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## Financial impact of introducing the Swiss-DRG reimbursement system on potentially avoidable readmissions at a university hospital

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### Summary

**QUESTION UNDER STUDY:** Thirty-day readmissions can be classified as potentially avoidable (PARs) or not avoidable (NARs) by following a specific algorithm (SQLape<sup>®</sup>). We wanted to assess the financial impact of the Swiss-DRG system, which regroups some readmissions occurring within 18 days after discharge within the initial hospital stay, on PARs at our hospital.

**METHODS:** First, PARs were identified from all hospitalisations recorded in 2011 at our university hospital. Second, 2012 Swiss-DRG readmission rules were applied, regrouped readmissions (RR) were identified, and their financial impact computed. Third, RRs were classified as potentially avoidable (PARRs), not avoidable (NARRs), and others causes (OCRRs). Characteristics of PARR patients and stays were retrieved, and the financial impact of PARRS was computed.

**RESULTS:** A total of 36,777 hospitalisations were recorded in 2011, of which 3,140 were considered as readmissions (8.5%): 1,470 PARs (46.8%) and 1,733 NARs (53.2%).

The 2012 Swiss-DRG rules would have resulted in 910 RRs (2.5% of hospitalisations, 29% of readmissions): 395 PARRs (43% of RR), 181 NARRs (20%), and 334 OCRRs (37%). Loss in reimbursement would have amounted to CHF 3.157 million (0.6% of total reimbursement).

As many as 95% of the 395 PARR patients lived at home. In total, 28% of PARRs occurred within 3 days after discharge, and 58% lasted less than 5 days; 79% of the patients were discharged home again. Loss in reimbursement would amount to CHF 1.771 million.

**CONCLUSION:** PARs represent a sizeable number of 30-day readmissions, as do PARRs of 18-day RRs in the 2012 Swiss DRG system. They should be the focus of attention, as the PARRs represent an avoidable loss in reimbursement.

**Key words:** readmission; DRG; financial impact

### Introduction

Hospital readmissions rates are considered to be a quality indicator for hospital care, and are usually measured over 30 days after discharge. However, although attractive, this indicator can be misleading for several reasons: patient and community level factors outside the hospital control play a role, and only some of these readmissions are probably preventable [1]. In addition, high readmission rates do not necessarily reflect poor quality of care: they can be the result of low hospital mortality rates during the initial hospitalisation, or reflect good access to hospital care, both of which are also considered as indicators of good quality of care [2, 3].

It is therefore important that the focus be shifted to potentially avoidable readmissions (PARs), defined as a second nonelective admission to the same hospital, for a diagnosis already present during the index hospitalisation. Readmission rates and causes can be identified by chart reviews. However, an algorithm based on widely available administrative data, including diagnostic and intervention codes, has been developed [4]. Its validation showed a 96% sensitivity and 96% specificity [5]. It was recently adopted by the Swiss National Association for Development of Quality in Hospitals (ANQ) as a mandatory indicator for all hospitals.

On the other hand, on January 1st 2012, all hospitals in Switzerland adopted a new diagnosis-related group reimbursement system (Swiss-DRG), based on diagnostic (ICD-10) and intervention (CHOP; Schweizerische Operationsklassifikation) codes, and a few additional factors such as age and gender. The codes associated and recorded during the hospital stay of a given patient determine a specific DRG, characterised by a severity score (cost-weight), and an associated fixed level of reimbursement between two lengths of stay (LOS), corresponding to 95% of observed LOS in a panel of reference hospitals 2 years previously. The reimbursement level associated with a cost-weight of one (corresponding to the average severity of all patients in the system) is negotiated each year between the hospital and the insurance companies [6].

In this reimbursement system, specific rules exist for readmissions. One of them states that all readmissions within the same major disease category (MDC) within 18 days after initial discharge lead to a regrouping of the two corresponding stays (initial hospitalisation and readmission) into a single stay, before a new DRG reflecting all diagnoses and interventions codes of both observed stays is determined. This rule is aimed at encouraging hospitals to deliver care of good quality and avoid complications. As an example, if a first hospital stay for heart failure lasts for 8 days, and a readmission for acute dyspnoea occurs within 18 days after discharge and lasts for 4 days, one single hospital stay of 12 days will be considered for reimbursement. If the same diagnostic and/or therapeutic procedures used during the initial hospitalisation are reintroduced, no additional diagnostic and/or therapeutic code will be recorded, and the upper LOS threshold, the final severity score (cost-weight) and the final DRG will remain the same. If this new LOS falls within the upper limit of LOS for this specific DRG, no additional reimbursement will be paid to the hospital for the second stay as compared with the first one. On the other hand, if this LOS falls outside the upper limit of LOS for this specific DRG, additional reimbursement will be paid. However, if additional diagnostic and/or therapeutic procedures are used during the readmission, additional codes will be recorded and might result in a different final DRG, with a different upper LOS threshold and/or a different final cost-weight, which both could lead to a different amount in reimbursement.

