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Minimal Data Requirements for a Continuous Monitoring of the Quality of Care using the DRG Classification

Brigitte Santos-Eggimann, Fred Paccaud

Institut universitaire de médecine sociale et préventive, Lausanne

Monitoring the quality of medical care is not a new idea: systematic reviews by the medical profession were undertaken from the beginning of the century in North America [1]. Voluntary efforts from medical associations have then been successively complemented by "teams" reviews, professional standards review organizations and more recently by peer review organizations supervising patient care for Medicare recipients. While case reviews require the investment of notable efforts and structures, monitoring processes based on routinely collected data such as hospital discharge statistics are considered as desirable in order to detect potential problems suitable for further investigation. The missing piece for such large-scale utilization of hospital discharge data for the purpose of quality of care monitoring was the availability of a medically meaningful patients classification in order to standardize institutional outcome measures for Casemix differences.

The classification of hospital patients into Diagnosis Related Groups (DRGs) has been developed for multiple purposes [2] which can be summarized in terms of planification, health services research (including research devoted to the quality of care), and financing. Among intended applications were patient care monitoring and utilization patterns review, as evidenced by the requirement of physician review during the process of DRGs definition in order to insure the medical meaning of categories based on length of stay homogeneity [3]. However, DRGs were quickly adopted in the United States as a prospective payment tool and, hopefully, as a cost-control mechanism. Accordingly, in-hospital patient care reimbursement using the DRG methodology was implemented for Medicare recipients since 1983–4 at the federal level [4].

Very early, concerns were raised about the possible deterioration of the quality of care associated with the expected results of prospective payment systems in general and of the reimbursement based on DRGs in particular [5–9]: an expected effect of such a system is to give incentives to hospitals to minimize the services delivered (eg to reduce the length of stay) in order to minimize the real cost of the case (as compared to the price paid by Medicare). The general fear was therefore to observe an increase in patients discharged "quicker and sicker". Thus a monitoring of the possible perverse effects of the new financing mechanisms appeared as an emergency and the same DRG classification was considered as an acceptable tool for this purpose.

Standardized Mortality Rates and Readmissions as Indicators of the Quality of Care

Many indicators have been proposed for the monitoring of the quality of care. The most sensitive are based on morbidity criteria, and sets of morbidity outcomes have been defined for example in the context of tracers methodology. However, these indicators are not appropriate for use in the context of hospital discharge statistics which provide only crude information on morbid conditions. Two main indicators have been advocated for quality of care monitoring based on large data sets of discharge records: the rate of readmissions after discharge and the mortality rate following an admission are considered as two useful indicators of the quality of hospital care in the process of evaluation of the effects of a length of stay reduction, whatever its origin may be, and were used to evaluate the effects of the prospective payment for Medicare patients [8, 10]. The advantage of both readmissions and deaths as indicators of the quality of care rests in their easy capture from routinely collected data such as hospital discharges and death certificates.

Owing to these concerns about the quality of hospital care and to the availability of the data sources, other potentials of the DRG classification than financial applications have, fortunately, recently found interesting demonstrations. The possibility opened by the DRG methodology to classify patients according to clinically relevant criteria has led to the development of risk-adjusted mortality rates and indexes based on both the DRGs and additional information included on the hospital discharge form [11, 12]. Dubois et al computed hospital death rates adjusted for age, mode of admission (emergency room, nursing home) and DRG. Desharnais et al built their risk adjusted mortality index for DRG clusters on patients characteristics such as age, sex and race as well as on a complex set of diagnosis-related indicators. For both approaches, the major argument in favour of the utilization of DRGs relies on the fact that DRGs are abstracted from the hospital discharge record.

These works are still limited by the restriction of the

observation period to the hospital stay. In a context of varying lengths of stay, this restriction may obviously lead to biased conclusions, since the mortality observed over a shorter stay–other things being equal– can be expected to be lower. This is especially true if differences in the mean length of stay are due to differences in the proportion of very long stays. In addition, the effects of the quality of hospital care may last beyond the hospital discharge [8, 9, 13, 14]. For these two reasons, a prolonged and uniform observation period (the following discussion will mention one year after the first admission but other periods may be defined) is certainly more appropriate to the study of the quality of hospital care.

Readmission rates also present limitations since they often remain poorly defined. The maximum period separating an admission and a readmission must be clarified. Exogenous causes of readmission, such as social problems, are often not coded as the first reason for the hospitalization. However, readmission rates remain a widely accepted indicator of the quality of care for monitoring purposes.

Medical Records Linkage

Medical record linkages are a necessary step for the computation of standardized mortality rates over a fixed period after admission, as well as for the estimation of readmission rates.

