Are PRO Discharge Screens Associated with Postdischarge Adverse Outcomes?

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Objective. We evaluate whether patient outcomes may be affected by possible errors in care at discharge as assessed by Peer Review Organizations (PROs).

Data Sources/Study Setting. The three data sources for the study were (1) the generic screen results of a 3 percent random sample of Medicare beneficiaries age 65 years or older who were admitted to California hospitals between 1 July 1987 and 30 June 1988 (n = 20,136 patients); (2) the 1987 and 1988 California Medicare Provider Analysis and Review (MEDPAR) data files; and (3) the American Hospital Association (AHA) 1988 Annual Survey of Hospitals.

Study Design. Multivariate logistic regression analysis was used to evaluate the association between the results of generic discharge screens administered by the PROs and two patient outcomes: mortality and readmission within 30 days. The analysis was adjusted for other patient characteristics recorded on the uniform discharge abstract.

Principal Findings. Four discharge screens indicated an increased risk of an adverse outcome–absence of documentation of discharge planning, elevated temperature, abnormal pulse, and unaddressed abnormal test results at discharge. The other three discharge screens examined–abnormal blood pressure, IV fluids or drugs, and wound drainage before discharge–were unrelated to postdischarge adverse outcomes.

Conclusions. Generic discharge screens based on inadequate discharge planning, abnormal pulse, increased temperature, or unaddressed abnormal tests may be important indicators of substandard care. Other discharge screens apparently do not detect errors in care associated with major consequences for patients.

Key Words. Quality of health care, professional review organization, Medicare, discharge planning, medical instability at discharge

Peer Review Organizations (PROs) use the technique of generic screening to detect quality problems in the delivery of care to Medicare patients. Generic screening, which uses particular events or patient conditions found in the medical record to initiate the need for further review, was instituted as part of the Medicare prospective payment system (PPS) in 1983 to assure that the quality of care was maintained.

The rationale behind generic screens is that the particular event or condition used in the review is an indicator of substandard care. Substandard care in and of itself is worth detecting, but an important assumption is that these generic screens are linked to adverse patient outcomes, the ultimate test of inadequate or inappropriate care. However, the link between generic screens and adverse outcomes has never been confirmed. Furthermore, the use of generic screens has been criticized for being both inefficient and inaccurate (Rubin, Rogers, Kahn, et al. 1992; Sanazaro and Mills 1991). In this article we analyze the relationship between generic screens of the patient's condition at discharge and adverse outcome, defined as death or readmission, that occurs after the patient leaves the hospital. We restrict our analysis to the relationship between discharge screens and postdischarge events, because the assessment of screens that pertain to care delivered during the hospitalization may be biased by the reviewer's knowledge of what subsequently happened to the patient in the hospital.

METHODS

The generic screens used by the PROs to evaluate patients at discharge are listed in the Appendix. The screens examined in this study are Screen 1 (adequacy of discharge planning) and Screen 2 (medical stability of the patient at discharge). The other screens–Screen 4 (nosocomial infections), Screen 5 (unscheduled return to surgery within the same admission), and Screen 6 (trauma suffered in the hospital)–pertain to events that took place during hospitalization and were used in this study to adjust for patient risk of postdischarge adverse outcomes. Screen 3 is used to record unexpected in-hospital deaths. It was not used in this study, since patients who died in the hospital were eliminated from the study.

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Trained nurses and physicians employed by PROs use these screens to review medical records of admissions selected for auditing. Admissions are audited by PROs for various reasons, including examination of day outliers, cost outliers and certain DRGs. A 3 percent random sample of cases is also obtained for annual peer review to assess quality of care. Once an admission is audited, the medical record for that admission and only for that admission is provided to PRO nurses and physicians. Therefore, nurse and physician reviewers are blinded to patient outcomes after discharge.

An admission that fails to pass any one of the 16 generic screens administered by a nurse reviewer is forwarded to a PRO physician for further review and analysis, except for admissions that failed only Screen 1, adequacy of discharge planning. PRO physicians then review the medical records to decide whether the admissions failing the nurse's review constitute a quality of care problem. While the nurse uses strict guidelines to identify screen failures, it is up to the physician to determine whether the management of the patient indeed reflects inadequate or inappropriate care. Both nurse and physician results of PRO generic screens were used in this study.

SOURCES OF DATA

This research analyzed the results of the California PRO generic screens on admissions of Medicare patients age 65 or older who were admitted to hospitals between 1 July 1987 and 30 June 1988. The California 3 percent annual random sample was used in this study and resulted in a total of 27,618 admissions. California was chosen because it had the largest number of Medicare patients among all states. The database contained the results of the generic screens and claims information pertaining to the hospital stay for which the screens were conducted. That included demographic information, diagnoses with up to five International Classification of Diseases 9th Revision Clinical Modification (ICD-9-CM) diagnostic codes, and procedures with up to three ICD-9-CM procedure codes. This core data set was merged with the 1987 and 1988 California Medicare Provider Analysis and Review (MEDPAR) data files by patient's Medicare number. This process ensured that, for each admission in the core data set, all admission information for at least 180 days before and at least 30 days after the index admission was included, which resulted in a total of 85,771 admissions. The date of death is updated routinely on the MEDPAR hospital record using Social Security Administration files. The third database used in this study was the American Hospital Association's (AHA) 1988 Annual Survey of Hospitals. All information on hospital structure was obtained from this survey.

