

Evaluation of quality improvement interventions to reduce inappropriate hospital use

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Abstract

Objective. To assess the impact of process analyses and modifications on inappropriate hospital use.

Design. Pre–post comparison of inappropriate hospital use after process modifications.

Setting. The Department of Internal Medicine of the Geneva University Hospitals, Switzerland.

Participants. A random sample of 498 patients.

Interventions. Two processes of care (i.e. non-urgent admissions and transfer to a rehabilitation hospital), which influenced inappropriate hospital use, were identified and modified. The impact of these modifications was then assessed.

Main outcome measures. The proportion of inappropriate hospital admissions and inappropriate hospital days.

Results. As a baseline assessment before quality improvement interventions, the appropriateness of hospital use (admissions and hospital days) was evaluated using the Appropriateness Evaluation Protocol (AEP) in a sample of 500 patients (5665 days). After modification of the two processes through a quality improvement program, inappropriate hospital use was reassessed in a sample of 498 patients (6095 days). Inappropriate hospital admissions decreased from 15 to 9% ($P=0.002$) and inappropriate hospital days from 28 to 25% ($P=0.12$).

Conclusion. Using the AEP as a criterion, the quality improvement interventions significantly reduced inappropriate hospital use due to the process of non-urgent admissions, but the reduction of inappropriate hospital days specifically attributed to the transfer to the rehabilitation hospital did not reach statistical significance.

Keywords: inappropriate hospital use, internal medicine, quality assurance

Many countries, including Switzerland, are confronted with increasing deficits in the health care sector. In this context, eliminating inappropriate use of health services is one among several methods to satisfy financial constraints without compromising quality of care [1]. In an effort to reduce public expenses, the Geneva University Hospitals reduced their number of beds from 1450 to 1100 between 1994 and 1998; at the same time, the Department of Internal Medicine reduced its number of beds from 502 to 399. The Department

of Internal Medicine was actively involved in managing the decrease in hospital beds, and approached this issue as a quality improvement process involving the following steps: a baseline measurement of inappropriate use; identification of the causes of inappropriate use; modification of faulty processes; implementation of the modifications; and measurement of the impact of these changes. The baseline assessment has been published previously [2,3]; this paper reports on the subsequent steps of the quality improvement cycle.

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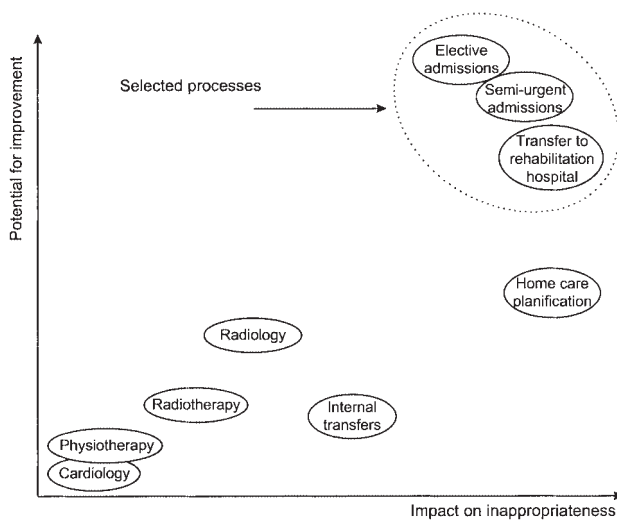


Figure 1 Classification of processes of care according to their overall impact on inappropriate hospital use and their potential for improvement.

Methods

A first cross-sectional measure of inappropriate hospital use was performed between 1 December 1994 and 28 February 1995 in a 1:2 sample of 500 patients admitted to the wards of the Department of Internal Medicine. The appropriateness of admissions and hospital days was assessed using the Appropriateness Evaluation Protocol (AEP) [4]; 15.2% of admissions [2] and 27.9% of hospital days [3] were rated as inappropriate.

A more extensive search for the causes of inappropriateness through individual interviews with key informants involved in the functioning of the department and a quantitative as well as qualitative analysis of the activities performed in the department was conducted by a consulting team. This approach led to the identification of 14 processes likely to generate inappropriate use of hospital services. They were linked to admission processes (elective admissions, semi-urgent admissions, admissions through the emergency room), specialized examinations (laboratory analyses, cardiological exams, radiological exams, endoscopies), specialized procedures (physiotherapy rehabilitation, radiotherapy), co-ordination with other services (specialized consultations, transfers between units of care), or to discharge processes (discharge towards home, home care planning, discharge to the rehabilitation hospital).