The following discussion will show that the observation of one-year mortality rates after a hospital stay is possible by combining the VESKA hospital discharge records and the anonymous Swiss death certificates, providing that a few additional variables are added to the hospital discharge form. The skills and knowledge gained in Switzerland by VESKA statistics reliability studies [15, 16] and by the conduct of the Casemix study could thus be used to monitor the quality of hospital care in the context of the length of stay reduction trend observed in the recent years.

The medical record linkage theory has expanded on the grounds that valuable information can be made available to the epidemiologic research when various data sources, of limited value taken isolately, are brought together. This principle has led to the development of computer algorithms to perform efficiently linkage procedures on large files, and to an increased utilization of routinely collected data [17]. Medical record linkages can be used to gather multiple records relating to the same individual in a single information system (eg assembling all the hospital discharge records relating to the same individual, creating a persons file rather than a discharges file, in order to study readmission patterns) or to combine records relating to the same individual in multiple data sources [eg associating to each death certificate the hospital stay(s), if any, relating to the same person, in order to study the mortality after an hospitalization].

In Switzerland, medical record linkage procedures are routinely performed by cancer registries and have provided many informations relating to the hospital morbidity and mortality due to acute myocardial infarct [18] or to the epidemiology of infant mortality in spite of the anonymity of death and birth certificates [19].

Practically, the linkage of anonymous records requires the presence of a set of common variables on the two types of records to be linked. As a first example, the date of birth and the sex are variables recorded both on the hospital discharge form and on the death certificate. This type of information is not supposed to change over time for the same individual. It should be concordant on the two records, unless errors took place at the time of registration or coding. A second type of information should be concordant on the two records, but additional errors may occur since the characteristics of the person are not immutable. The place of residency is an example of this type of variable which content can really change between the time of hospital stay and the time of death, even if the probability to move in one year is not very high. As a general rule, an ideal variable suitable for linkage procedures should be as stable as possible over time, as discriminating as possible (which means contain a large number of clearly separated categories in order to lead to a low probability of chance concordance: the day and month of birth are less susceptible to be shared by two persons than their sex), and not very prone to registration errors [20].

First Step: Aggregation of Multiple Discharge Records Relating to a Single Patient

A known limitation of hospital discharges statistics rests in the unit of data collection: a stay rather than a patient. For a unique event such as death, computation of rates without taking into account the dimension of readmissions may lead to an underestimation of mortality rates. Little is known concerning readmission rates in Switzerland, but in some hospitals the proportion of readmissions may be as high as 20% [21].

As a first step, all the discharge records relating to a single individual have to be aggregated in order to constitute a persons file [22]. This step corresponds to a linkage among the records of the VESKA statistic belonging to the same patients. The introduction on the hospital discharge form of a sole code attached to the individual, such as the social security number (SSN) which follows the person through the whole life, is a crucial point and has been advocated both at an international [23, 24] and at a national level [25]. The Swiss SSN would offer the advantage of being systematically attributed to the whole adult population of the country; for children, the attribution of a code according to the same rules followed for the constitution of the SSN is current practice in the context of the disability insurance and could thus be extended to all children. The main problem with SSN adoption remains its modification for women as they change their marital status; the choice of the adequate code will have to take this problem into account. This code

should not vary across the multiple stays of a patient either in the same or in various institutions. Since this SSN would be used for this step exclusively, it could be transformed after the aggregation in order to preserve the anonymity of the file.
The first step is indispensable to proceed toward the second step of hospitalized patients and death certificates linkage, since the death certificates file is based on the person as the unit. It also provides the data base for the study of readmissions after discharge.

Second Step: Linking Death Certificates and Hospitalized Patients

Several of the variables required for this second step are already available on the hospital discharge form (table 1). The additional variables to be added to the currently used hospital discharge form are listed in table 2. These additional variables have been selected according to the following criteria:
- Their presence on the death certificate
- Their discriminating power (cf medical record linkage)
- The parsimony of the selection

Tab. 1. Link variables currently recorded on the death certificate and on the hospital discharge form

1. Date of birth (day/month/year) of the deceased/patient
2. Sex
3. Date of death (day/month/year) of the deceased/patient (if discharged dead)
4. Nation of origin of the deceased/patient
5. Religion of the deceased/patient
6. *Commune of residency of the deceased/patient
7. Marital status of the deceased/patient

*Commune of residency: this variable should be coded according to the Federal Office for Statistics rules on the hospital discharge form

Tab. 2. Additional variables to include on the hospital discharge form

1. For all patients:
   Social security number
2. For patients less than 20 years old:
   Date of birth (day/month/year) of the mother
3. For all patients 20 years old or over:
   *Occupational category of the patient (last occupation)
4. Specifications about the marital status:
   - For married patients:
     Date of birth (day/month/year) of the spouse
   - For divorced patients:
     Date of the divorce
   - For widowed patients:
     Date of the widowhood
5. For all patients discharged dead:
   Hour of death

*Occupational category: should be registered according to the classification adopted by the Federal Office for Statistics and listed on the back of the death certificate form

This last point refers to the fact that only a few variables can be added to the current discharge form if a too heavy administrative burden to the hospitals is to be avoided. As a matter of fact, the additional variables required according to table 2 amount to four variables per discharge at most for any given case.