INCLUSION/EXCLUSION CRITERIA

Before beginning the analyses, admissions were selected from the sample using the criteria in Table 1. Because this article is to study the relationship of "discharge screens" and the adverse outcomes of postdischarge mortality and readmissions, patients who died in the hospital, those who were directly transferred to another acute care hospital, or those who left the hospital against medical advice were excluded. In order to make the admissions in the study sample more homogenous with respect to the type of hospitals in which they were treated, admissions to non-AHA hospitals and hospitals with swing beds were eliminated from this study. Hospitals with swing beds are rural hospitals that also care for patients who would otherwise be transferred to a nursing home or another institution for extended care if the appropriate institution were available. For the patient who had multiple admissions between 1 July 1987 and 30 June 1988, only the last reviewed admission was included in the analyses, which resulted in the deletion of 1,044 admissions.

Coding problems also affected the admissions selected. For 177 patients information on the discharge destination of the index admission was inconsistent with what happened after discharge. In some cases, for example, the discharge destination of the index admission was a transfer, but no admission records were found after the index admission. These were dropped. An additional 119 patients were deleted from the sample since coding was unclear. The records of 23 of these 119 admissions indicated that they were discharged from the hospital and died on the same day. These might have been in-hospital deaths that were incorrectly coded as a discharge. The other 96 admissions were discharged from one hospital and admitted to another on the same day. While these patients were coded as a discharge, they might be miscoded transfers. Since we did not have access to the medical records necessary to verify that these cases were not coding errors, these admissions were deleted from this study.

After the inclusion/exclusion criteria were met, the study sample contained 20,136 individual subjects, none of whom was counted more than once and all of whom were at risk for adverse outcomes after discharge.

PATIENT CHARACTERISTICS

The following comorbidity conditions were used to adjust for variations in the health status of study patients at discharge: diabetes (ICD-9-CM diagnostic codes: 250–250.99), hypertension (401–402, 402.1, 402.9, 403–405.99)

Table 1: Selection of Study Admissions of California Medicare Patients (7/1/87–6/30/88)

	No.
PRO-reviewed admissions (a 3% random sample of California Medicare admissions 7/1/87–6/30/88)	27,618
Admissions excluded	
Step 1	
Admission occurred after recorded date of death	4
Alcohol drug units	9
Step 2	
Died in the hospital	2,068
Transferred to another acute care hospital	774
Left against medical advice	160
Admitted by court/law enforcement	5
Admitted for an organ transplant procedure	4
Source of admission unknown	48
Not AHA hospital	3,412
Swing-beds hospital	208
Inconsistent information on discharge destination	177
Died on the day of discharge	23
Readmitted to another acute care hospital on the day of discharge	96
Step 3	
Not general medical-surgical hospital	16
Step 4	
Not "last" reviewed admission	1,044
Total admissions in the study sample	20,136

Note: Since some admissions were excluded for more than one reason, the total number of admissions included in the analyses is greater than the initial number minus the total number excluded. AHA denotes American Hospital Association.

ischemic heart disease (411–414.99), cancer (141–160.9, 162–172.9, 174–209.9), pneumonia (480–487.9, 491–492.9,496–496.9), congestive heart failure (398.91, 402.01, 402.11, 402.91, 428–428.9, 785), acute myocardial ischemia (410–410.9), renal failure (582–583.9, 585–587.9), psychological disease (290–290.9, 294–299.9), other coronary diseases (426–427.9, 429–429.2), liver disease (571–572.9), and stroke (430–438.9). Comorbidity conditions for each patient were gathered from the diagnosis codes listed on admission records of the index admission and all other admissions occurring within 180 days prior to the index stay (Roos, Nicol, and Cageorge 1987; Roos et al. 1989; Wennberg 1987; Wennberg, Roos, Sola, et al. 1987).

The diagnosis codes for comorbidity adopted in this analysis were originally used for the HCFA mortality study (Health Care Financing Administration 1991). Since certain diagnosis codes in the HCFA mortality study were originally assigned to more than one comorbidity category, these diagnosis codes were reassigned in this study to the comorbidity category with a higher association to adverse outcomes, and deleted from the comorbidity category with less association to adverse outcomes. Hence, no patient was included in two different comorbidity categories because of a single diagnosis code. However, a patient was classified according to each comorbid disease, so that a patient with ischemic heart disease and diabetes would be classified in both categories. We were unable to assess the severity of a given comorbid condition, since additional medical history, physical findings, and laboratory results are not currently available in the Medicare data files.

