Readmittance rates within seven days are preferable in quality measuring of emergency departments

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ABSTRACT

INTRODUCTION: The objective of this article was to qualify and test the recommendations of a national Danish report. We conducted an investigation on the readmittance rate as well as reasons for readmittance in a patient cohort defined through the process of internal audit at the Emergency Department at Zealand University Hospital, Køge, Denmark.

METHODS: A retrospective, descriptive study of admitted patients in November 2014, including a total of 1,440 patients. Data and parameters were obtained from electronic patient records.

RESULTS: A total of 162 patients were readmitted within 30 days from their initial admission (11% of the cohort). Of this group, 139 (86%) readmittances were unpreventable or planned. Readmissions caused by missed diagnosis or insufficient treatment accounted for 8% and 6%, respectively. The median time until readmission in these cases were two and four and a half days, respectively. The median time to readmission for the unpreventable readmissions ranged from 13 to 18.5 days.

CONCLUSION: In terms of patient safety, our data support a seven-day observation period for readmission rates when measuring or monitoring quality of care in emergency departments.

FUNDING: none.

TRIAL REGISTRATION: none.

ORIGINAL ARTICLE

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Dan Med J 2016;63(9):A5267

The time consumed and the sheer burden of scrutinising patient records for monitoring quality of care and treatment in emergency departments (EDs) is evidence of the need for development of quality indicators that can provide effective monitoring at a statistical level. To address this issue at a national level, the Danish Institute for Local and Regional Government Research (KORA), issued a report in 2013 on the indicators for quality in evaluation of performance in EDs in Denmark. The report identified four classes of indicators; one related to efficiency, a second to patient safety, a third to patient satisfaction, and a fourth to the organisation of the department. The problem of readmittance has a bearing on all four classes. Thus, readmittance may to some extent be acknowledged as a deficiency in the quality of care in as far as readmitted patients are found to have a higher rate of diagnostic error and insufficiency in treatment [1, 2]. On top of this, readmissions also place a significant extra burden on medical wards giving rise to lengthier admission times and an increase in expenditure [1, 2]. The UK national guidelines on urgent & emergency care clinical quality indicators define an unplanned readmission rate above 5% for readmissions occurring within seven days of discharge as a necessary trigger for investigation into the procedure [3]. Currently, readmittance in Danish EDs is monitored on the basis of a 30-day period [4].

To qualify and test the recommendations of the aforementioned national Danish report, we conducted an investigation on the readmittance rate as well as reasons for readmittance in a patient cohort defined through the process of internal audit at the ED at Zealand University Hospital, Køge. The hospital is a middlesized regional hospital with internal medical, surgical and orthopaedic specialties present. The ED was established in 2009. Initially, it operated as a simple transit department for initial medical evaluation and treatment, but in 2013 it was expanded to include a short-stay unit and to facilitate an independent treatment capacity. Against a catchment area with approximately 250,000 inhabitants, some 15,000 patients are annually admitted to the department for evaluation and treatment. In addition, some 24,000 patients are treated for minor emergency room casualties.

METHOD

Audit data acquisition

As part of an internal audit, patients admitted to the ED in the period from 1 to 30 November 2014 were identified through the electronic hospital registry. Patients only seen in the minor casualty room were excluded from the survey. A total of 1,440 patients were identified and data were obtained from electronic patient records. The patient cohort was divided into three parts of equal size, and each was allocated to a senior physician at the ED (either MS, JJL or JT). The following parameters were recorded:

- Age and gender
- Referral mode: By 112-contact with emergency medical services, by GP, by out-of-hours doctor, by another department or by own initiative.

- Seen by a physician: If seen by physician prior to admittance
- Transportation mode: Indicating the mode of transport to the ED
- Triage: Patients arriving at the ED were subject to triage according to method devised by Skriver et al [5].
- Disposition: Indicates mode of discharge from the ED, whether admitted to a hospital ward for longer-term treatment or specialised evaluation, discharge to an outpatient clinic for elective evaluation or discharge directly to the patient's home.
- Occurrence of readmission within 30 days of admission to ED. An estimate of the reason for readmission was classified according to the following five categories: missed diagnosis, insufficient or erroneous treatment of an identified condition, exacerbation in known chronic condition otherwise correctly treated, admitted for treatment for a new condition and planned readmission. Additionally, a category assigned "Other" was ascribed for patients who did not fit within the defined categories. In **Table 1**, the terms are defined. In addition, the numbers of days from admission to readmission were recorded, and the readmissions were related to whether they occurred after direct discharge from the ED (to home or elective out-patient evaluation) or after admission to a hospital ward.