Regrouped readmissions can then be analysed with the same methods as described above to identify potentially avoidable regrouped admissions (PARRs).

This readmission rule has obvious financial consequences for hospitals, which should be monitored as the system is implemented. We wanted to assess its financial impact on our institution for a whole year. As PARs represent the only type of all readmissions under strict hospital control, we focused on PARRs to delineate characteristics of patients and stays, as well as loss in reimbursement, and to identify ways to prevent them from occurring.

## Methods

All hospitalisations recorded between January 1st and November 31st, 2011, at our university hospital were retrieved for analysis and submitted to the SQLape<sup>®</sup> readmission algorithm, and PARs were identified. The observation period was limited to 11 months so that readmissions occurring during the 30 days following the hospital discharge of the last patient in November could be observed in the year 2011.

The readmission rules of the 2012 Swiss-DRG system were then applied, leading to a certain number of regroupments of two consecutive stays (regrouped readmissions = RRs). Submitting these RRs to the SQLape<sup>®</sup> algorithm lead to four different categories of RRs: (1.) Potentially Avoidable Regrouped Readmissions (PARRs); (2.) Non-Avoidable Regrouped Readmissions (NARRs); (3.) Noneligible stays according to the SQLape<sup>®</sup> algorithm; (4.) Admissions (because the index stay is not eligible for assessing potential PARs according to the SQLape<sup>®</sup> algorithm but considered

as a readmission by the Swiss-DRG system). These last two categories were regrouped as “other causes of RRs” (OCRRs).

The financial impact of RRs was computed as the difference between the amount in reimbursement the hospital would have received if a DRG had been determined and billed for each stay (initial hospitalisation and readmission) and the amount billed for the new DRG resulting from each specific RR. The amount in reimbursement was computed along the rules of the Swiss-DRG system [6] with a DRG cost-weight unit point amounting to CHF 11,000.

The specific patient and readmission characteristics of PARRs were then retrieved and analysed, and the financial impact of PARRs was computed as described above for RRs.

## Results

### Hospitalisations and regrouped readmissions (RRs)

Of the 36,777 hospitalisations recorded in 2011, 3,140 were readmissions (readmission rate = 8.5%), of which 1,470 were considered as PARs (46.8%) and 1,733 as NARRs (53.2%), according to the SQLape<sup>®</sup> algorithm.

Application of the 2012 Swiss-DRG rules resulted in 910 RRs (2.5% of all hospitalisations, 29% of all readmissions), of which 395 were considered as PARRs (43% of RRs), 181 as NARRs (20% of RRs) and 334 as OCRRs (“admissions” or “noneligible stays”, 37% of RRs).

Reimbursement linked with the billing of these 910 RRs, according to the 2012 Swiss DRG readmission rules would have led to a loss in revenue amounting to CHF 3.157 million (0.6% of the total reimbursement) as compared with reimbursement associated with billing each single stay (initial hospitalisation and readmission).

### Characteristics of PARRs

The age distribution of the 395 PARRs was bimodal, with 76 cases occurring in patients below the age of 16 years (19%), and a second peak of 69 cases observed in patients between 41 and 56 years (17%). A total of 58% of PARRs patients were male.

Mean LOS of PARRs was 7 days, with a median of 4 days (range 1–70 days). A total of 95% of the PARRs were related to patients living at home, and 28% of these PARRs occurred within 3 days after discharge. A majority of these PARRs were of short duration (58% ≤ 5 days), and 79% of the patients were discharged home again.

Four major disease categories (MDC) in the Swiss-DRG system accounted for 27% of the PARRs: “E 65–07 other affections of respiratory system” (n = 31, 8%), “GH 9–16 gastric and intestinal disorder” (n = 27, 7%), “V 60–04 alcohol and drug abuse” (n = 24, 6%), and “F 60–00 acute myocardial infarction or heart failure” (n = 23, 6%). Altogether, 69 different diagnoses were recorded.