These 14 processes were examined by a working group of 21 persons who either managed the Department of Internal Medicine or represented service providers (emergency room, radiology, home care, etc.). Their motivation consisted of attempting to reduce a waste of hospital resources, in the perspective of the introduction of a prospective payment system in Switzerland. Processes were rated on (i) overall impact on inappropriate hospital use and (ii) potential for improvement (Figure 1). Three processes received high scores

on both criteria: non-urgent admissions through the emergency room; elective admissions directly to the internal medicine wards without assessment in the emergency room; and discharge from the wards of internal medicine to a rehabilitation and semi-acute care hospital. Two working groups were mandated to modify the faulty processes.

(a) Admission process

The group determined that much of inappropriate hospital use was due to non-urgent admissions, which evaded triage by hospital physicians, and to unplanned admissions for elective treatments or investigations. Both types of admissions represented patients sent to the hospital by community physicians. After involving these physicians in the search for practical solutions by means of a postal questionnaire, the working group implemented a telephone hotline. The main goal of the telephone hotline was to provide community physicians with a medical respondent that would be a member of the Department of Internal Medicine, medically competent, and aware of the wards' occupancy rates. The community physicians would therefore be able to discuss the necessity of the admission, and discuss with a colleague their views about investigation and treatment plans. The expected benefit for the community physicians was the ability to reach, at any time, a member of the hospital medical team; for the hospital physician, the telephone discussion was considered as a medical act.

(b) Discharge to the rehabilitation hospital

This group identified several inefficiencies in the planning and transfer of the patient to the rehabilitation hospital. Both the handling of the transfer request and patient transfer itself were simplified. The original process (Figure 2, a) implied the intervention of at least five persons, and the transfer forms transited several times from one person to the other. After process modification (Figure 2, b), the number of implied persons was reduced and the forms were transmitted only once to each person.

The intervention itself consisted of the implementation of the reorganized processes in the Department of Internal Medicine.

The main evaluation of the impact of the interventions was a before-and-after study of the proportion of inappropriate admissions and hospital days. The follow-up study took place between 18 November 1996 and 14 February 1997. A systematic 1:2 sample of admitted patients was enrolled until a sample size of 500 was reached. As before, each admission and each hospital day were assessed using the AEP by trained abstractors. The main reasons for inappropriate hospital days were determined using the delay tool [5,6]. As each inappropriate hospital day could have several reasons for inappropriateness, we examined how many times a cause of inappropriateness was mentioned; therefore, the total number of possible causes exceeded the number of inappropriate hospital days. Information was collected from patients' charts on the second day of their stay for appropriateness of

included patient characteristics (age, sex), and characteristics of hospital stay (appropriateness of admission, length of stay) and of hospital day (day of week, rank of each day, time remaining before discharge). Adjustment for possible confounders was performed by means of logistic regression models, where standard errors were computed using robust methods that take lack of independence into account [8]. Analyses were run on Stata 5.0 software (Stata Corporation, College Station, TX, USA).

Delays between emission of a transfer request form by an internal medicine ward and its receipt at the rehabilitation hospital, as well as delays between receipt of the request form and actual transfer, were compared before and after intervention. Data for this analysis were obtained from administrative files of the two treatment facilities. The time requested to complete transfers before implementation of the new procedure (642 transfers between January and October 1995) was compared with data collected after implementation of the new transfer procedure (484 transfers between April and December 1996). The mean time for the whole transfer process between the internal medicine wards and the rehabilitation hospital was 7.9 days before modification of the process (2.5 days for the transfer request to reach the rehabilitation hospital and 5.4 days for effective patient transfer).

Results

Only 498 admissions were included in the second appropriateness survey because information on two patients was duplicated. Type of admission and distribution of age groups differed between baseline and follow-up (Table 1). Patients older than 80 years were fewer in 1996–97 than 2 years earlier. However, mean age was similar (65.8 versus 67.0 years; $P=0.6$).

The proportion of inappropriate admissions decreased by 43% (15.2 versus 8.6%; $P=0.002$) and the proportion of inappropriate hospital days by 12% (28.0 versus 24.8%; $P=0.12$). The 76 inappropriate admissions at baseline generated 938 hospital days, of which 51% (481) were inappropriate. At follow-up, inappropriate admissions ($n=43$) generated 540 hospital days, of which 53% (287) were inappropriate. This proportion was not statistically different ($P=0.49$). It is of note that length of hospital stay (LOS) between appropriate and inappropriate admissions was not statistically different before (11.2 ± 8.0 versus 12.3 ± 10.3 days; $P=0.26$) or after (12.2 ± 9.8 versus 12.6 ± 9.8 ; $P=0.83$) the interventions.