Using the stacked-area chart function in Microsoft Excel, the reason for readmittance was plotted against time to readmittance from the initial visit to the ED.

Statistics

Differences in reasons for readmittance between patients directly discharged from the ED and patients admitted to hospital wards were tested using the chi-squared test with Yates' correction. A probability value of less than 0.05 was considered statistically significant.

Interobserver agreement for the category "Admitted for treatment of a new condition" was tested calculating the Kappa coefficient as modified by Fleiss for multiple observers [6]. The calculation was performed on the theoretical assumption that the true number of patients being admitted for the treatment of a new condition was equal in the respective groups of patients analysed by the three senior physicians.

Trial registration: none.

TABLE 1

Definitions of readmission classifications.

Classification of readmission	Definition
Missed diagnosis	The patient is readmitted with identical symptoms and following re-evaluation he or she is diagnosed differently and subsequently offered relevant treatment for the malady in question
Insufficient or erroneous treatment of an identified condition	The patient is diagnosed correctly at the 1st visit but discharged with insufficient or erroneous treatment leading to a 2nd admittance
Exacerbation in known chronic condition otherwise correctly treated	The patient experiences an unforeseen worsening in a chronic condition otherwise treated optimally
Admitted for treatment of a new condition	Discharged with a condition and then seen again with a new set of symptoms which may not be related to the condition for which the patient was treated at the initial visit
Planned readmission	Readmitted for treatment or evaluation according to a plan specified at the initial visit
Other	Readmitted for reasons which cannot be otherwise classified

RESULTS

A total of 1,440 patients were admitted during November 2014. The mean age of the patients was 60 years, and the male-female ratio was 52:48. Data regarding referral mode are summarised in **Table 2**.

A total of 162 patients were readmitted within 30 days from their initial admission, corresponding to 11.3% of the cohort. 42% of the readmitted patients were classified as being readmitted for assessment of a new condition and 24% for exacerbation of an otherwise well treated condition on the primary admission. Missed diagnosis was the reason for readmittance of 8% of the patients, and insufficient or erroneous treatment of an identified condition was the reason for 6% of the patients. 7% of readmissions were planned at the initial visit. 12% of the readmitted patients were classified as being admitted for "other" reasons.

There was no significant difference between readmittance rates for patients discharged directly from the ED (12%) compared with patients admitted to hospital wards (11%). Analysis of differences in the reasons provided for readmittance showed a significant difference ($p < 0.05$) in patients admitted due to missed diagnosis. This was the case for 13% of patients directly discharged from the ED compared with only 3% of patients admitted to hospital wards. The median time to readmission in case of missed diagnosis was two days. In case of insufficient or erroneous treatment, the median time to readmission was four and a half days. Except for "Other" reasons, where the median time to readmission was two days, the median time to readmission for the remaining readmission types ranged from 13 to 18.5 days. The data analyses are summarised in **Table 3**. Graphically, the distribution of reasons for readmission in comparison to the time to readmission is shown in **Figure 1**.

The Kappa coefficient for interobserver agreement was 0.753, corresponding to "substantial agreement" [7].

DISCUSSION

Quality of care provided in the ED may be defined along

TABLE 2

Characteristics of patients admitted in the Emergency Department of Zealand University Hospital, Køge.

	n	%
Gender		
Female	693	48.1
Male	747	51.9
Total	1,440	100.0
Age distributiona, yrs		
≤ 10	5	0.3
11-20	70	4.9
21-30	95	6.6
31-40	112	7.8
41-50	197	13.7
51-60	171	11.9
61-70	257	17.8
71-80	295	20.5
81-90	191	13.3
91-100	47	3.3
> 100	0	0.0
Total	1,440	100.0
Referral mode		
112	508	35.3
General physician	428	29.7
Out-of-hours doctor	349	24.2
Own initiative	106	7.4
From other department	29	2.0
Unknown/other	20	1.4
Total	1,440	100.0
Seen by physician		
No	817	56.7
Yes	612	42.5
Unknown	11	0.8
Total	1,440	100.0
Transportation mode		
Ambulance, priority 2: within 30 min.	524	36.4
By self	461	32.0
Unknown	262	18.2
Ambulance, priority 1: immediate transport	99	6.9
Ambulance, priority 3: within 3 h	94	6.5
Total	1,440	100.0
Triage		
Green: allows for 1-h wait	1,166	81.0
Unknown	118	8.2
Yellow: allows for 30-min. wait	92	6.4
Orange: allows for 15-min. wait	40	2.8
Red: immediate attention	21	1.5
Blue: no specified need of attention	3	0.2
Total	1,440	100.0
Disposition		
Hospital ward	751	52.2
Home or general physician	534	37.1
Ambulatory	154	10.7
Unknown	1	0.1
Total	1,440	100.0

