DRGs in hospital management, planning and financing.

Resumé

Importance des DRGS pour la gestion hospitalière

Alors que des progrès considérables ont été faits dans le diagnostic et le traitement des patients, les systèmes de gestion hospitaliers ont progressé beaucoup moins vite. Les types d'information habituellement utilisés dans le secteur industriel ne sont pas actuellement disponibles dans le secteur sanitaire. Pour cette raison, beaucoup d'observations restent mal expliquées: c'est le cas par exemple des variations des coûts par cas ou des durées de séjours entre les hôpitaux. Le système des DRGs (Diagnosis Related Groups) définit des groupes de patients qui consomment des quantités relativement homogènes de ressources hospitalières. Sur cette base, il est possible de standardiser les coûts moyens et les durées moyennes de séjour par rapport aux différences de case mix. C'est ainsi que les DRGs peuvent intervenir directement dans l'analyse des variations entre hôpitaux; de même ils peuvent être utilisés comme base de remboursement prospectif des hôpitaux. Comme c'est le cas dans beaucoup d'autres pays européens, un projet a été élaboré en Suisse pour examiner les possibilités d'utilisation des DRGs pour la gestion, la planification et le financement des hôpitaux.

Zusammenfassung

Bedeutung des DRG-Klassifikationssystemes für das Spitalmanagement

Während in den letzten 20 Jahren enorme Fortschritte in der Diagnostik und Therapie erzielt wurden, blieb das Verwaltungssystem der Spitäler relativ unverändert. Die im Industriesektor für die Planung üblicherweise verwendeten Informationen fehlen im Bereich der Gesundheitsversorgung. Aus diesem Grunde kann man sich manche Beobachtung nicht erklären, so etwa die von Klinik zu Klinik verschiedenen Kosten per Krankheitsfall oder auch die Unterschiede in der mittleren Aufenthaltsdauer. Das DRG-Klassifikationssystem (Diagnosis Related Groups) definiert Patientengruppen mit relativ homogenem Pflegeaufwand. Auf dieser Basis wird es möglich, die Durchschnittskosten und die mittlere Aufenthaltsdauer nach der Patientenstruktur («Case Mix») zu standardisieren. So kann das DRG für einen Vergleich zwischen den Spitälern dienen. Gleichzeitig kann es auch als Grundlage für eine prospektive Finanzierung der Spitäler verwendet werden. Wie in vielen europäischen Ländern, so wurde auch in der Schweiz ein Projekt ausgearbeitet, welches die Verwendungsmöglichkeiten des DRG auf dem Gebiet der Planung und Finanzierung prüfen soll.

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