Validity and Acceptability

The expected validity of the linkage made possible by the addition of the information listed in table 2 should be very high if the information about dates is extensively recorded. Practically, the availability of two dates per certificate does not leave a large place to uncertainty, and the additional variables should allow to clarify further doubtful cases. According to tables 1 and 2, two dates will be available either for all patients under 20 years of age, or for married, divorced or widowed patients. Even if the date of divorce or widowhood is in practice only partially recorded, as can be expected for events occurred several years ago, the information remains rich enough. The largest uncertainty will thus concern the adult unmarried patients dying outside of the hospital, who will still be characterized by some six variables: date of birth, sex, commune of residency, nation of origin, religion, and occupational category. Improvements for this subgroup cannot be found by the inclusion of other additional variables on the hospital discharge form: the limitation is due to the scarcity of information recorded on the death certificate.
Medical record linkages are routinely performed in several countries and have made possible many works in the fields of epidemiologic research. The acceptability of the proposed linkages rely on the value attributed to the monitoring of the quality of care. Clearly, data protection cannot be dissociated from file linkage procedures, and particularly from the diffusion of the results of these procedures. The discussion related to the appropriate place where personal codes should be attributed, or linkage procedures performed, goes beyond the scope of this paper. Similarly, the circumstances and the degree of completeness of data transmissions will not be solved here.

Conclusions

The addition of very few variables on the hospital discharge form would provide an opportunity to monitor the quality of hospital care by the analysis of readmission rates and of mortality rates of admitted patients at the light of the DRG classification as well as of the information recorded on the hospital discharge form.
However, the medical record linkage made possible by this additional information is interesting for many other aspects of the epidemiologic research. In particular, mortality curves could be drawn for subsets of patients hospitalized for a specific condition [26, 27], or newborns with major diseases could be followed from birth to their death when it occurs during the childhood. As mentioned by Blumberg [8], the DRGs were not specifically developed as measures of the risk of

death, and for this reason the DRG methodology will mainly allow to screen hospitals. Based on the findings, further reviews are required and need more targeted questions concerning the mortality for specific conditions and population subgroups. The reflection triggered by the Casemix study should certainly take into account this potential for a better understanding of the outcomes of hospital care.

Summary

The DRG classification provides a useful tool for the evaluation of hospital care. Indicators such as readmissions and mortality rates adjusted for the hospital Casemix could be adopted in Switzerland at the price of minor additions to the hospital discharge record. The additional information required to build patients histories and to identify the deaths occurring after hospital discharge is detailed.

Résumé

Information supplémentaire minimale nécessaire pour permettre un contrôle de la qualité des soins à l'aide de la classification par DRG

La classification par DRG représente un instrument utile pour l'évaluation des soins hospitaliers. Des indicateurs tels que les taux de réadmissions ou de mortalité ajustés pour le Casemix de l'hôpital pourraient être adoptés en Suisse au prix d'adjonctions mineures au résumé de sortie. L'information minimale supplémentaire requise pour reconstruire l'histoire des patients et pour identifier les décès après sortie de l'hôpital est détaillée.

Zusammenfassung

Mindestanforderungen an Daten zur kontinuierlichen Überwachung der Qualität der Spitalpflege mittels der DRG-Klassifikation

Die DRG-Klassifikation ist ein nützliches Instrument zur Evaluation der Spitalbetreuung. In der Schweiz könnten Indikatoren – wie für die Patientenzusammensetzung standardisierte Wiedereinweisungsziffern oder Sterbeziffern – durch kleine Aenderungen der Spitalentlassungsformulare für eine solche Evaluation gewonnen werden. Der Artikel zeigt, welche zusätzlichen Informationen mindestens benötigt werden, um Krankengeschichten so zu ergänzen, dass Todesfälle auch nach der Spitalentlassung identifiziert werden können.

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Address for correspondence:

Dr Brigitte Santos-Eggimann, MD, MPH
Institut universitaire de médecine sociale et préventive
17, rue du Bugnon
CH-1005 Lausanne