a) Mean: 59.7 yrs; median: 64.0 yrs.

TABLE 3

Description of readmitted inside 30 days on the Emergency Department of Zealand University Hospital, Køge.

		% of		Days	
	n	readmitted	all	mean	median
Patients	1,440	–	–	–	–
Readmitted inside 30 days	162	100.0	11.25	–	–
Cause					
Missed diagnosis	13	8.0	0.9	3.7	2.0
Insufficient or erroneous treatment of an identified condition	10	6.2	0.7	5.6	4.5
Exacerbation in known chronic condition otherwise correctly treated	39	24.1	2.7	16.8	18.0
Admitted for treatment of a new condition	68	42.0	4.7	14.6	13.5
Planned readmission	12	7.4	0.8	13.4	13.5
Other	20	12.3	1.4	6.8	2.0
Days					
≤ 1	20	12.3	–	–	–
> 1-3	16	9.9	–	–	–
> 3-7	27	16.7	–	–	–
> 7-14	34	21.0	–	–	–
> 14-30	65	40.1	–	–	–

different dimensions covering topics such as convenience, cost-efficiency and patient safety. The WHO (Europe) simply defines patient safety as the prevention of errors and adverse effects to patients associated with healthcare [8]. Readmittance rates are widely used as an indicator of quality for the assessment of EDs. Many hospitals utilise a unique identifier for each patient allowing for easy obtainability of readmission rates from electronic hospital records. Through consensus, the Danish EDs chose a 30-day period to demarcate the time within which each readmission is to be monitored. But is seems relevant to ask what should be measured within such a period.

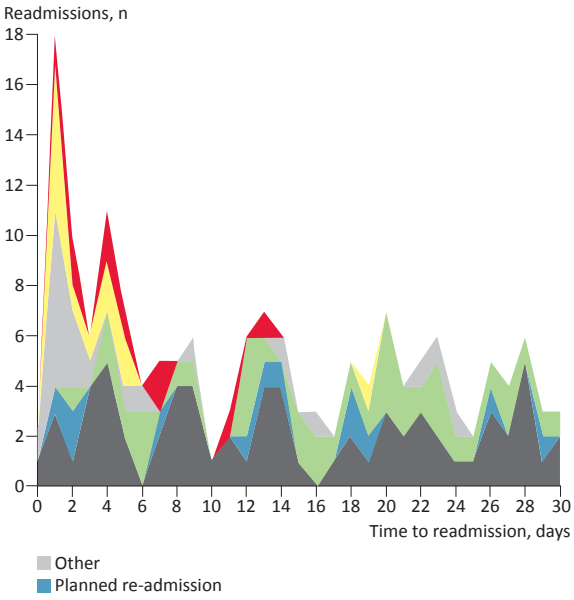
Some readmissions cannot be prevented. The data from the ED at Zealand University Hospital, Køge, show that 68 patients (42% of the readmissions) were readmitted for the assessment of a condition not related to the one that was primarily assessed. A total of 39 patients (24%) were readmitted due to a worsening of a chronic condition that was otherwise well treated. And, lastly, 12 patients (7%) had been scheduled for readmission. Hence, a total of 119 patients (73% of readmitted patients) were readmitted for unpreventable causes. The median number of days passing before readmittance for these causes ranged from 13 to 18 days.

Socalled preventable readmissions, comprising those related to missed diagnosis and insufficient treatment made up 13 patients (8%) and ten patients (6%), respectively. The median number of days until readmission was two days and four days, respectively.

