

ORIGINAL ARTICLE

Assessing 30-day avoidable readmission rates: Is it an appropriate tool to manage emergency department quality of care?

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ABSTRACT

Objective: Quality indicators, based on administrative data, are being increasingly used to assess avoidable hospital readmission rates. Their potential to identify areas for improvement at low cost is attractive, but their performance in emergency departments (EDs) has been criticised.

Methods: Hospital readmissions were categorised as potentially avoidable or non-avoidable, by a computerised algorithm (SQLape®, version 2016 - Striving for Quality Level and analysing of patient expenditures). Half-yearly rates were reported between July 2015 and June 2016. Two senior physicians conducted a medical record review on 100 randomly selected cases from an ED, flagged as potentially avoidable readmissions (PAR). Results were then discussed with the algorithm's designer.

Results: The algorithm screened 2,182 eligible emergency visits - 105 cases (4.8%), were deemed potentially avoidable by the algorithm. Among 100 randomly selected cases, nine exclusions were due to coding issues and four due to false positives. Overall (N = 87), 20/87 (23%) of readmissions were directly related to sole emergency care, 31/87 (36%) related to healthcare providers other than the ED, and 23/87 (26%) were of mixed provision, while 13/87 (15%) were attributed to the course of the disease.

Conclusions: The study confirms the need for a better understanding of the algorithm's measurement and of its reported results. Careful interpretation is required before a sound conclusion can be made. Indeed, it is apparent that the 30-day PAR quality indicator rate reflects a wider parameter of care than hospitals alone, who understandably tend to concentrate on their own, direct liability of care. In particular the 30-day PAR quality indicator is not well-suited to evaluate ED performance.

Key Words: Quality of care, Quality indicator, Avoidable readmission, Emergency department, Improvement area, Administrative data, Public health

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1. INTRODUCTION

Worldwide, readmission rates are increasingly being used as indicators to measure hospital performance. Software run on routinely coded administrative data of inpatients and rates for Emergency Departments (EDs), are mostly reported within 72 hours of discharge.^[1-4] In the US, the 3M™ Potentially Preventable Readmission Grouping Software reports potentially preventable events, allowing health professionals to improve patient safety and reduce treatment costs.^[5] In Switzerland, SQLape® software is used nationally to identify potentially avoidable readmissions (PAR) within 30 days after discharge, and the results are publicly reported. PAR is an inpatient quality of care indicator which aims to identify areas for improvement,^[6] by tracking the lack of discharge preparation, premature discharge or sub-optimal care and coordination.^[7] However, these indicators have been strongly criticised when used in the emergency medicine field.^[8] Emergency physicians must balance the expected benefits of hospitalisation against clinical uncertainty and the cost associated with inappropriate hospitalisation.^[9] Moreover, it has been shown that for an interval of 7 days or less, there is a better correlation between readmission and aspects of care directly under the control of the hospital.^[10] Over a 30-day period, many different healthcare providers may contribute to the care of patients after an ED visit and therefore influence the 30-day PAR rate. Thus, sub-optimal results may be attributed to the ED, while the causes are, at least in part, external to the department. Nevertheless, if PAR is ignored, there is a risk of losing the opportunity to discover wider opportunities for improvement at a higher, inter-departmental^[11] and inter-hospital level, where there is increasing collaboration and growing public-private partnership.^[12]

An objective of this study was to analyse the application of SQLape®'s algorithm, reporting the 30-day PAR rate, on a Swiss ED patient population, in order to provide a methodology for practical use of the data and to identify the cause of readmissions identified by the software. It is hypothesised that the algorithm is not an adequate tool to specifically measure the performance of an ED department, but has a broader scope, when taking into consideration the whole community of healthcare providers.