The risk of experiencing an inappropriate day of hospitalization decreased modestly, and not significantly, between baseline and follow-up [odds-ratio 0.8; 95% confidence interval (CI) 0.7–1.0]. After adjustment for possible confounders, which included the appropriateness of admission, the difference remained non-significant (odds-ratio 1.0; 95% CI 0.8–1.2).

Table 1 Comparison of patient characteristics at baseline and follow-up surveys

Patient characteristics	1994–95 ($n=500$), no. (%)	1996–97 ($n=498$), no. (%)	<i>P</i>
Sex			
Men	282 (56)	283 (57)	0.9
Women	218	215	
Age (years)			
Less than 50	92 (18)	73 (15)	0.03
50–79	275 (55)	316 (63)	
80 and over	133 (27)	109 (22)	
Length of stay (days)			
Mean	11.3	12.2	0.2
Median	9	10	
Type of admission			
Direct	121 (24)	127 (26)	0.03
Through emergencies	321 (64)	286 (57)	
Internal transfers	58 (12)	85 (17)	
Destination at discharge			
Home	314 (63)	339 (68)	0.4
Rehabilitation hospital	60 (12)	50 (10)	
Other facility	81 (16)	72 (14)	
Deceased	45 (9)	37 (7)	

Table 2 Inappropriate hospital admissions, due to specific reasons, before and after implementation of a modified admission process at the Department of Internal Medicine of the Geneva University Hospitals

Reason for inappropriateness of admission	1994–95 ($n=500$), no. (%)	1996–97 ($n=498$), no. (%)	<i>P</i> ¹
Private practitioner asking for diagnostic exams	50 (10.0)	35 (7.0)	0.1
Private practitioner asking for social hospitalization	11 (2.2)	3 (0.6)	0.06
Other reasons	15 (3.0)	5 (1.0)	0.04
Total	76 (15.2)	43 (8.6)	0.002

¹Fisher's exact test.

The proportion of inappropriate admissions due to specific reasons did not differ between baseline and follow-up (chi-square test, $P=0.2$) (Table 2). However, inappropriate admissions generated by requests from private practitioners (diagnostic examinations and social hospitalizations), which represented 61 admissions (12.2% of all admissions) at baseline, decreased to 38 admissions (7.9%) at baseline ($P=0.02$, Fisher's exact test).

Table 3 Inappropriate hospital days, due to specific reasons, at baseline and at follow-up

Reason for inappropriate hospital day	1994–95 (<i>n</i> = 2736), days (%)	1996–97 (<i>n</i> = 2982), days (%)	<i>P</i> ²
Due to hospital physicians	161 (5.9)	102 (3.4)	0.03
Due to patients	4 (0.2)	19 (0.6)	0.06
Due to scheduling of diagnostic procedure	118 (4.3)	124 (4.2)	0.90
Due to the performance of a diagnostic procedure	43 (1.6)	43 (1.4)	0.82
Due to specialized consultations	80 (2.9)	60 (2.0)	0.26
Due to discharge processes other than to rehabilitation hospital	336 (12.3)	343 (11.5)	0.68
Due to discharge to the rehabilitation hospital	155 (5.7)	100 (3.4)	0.09

¹Only hospital days assessed by the reviewer participating in both studies were included in this analysis. Since several causes of inappropriateness are possible for a single day, the total for these columns exceeds the total number of inappropriate days. *P*² is adjusted for intra-patient correlation.

The proportion of inappropriate hospital days due to specific reasons was compared only for the days assessed by the reviewer who participated in both surveys (2736 days at baseline and 2982 days at follow-up) (Table 3). It is of note that the reduction in inappropriate hospital days in this subgroup was similar to the one in the whole sample (29% in 1994–1995 versus 25% in 1996–1997). The proportion of inappropriate days in which delays from physicians were mentioned decreased significantly. The proportion of inappropriate days due to specialized consultation, as well as to transfer to a rehabilitation hospital decreased, although not significantly. Inappropriate hospital days attributable to delays due to patients (for example a patient refusing to be transferred to another facility) increased between baseline and follow-up, but remained negligible in absolute terms. The proportion of inappropriate hospital days generated by other causes remained unchanged.

After modification of the transfer process, the mean time for the whole transfer process significantly decreased to 5.4 days (mean time for request transfer 1.5 days, *P* < 0.0001; mean time for patient transfer 3.9 days, *P* < 0.0001).

Discussion

This study shows the results of a full quality improvement cycle that identified a dysfunction, attempted to correct the processes responsible for it, and evaluated the results of

corrective interventions. After the interventions, the proportion of inappropriate admissions sharply and significantly decreased, whereas the proportion of inappropriate hospital days decreased only a little, and not significantly.