As a consequence, three wards covered 49% of the PARRs: emergency (n = 70, 18%), paediatrics (n = 65, 16%) and internal medicine (n = 58, 15%).

Reimbursement linked with the billing of these PARRs, according to the 2012 Swiss DRG readmission rules, would lead to a loss in revenue of CHF 1.771 million (56% of the

revenue loss associated with all RRs, or 0.3% of the total reimbursement) as compared with reimbursement associated with billing each single stay (initial hospitalisation and readmission).

## Discussion

Potentially avoidable readmissions (PARs) represented a sizeable number of readmissions, as they amounted to slightly less than half of all readmissions, and the same was true for regrouped readmissions (RRs) in the 2012 Swiss-DRG system (PARRs). PARs should be the focus of attention of clinicians, as they are often associated with questionable quality of care, and PARRs should attract the interest of both clinicians and hospital administrators as they represent, in addition, a potentially avoidable loss in reimbursement.

The main interest of this study was the number of hospital stays and hence of PARs and PARRs identified, as most studies published in the literature on this subject sampled fewer than 100 stays [6]. The rate of PARRs observed (43%) was rather high. American data [1] showed an average of 27%, ranging from 12% when using clinical criteria, to 59% when using administrative criteria to identify them. Our high rate is therefore in accordance with these data, as we used administrative criteria.

The second interesting aspect of this study was the use of an algorithm to single out PARs and PARRs. A review of the available literature on readmissions [7] emphasised the high variability of definition criteria linked with the types of data analysed, their stratification, and the subjectivity impact of reviewers. In addition, most studies on PARs focused on a limited number of side effects considered to be preventable. As a consequence, using a detailed and specific algorithm could be very interesting if longitudinal surveys within a given hospital or benchmarking comparisons between hospitals are to be carried out.

Most studies published in the literature showed that no single intervention was effective in decreasing readmissions, whether directed at predischarge or postdischarge, or bridging hospital and outpatient care [8]. Therefore, focusing on PARs might be more attractive to clinicians, but should include more detailed clinical data to be useful. Despite the fact that most predictive models developed so far were shown to perform poorly in predicting readmissions [9], a recent study reported the development and validation of a simple score to detect patients at risk of readmission [10], with an interesting result.

We chose to focus on PARRs for obvious reasons, as hospital administrators are concerned about the financial impact of the new reimbursement system, in particular the consequences of the rule for regrouping stays if readmission occurred within 18 days of initial discharge. Thus the finding that most PARRs occurred during the 3 first days following hospital discharge could indicate the introduction of a better follow-up for the period immediately following discharge. However, this is not likely to be a comprehensive solution, as by introducing better coordination and follow-up of patients, access to care was shown to be improved and, paradoxically, to lead to an increase in the readmission rate [11]. The finding that most of these

PARRs were linked to four MDC and mainly occurred in three wards was also interesting, as it might support focusing interventions on these conditions and wards within the hospital. However, all these conditions are not easy to master, especially alcohol and substance abuse, thus limiting the potential efficacy of planned interventions.

Our study has several limitations. Available data did not include socioeconomic characteristics of patients, which would be useful as most of them came from and were discharged home. These data do not include either disease severity or other clinical characteristics, which would be interesting and useful in targeting interventions to reduce PARRs.

Another limitation is linked to the fact that this study was carried out at a single institution in a given healthcare system. Its results are therefore not necessarily applicable to other institutions of other healthcare systems. Furthermore, the data collection was limited to one year. However, other important factors, such as quality of coding or reimbursement system (with its indirect impact on clinical care), were not modified during this time, and therefore the short period of observation is not likely to have an important impact on our results. Nevertheless, the financial impact of the regrouped readmissions might vary every year, depending on the characteristics of the patients and hospital stays involved.

In the given context of limited healthcare resources, PARs represent an obvious target for reducing hospital use and hence costs, and PARRs for reducing loss in reimbursement. However, as they represented only 0.3% of the total hospital reimbursement in 2011, elimination of this waste should not include interventions more expensive than the targeted savings. As a consequence, testing predictive scores to identify patients at high risk for readmission and looking to improve coordination of care between hospital and private practitioners should be encouraged to design cost-effective interventions on PARs and PARRs.

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