2. MATERIALS AND METHODS

The aim of SQLape® is to detect potentially avoidable readmissions (PAR) within a 30-day interval, using routinely coded and administrative data. Previously published^[13] and validated,^[14] the algorithm uses the Disease Related Groups (DRG) billing system's definition of in hospital stay, which only includes patients overpassing midnight in a hospital bed

in an index visit, even in the ED, and returned to that hospital for a second visit.

This is a retrospective study on patients treated by Lausanne University Hospital (CHUV) ED during a 12-month period, from July 2015 to June 2016. CHUV is a 1050 acute somatic beds university hospital.

Readmission is flagged as potentially avoidable if it is related to a symptom or disease known during the index visit, except for specifically listed diseases that are difficult to cure.^[7] The observed PAR rate is the number of eligible discharges, followed by potentially avoidable readmissions, divided by the number of eligible discharges. The expected rate is calculated at a national level and adjusted for each Swiss hospital according to its own case mix. If the observed rate is higher than expected, there is one potential improvement area to find. The quantity of potentially avoidable readmissions to be reduced, corresponds to the difference between the two rates, multiplied by the amount of eligible ED visits.

Patients with an index visit to the ED who were kept for surveillance overnight, or were present at midnight in a bed within the ED, and then returned within 30 days to the hospital, were included. Excluded patients comprised healthy newborns, patient candidates for day-surgery, patients transferred to another hospital or readmitted to another hospital, patients living in another country, deceased patients, and those not spending midnight within the ED.

Medical chart review included 100 randomly selected cases, flagged as potentially avoidable readmissions by the algorithm. Characteristics of admission were collected from ED charts, including basic administrative data, diagnostic and treatment information from the first ED visit. Information collected regarding the readmission included the patient's origin (home, institution, other hospital or specialised clinic), their diagnosis, treatments, and if known, the existence of an intermediate healthcare provider involved in between the two visits. The latter would typically include general practitioners, nursing home physicians, another hospital's ED physician, or the specialist at a specialised clinic. The final destination after the return visit was also recorded and included home (with or without home care), nursing home, specialised clinic and other hospital.

The underlying reasons for readmission were categorised into 19 main causes (see Table 1) and were attributed to the ED, the healthcare system, to both of them, or to the course of the disease. The healthcare system included all healthcare providers having a role in the management of the considered patient.

Cases were then classified with different degrees of avoid-

ability (see Table 2). Because alcoholism and drug use were difficult to judge, the difference between the study’s ED rate and the average Swiss rate was retained, as being the respective degree of avoidability for these two specific groups of cases.

Table 1. Different causes of potentially avoidable readmissions

Causes of potentially avoidable readmission	
A1	Surgical complication
A2	Medication side effect
A3	Other complication
B1	Missed diagnosis
B2	Inappropriate therapy (simple)
B2'	Inappropriate therapy (external to the ED)
B3	Premature discharge
B4	Other discharge deficiency
C1	Post-discharge late appointment (simple)
C1'	Post-discharge late appointment (compliance issue)
C2	Transmission on information too late
C3	Inappropriate ambulatory therapy (simple)
C3'	Inappropriate ambulatory therapy (compliance issue)
C4	Deficient home care
C5	Alcoholism
C5'	Drug use
C5	Other compliance issue
D	Course of the disease
E	Unjustified readmission

A senior ED chief and a senior general surgeon working in the ED at the time of the study, acted as internal reviewers and investigated the observed PAR rate. A further independent review was performed by a third physician, the SQLape® algorithm’s designer, acting as an external reviewer.

The Institutional Review Board approved the study (CER-

VD # 2019-00719), and the hospital gave access to the charts of all ED patients included.

3. RESULTS

Of the 29,078 patients that attended the ED during the study period, 9,716 (33.4%) stayed over midnight. Among them, 2,182 (23%) were an eligible ED visit and 105 cases (4.8%) were deemed potentially avoidable by the SQLape® algorithm. One hundred cases were randomly chosen for the medical chart review. The ratio of the studied period was 1.2 between the observed and expected PAR rate, anticipating 20% of extra potentially avoidable readmission, compared to the Swiss ED mean result. Among 100 randomly selected cases, nine were excluded because they concerned transferred patients, even though their movement did not figure in the administrative files, while four were false positive. The latter included foreseen readmissions (2/4) and readmissions not related to the index visit (2/4) (see Figure 1).