As is also shown in Figure 1, preventable readmissions occurred earlier in the observation period, whereas non-preventable readmissions occurred later in the

FIGURE 1

A stacked areal chart displaying the correlation of the cause for readmission by number of days to re-admission. Readmissions caused by a missed diagnosis ( ) or insufficient treatment ( ) tend to occur within a week, whereas readmissions due to exacerbation of chronic illness ( ) or re-admission due to a new condition ( ) do not correlate with time from re-admission, but is equally distributed over the 30-day observation period.



observation period. In keeping with the definition offered by the WHO (Europe), patient safety involves avoidance of error and adverse effects. The definition poses diagnostic error and insufficient treatment as core parameters, as opposed to unavoidable readmission due to conditions that, within the realm of clinical estimate, may not be predicted, or due to known, but un-predictable variations in chronic illness that is otherwise well treated. Other than the 30-day period, the available literature reports two other lengths of time for observation, namely that of 72 hours and that of seven days. We have not been able to determine from the available literature how the different observation periods were defined. Our data collection favours the use of the seven-day observation period. The relevance of readmission rate within a seven-day observational period as a quality indicator for EDs is strengthened by the fact that diagnostic error was the cause of readmission in a significantly higher number of patients discharged directly from the ED than in patients discharged from hospital wards.

Although readmissions central to patient safety occur within a seven-day period, it must at same time be recounted that 68% of the patients readmitted within seven days were readmitted for reasons more peripheral to the issue of patient safety. The use of a general cutoff mark for statistical benchmarking of clinical performance in EDs therefore requires concrete knowledge of the proportion of these reasons – both over time and in relation to geography. Our data do not offer any general conclusions on this issue. The category "Other" exemplifies the diversity in the reasons for readmittance. The category was assigned as cause of readmission to 20 readmissions; 14 of these occurred within seevn days after the index visit. Some were admitted on social indications, e.g. palliative induced admission of a terminal patient. However, many admissions were of a short duration without any identifiable malady, the socalled *medically unexplainable symptoms*. This can be related to the statement put forward by Pham et al. concerning how many readmissions are caused by socioeconomic reasons, e.g. that certain patients prefer the ED because it is nearer to their homes and more convenient than their own general practitioner [9]. According to Giuseppe et al., there is a significant correlation between return rates and nearby residence [10].

It would require substantial research effort to establish the proportion of readmittances due to reasons that are central to patient safety, if this is at all possible. An alternative would therefore be to review all cases readmitted within seven days for decision on acceptability of reason for readmission. In the present material, 63 patients were readmitted within seven days. On average, for the department in our study, that would mean review of some 15 cases per week.

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ACCEPTED: 6 June 2016

CONFLICTS OF INTEREST: Disclosure forms provided by the authors are available with the full text of this article at www.danmedj.dk

LITERATURE

1. Baer RB, Pasternack JS, Zwemer FL, Jr. Recently discharged inpatients as a source of emergency department overcrowding. Acad Emerg Med 2001;8:1091-4.
2. Verelst S, Pierloot S, Desruelles D et al. Short-term unscheduled return visits of adult patients to the emergency department. J Emerg Med 2014;47:131-9.
3. DH Urgent & Emergency Care. A&E clicinal quality indicators. Implementation guidance. London: Department of Health L, 2010. http://webarchive.nationalarchives.gov.uk/20130107105354/http:/www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/documents/digitalasset/dh_123055.pdf (14 Jun 2016).
4. Brøcker A, Christensen, IE, Bro Lea. KORA – kvalitet og mål i akutmodtagelser. Copenhagen: KORA, 2013. www.kora.dk/udgivelser/udgivelse/i6823/Kvalitet-og-maal-i-akutmodtagelser (14 Jun 2016).
5. Skriver C, Lauritzen MM, Forberg JL et al. Triage quickens the treatment of the most sick patients. Ugeskr Læger 2011;173:2490-3.
6. Fleiss JL. Measuring nominal scale agreement among many raters. Psychological Bulletin 1971;76:4.
7. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159-74.
8. WHO/Europe. www.euro.who.int/en/health-topics/Health-systems/patient-safety (14 Jun 2016).
9. Pham JC, Kirsch TD, Hill PM et al. Seventy-two-hour returns may not be a good indicator of safety in the emergency department: a national study. Acad Emerg Med 2011;18:390-7.
10. Di Giuseppe G, Abbate R, Albano L et al. Characteristics of patients returning to emergency departments in Naples, Italy. BMC Health Serv Res 2008;8:97.