A substantial decrease in the number of inappropriate hospitalizations occurred after a phone line dedicated to plan elective admissions was made available to community physicians. This favourable effect may be due either to more effective planning of in-hospital procedures, or to a transfer of some procedures to the outpatient sector.

The modest decrease of inappropriate hospital days was a disappointment. However, it must be recognized that a sharper reduction was unlikely, since only one discharge process was modified (i.e. transfer to the rehabilitation hospital), which accounted for only 5.7% of all hospital days during the baseline survey. Nevertheless, this process was selected because such transfers represented the third leading cause of inappropriate hospital days (important impact on appropriateness), and because the Department of Internal Medicine had a full control over its modification and could implement the modified process without the cooperation of other hospital departments (important potential for improvement). That proportion dropped to 3.4% after the intervention. Even though the difference was not statistically significant, other indicators measuring the process (transfer delay dropping from 7.9 to 5.4 days) showed that the intervention did have an actual impact. Thus, we believe that the reorganization of the discharge process was effective, but that its effect was diluted among many other causes of days, which remained untouched. It is also possible that improvement of selected hospitalization processes may cause or reveal inefficiencies elsewhere, such that the final proportion of inappropriate hospital days does not vary, which is what an improvement cycle is about. For instance, we do not know whether the increase of inappropriate hospital days attributed to the patient was related or not to the more efficient discharge process. Some things have an impact, some have less impact than expected but suggest areas for future improvement. Other processes, such as scheduling diagnostic procedures or discharge processes other than to the rehabilitation hospital, were generating inappropriate hospital use. However, since several other departments had to be involved in their modification, they were more difficult to work on. Potential for their improvement existed nevertheless, but the level of intervention had to evolve from an intra-departmental to an inter-departmental one.

Other studies reported interventions aimed at reducing inappropriate hospital use, such as introducing specific appropriateness criteria in patient charts [9] or providing informational feedback on appropriateness of hospital use to hospitals and physicians [10]. Although generally successful in reducing inappropriate hospital use during the intervention periods, these studies were limited in their duration. Our goal was rather to permanently modify a standard procedure in order to minimize the need for reminders. Indeed, since its opening, the telephone hotline has been increasingly used by community physicians (the number of calls received increased from 330 in 1996 to 878 in 2001).

The design of our study has some limits. We cannot rule out, for example, a prior trend to the reduction of inappropriate admission and stays, or the possible existence of other concomitant changes that might have affected the results. However, since the selected processes were under full control of the Department of Internal Medicine and since the implementation of the correction was run only in the same department, we think that these potential biases did not substantially influence the results. In addition, overall bed occupancy in the Department of Internal Medicine evolved from 80% during the baseline period to 83% during the follow-up period. Thus, it is unlikely that changes in admission rates influenced inappropriate hospital use during the study period. It should be added that in the canton, or province, of Geneva (380 000 inhabitants), there is only one large, 1100-bed community hospital, which is also the teaching University Hospital. Other hospitals in the canton are private institutions, which take care of patients with special insurance coverage (private insurance); thus, these institutions do not share a patient population with the Geneva University Hospitals, which means that no patient shift to or from the University Hospitals can have accounted for the changes observed during the study period.

Other questions remain unanswered. Firstly, we expected that the reduction of inappropriate hospital days would have been accompanied by shorter length of stay, but length of stay, if anything, increased. This result is reminiscent of a previous report that inappropriate use of resources does not explain variations in resource use [11]. A possible explanation might be that some hospitalizations for investigations, which are usually short, were diverted to the ambulatory sector, thus inflating length of stay. In addition, shorter length of stay has been shown to be poorly associated with the appropriateness of hospital use [12].

Another problem pertains to the performance of the instruments we used. Even though the reliability of the AEP was satisfactory, an average kappa of 0.7 implies that 30% of the variance in AEP assessments resulted from random errors. Such random errors may have contributed to obscure a small but real before–after difference. Thus, when expected changes are small, more reliable instruments than the AEP may be necessary. In addition, the validity of the AEP has been questioned, notably because it does not examine the appropriateness of medical procedures, such as the maintenance of an intravenous line, which can justify a day in hospital.

Finally, the sensitivity to change of the AEP, which would be its most important property for before-and-after studies, remains unknown. We suggest that the AEP at least be supplemented by more specific outcome measures that directly measure the health care processes which have been modified (such as the delay between transfer request and actual transfer). In addition, the reliability of the delay tool clearly needs to be investigated.

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