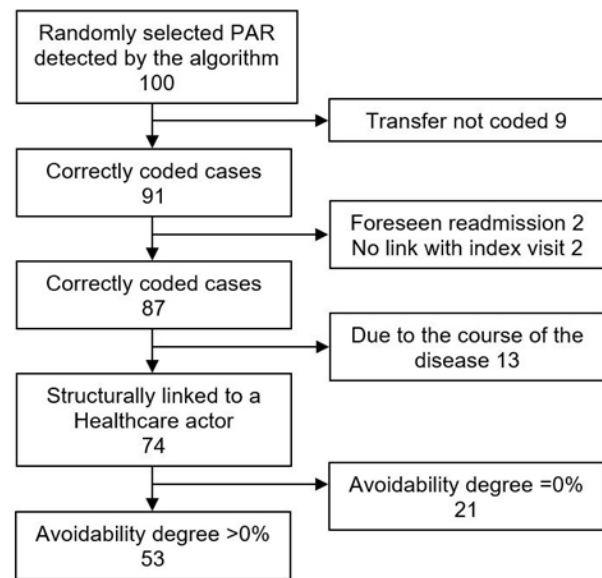


Figure 1. Patients flowchart

Table 2. Degree of avoidability used to classify readmissions

Degrees of avoidability		
-	False positive	Foreseen readmission or readmission not related to index stay
0%	Difficult to avoid	Related to an actor but difficult to avoid (avoidable only for external reviewer)
10%	Possibly avoidable*	Initially not avoidable for clinicians; avoidable after discussion with external reviewer
50%	Probably avoidable#	Avoidable for only 1 clinician and the external reviewer
90%	Avoidable	Avoidable for both clinicians and the external reviewer

Note. * Including drug use cases; # Including alcoholism cases. Degree of avoidability for these two conditions were calculated by the difference between CHUV’s ED rate and national average rate.

Regarding the 87 cases analysed, 23% (20/87) were directly linked to the care delivered in the ED, 36% (31/87) to external healthcare provider other than the ED (GP not available to see the patient within 48h after ED visit, inappropriate care from GP or specialist (new medication not pursued),

lack of specific structure to assist patients with chronic abuse of alcohol or drugs), 26% (23/87) were considered under both external and ED responsibility. Finally, 15% (13/87) could not be linked to any specific provider but were related to the natural course of the disease (see Table 3).

Table 3. Causes and responsibilities of potentially avoidable readmissions (N = 87)

Causes of readmission (N = 87)		ED responsibility	Health Care system responsibility	Shared responsibility	Natural course of the disease
A1	Surgical complication	4			
A2	Medication side effect	1			
A3	Other complication	3			
B1	Missed diagnosis	5			
B2	Inappropriate therapy (simple)	2			
B2'	Inappropriate therapy (external to the ED)			9	
B3	Premature discharge	5			
B4	Other discharge deficiency			6	
C1	Post-discharge late appointment (simple)		5		
C1'	Post-discharge late appointment (compliance issue)			5	
C2	Late transmission of information				
C3	Inappropriate ambulatory therapy (simple)		4		
C3'	Inappropriate ambulatory therapy (compliance issue)			3	
C4	Deficient home care		2		
C5	Alcoholism		9		
C5'	Drug use		2		
C5	Other compliance issue		4		
D	Course of the disease				13
E	Unjustified readmission		5		
	Total	20	31	23	13
	%	23%	36%	26%	15%

Table 4. Degree of avoidability of reviewed potentially avoidable readmissions (N = 87)

Reviewed cases of readmissions and type of concordance	Estimated probability of success	Number of cases	Improvement potential (number of avoidable cases)
Avoidable	90%	7	6.3
Probably avoidable	50%	27	13.5
Possibly avoidable	10%	19	1.9
Difficult to avoid*	0%	34	0
Total		87	21.7 (25%)

Note. * Including 13 cases due to the course of the disease and 21 other cases judged avoidable only by external reviewer.

The median time interval for patients to return to the hospital was 5.4 days (range: 1–23 days) for a PAR structurally linked to the ED, and 11.2 days (range: 1–30 days) for a PAR structurally linked to the healthcare system, or shared between both the ED and an external healthcare provider.

The degree of avoidability of the 87 cases of readmissions is shown in Table 4. Seven out of 87 cases (8%), were considered as avoidable by the three reviewers, with a probability of success estimated to 90%, while 27/87 cases (31%), had an avoidability degree of 50% including 9 due to chronic alcohol consumption. Nineteen out of 87 cases (22%), had an avoidability degree of 10%, among which two cases were related to drug use. Finally, 34/87 cases (39%) were judged as difficult to avoid and included the 13 cases of readmissions related to the course of the disease, and 21 other cases that were considered by both clinicians as almost unavoidable, although the external reviewer disagreed.

The reasons for readmission of patients having an avoidability score greater than 0% (N = 53), were distributed as follows: cardiovascular disease (n = 11); substance abuse among chronic users (n = 8); gastro-intestinal disorders (n = 7); chronic psychiatric disorder other than substance abuse (n = 5); neurological disorders (n = 5); pulmonary disease (n = 4); pain and general health state deterioration (n = 4); infectious disease (n = 2); trauma (n = 2); endocrine disease (n = 2); urological disease (n = 1); Ear-Nose-Throat (n = 1) and nephrology (n = 1).

Among readmissions with a potential avoidability, 70% (37/53) of patients had underlying conditions such as immunosuppression, cancer, mental health disorder or other chronic somatic disease, were institutionalised or had a previously known compliance issue.

Patients discharged from ED following the index visit went home in 87% of cases (46/53) and 13% (7/53) went to a specialised clinic (5/7), or back to their institution (2/7). Overall, one third of discharged patients had a documented notice in their chart they saw an external healthcare provider before returning to the study hospital (14/53), such as specialist physicians (n = 9) and general practitioners (n = 5). Half of readmitted patients with a potential avoidability were hospitalised (25/53), and the other half (28/53), either went back home without further care after the ED visit (25/28), went back to their medicalised nursing home (2/28), or went home with a healthcare network being set up (1/28).

4. DISCUSSION

For the first time, a performance analysis of the SQLape® algorithm nationally used in Switzerland and reporting the 30-day PAR rate has been performed on a Swiss ED patient

population. The results confirm the hypothesis that it is not an ideal tool to specifically measure the performance of an ED department as only 23% of eligible PAR were due to the sole ED (missed diagnosis, premature discharge). The healthcare system alone, or in conjunction with the ED, was responsible for 62% of PAR, while the remaining 15% were caused by the natural evolution of the disease. The usefulness of an algorithm running on routinely coded and administrative data in a hospital, used for tracking areas of improvement, is evident, but as expected, the cases identified do not only point to improvements of the sole hospital department, but mainly to the community of healthcare stakeholders also. This is of prime importance for hospital administrators and clinical department management when they discuss their results. Considering specifically the ED activity, it is essential to warn against simplistic conclusions regarding PAR rate results, using a 30-day delay after discharge as the inclusion criteria.

Following the medical chart review and evaluation of avoidability criteria by the two internal reviewers and the algorithm designer, a potential 25% of the rate of readmissions might be avoided by multiplying the number of readmissions by the expected proportion of success.

An original method was used to assess the avoidability of alcoholism cases. It was considered that half of alcoholism cases might be avoided, as the rate of such readmissions is twice as high at the CHUV than the average rate in Switzerland. With the same logic, a probability of success of 10% was applied to the two cases of drug use. As previously described regarding homeless patients with mental health condition,^[15] readmission of addicted patients can differ greatly between hospitals, particularly if an effective system to admit those patients exists in the community. These patients generally should not be handled by ED, except for life threatening emergencies.

Among 34 cases with a null degree of avoidability, half were due to the course of the disease per consensus among the reviewers. The remaining 21 readmissions were considered initially by both internal reviewers as unavoidable (from the ED unit point of view), but possibly or probably avoidable, by the external reviewer; thus, were graded as 0% avoidability. These cases were all related to external causes, including outpatient follow-up, malnutrition that may have been prevented by home care and low patient compliance.

Only a fifth of PAR cases (n = 20) were clearly related to ED decisions and the median time interval between index admission and readmission was below seven days. A permanent concern of ED is to balance the appropriateness of hospital admissions and the risk of readmission. Indeed, the

aim is not to indiscriminately reduce the PAR rate, as unintended harm can result from this strategy.^[16,17] In other situations, the risk of readmission is known and assumed. ED physicians must evaluate the benefit of not admitting a low-risk patient onto a ward, due to concerns regarding hospital overcrowding and the cost of unnecessary hospital stays. For suspicion of appendicitis, for example, the patient may be discharged with a recommendation to come back if the symptoms are getting worse. This strategy reduces unnecessary hospitalisation, which is clearly the downside when looking at reducing PAR rate.

The 4% of false positives found in this study corresponds to previously reported rate by Halfon et al.^[14]

Since a majority of 30-day avoidable readmissions were related to external causes, ED should establish a closer relationship with general practitioners and home services, to prevent recurrences or further deterioration of patients' health status, but this must be clearly stated in ED mission statements. However, today, EDs do not have neither the responsibility, nor the authority or financial support to organize their local healthcare network.

Regarding specific issues such as alcoholism, drug use, vulnerable patients and patients with underlying chronic disease, it is clear that external healthcare providers should be strengthened, in particular if they are missing.^[18,19] This is of crucial importance, as 70% of readmitted patients in this study belonged to at least one of these categories.

In light of what has been reported in this study and in a healthcare system with growing competition, quality indicators need to be able to differentiate responsibilities. This is even more important as the results are publicly reported. Therefore, if the aim is to measure ED performances specifically, sentinel cases, inappropriate admission and a shorter period for readmission (such as seven days), might be used

instead, as previously proposed by Chin et al.^[10] Also all patients should be included and not only those passing midnight within the ED. At the same time however, a longer period, such as the 30-day PAR rate, cannot be ignored, as it brings a more global view of quality in a healthcare system.

This study has limitations inherent to its retrospective character. Moreover, the algorithm nationally used only takes into account first visits and when the patient passes midnight in the ED. This may be too restrictive for ED patients. It was also not possible, regarding the available data, to be aware of all the visits where patients benefitted from other healthcare providers in between the index visit and the readmission. The research team was only aware of them if documented in the hospital chart. Also, only revisits to the study hospital were considered, omitting patients revisiting other hospitals. Finally, the "degree of avoidability" used in this work is not a validated tool. It has been created by the study team to clarify readmissions and categorize them into groups.

5. CONCLUSIONS

A 30-day PAR rate includes a perimeter of care much wider than hospitals, or EDs, and therefore, careful interpretation of the results must be made before firm conclusions are drawn. Comparing different EDs with such tools makes it difficult to know whether the ED quality of care or the surrounding healthcare network is responsible for ratio variations. Moreover, in a highly competitive environment, hospitals tend to concentrate on their own, direct liability. For ED in particular, other indicators such as sentinel cases, unjustified admission rate, or PAR rate with shorter time intervals should be added. The 30-day PAR rate, however, is essential to evaluate the increasing interactions between healthcare providers within a community.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare they have no conflicts of interest.

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