Also used to adjust for characteristics of the study admission that might be associated with outcome were patient demographic information (Anderson and Steinberg 1984; Fethke, Smith, and Johnson 1986; Gooding and Jette 1985), type of admission, source of admission, total number of procedures performed, total number of diagnoses recorded, and total number of hospitalizations occurring within 180 days prior to the index stay (Anderson and Steinberg 1985; Beebe, Lubitz, and Eggers 1985; Dubois, Brook, and Rogers 1987; Eggers 1982; McCall and Wai 1983; Wennberg, Roos, Sola, et al. 1987). For accuracy in calculating the total number of prior hospitalizations occurring within 180 days, the data were carefully edited so that each hospitalization counted only once, regardless of the number of admission records it generated and the number of either or both in-hospital or inter-hospital transfers it involved. In addition, PRO screens of nosocomial infections, unscheduled return to surgery within the same admission, and trauma suffered in the hospital were used to assess events that occurred during the admission. Holloway et al. have shown that the patients with chronic diseases who had surgery during a hospital stay were more likely to be readmitted (Holloway, Thomas, and Shapiro 1988; Holloway and Thomas 1989). To control for the effect of this risk factor on the postdischarge adverse outcomes, we included, as independent variables, interaction terms between comorbidity and whether any surgical procedure was performed during the index stay.

STATISTICAL ANALYSIS

We performed univariate analyses to define the relationship of each discharge screen to the likelihood of adverse outcomes. We used the chi-square or

Fisher's exact test to assess statistical significance of each nominal risk factor. Multivariate logistic regression analysis was then used to evaluate the independent effect of each characteristic of interest. A dichotomous dependent variable was created based on the occurrence of an adverse outcome within 30 days. The independent variables were patient demographics, admission and comorbidity information, the comorbidity/surgery interaction terms, and nurse and physician screen results with at least five screen failures. The discharge screens in the analysis are shown in Table 3. The nurse and physician screens with fewer than five screen failures were not included in the analyses (nurse screens: complications of anesthesia and transfusion error; physician screens: wound drainage before discharge, unplanned organ repair, fall with injury in the hospital, complications of anesthesia, transfusion error, and hospital-acquired decubitus ulcer). Variables were selected for a "best" regression equation according to stepwise procedures. Both forward and backward stepwise procedures were used to identify the best equation. The significance limit used to enter or remove a variable was .05.

RESULTS

Table 2 shows the demographic, admission, and comorbidity characteristics of study patients. Of the 20,136 patients, 4.2 percent died after discharge and 15.1 percent were readmitted to hospitals within 30 days. Together they constitute 17.6 percent of study patients. Except for inadequate discharge planning and unaddressed abnormal diagnostic results, all nurse discharge screens occur at frequencies below 2 percent, as shown in Table 3. After physician review, the frequency of a confirmed discharge quality problem is even lower, the largest category being unaddressed abnormal diagnostic results with 1.3 percent. Thus, the nurse screens detect a large number of events (over 90 percent) that subsequently are judged by physicians not to be a quality problem.

Table 3 shows the unadjusted mortality and readmission rates for discharge screens. Of the nurse screens, absence of documentation of discharge planning, elevated temperature within one day of discharge, and IV fluids or drugs on the day of discharge were associated with postdischarge death. Unaddressed abnormal diagnostic results at discharge was the only significant nurse discharge screen indicating an increased likelihood of readmission. Of the physician screens, elevated temperature on the day prior to or the day of discharge and unaddressed abnormal diagnostic results at discharge were

Table 2: Characteristics of the 20,136 California Medicare Admissions (7/1/87–6/30/88)

Characteristic	*Value Percent (No.)*
Patient-related	
Age	75.49 ± 7.33*
Sex	
Male	52.2 (10512)
Female	47.8 (9624)
Race	
Caucasian	89.2 (17966)
African American	6.3 (1268)
Other	4.5 (902)
Admission-related	
Type of admission	
Emergency	37.6 (7577)
Urgent	37.2 (7489)
Elective	25.2 (5070)
Source of admission	
Physician or clinical referral	52.4 (10550)
Transfer from a hospital or long-term care facility	3.3 (663)
Emergency room	44.3 (8923)
Total no. of procedures per admission	1.37 ± 1.15
Total no. of diagnoses per admission	3.57 ± 1.39
Prior hospitalizations within 180 days per admission	0.56 ± 1.04
Comorbidity	
Diabetes	12.9 (2595)
Hypertension	21.9 (4408)
Ischemic heart disease	24.6 (4958)
Cancer	14.4 (2891)
Pneumonia	21.0 (4221)
Congestive heart failure	16.4 (3303)
Acute myocardial ischemia	4.2 (844)
Renal failure	3.5 (713)
Psychological disease	4.0 (815)
Other coronary diseases	24.5 (4933)
Liver disease	1.2 (247)
Stroke	11.1 (2229)
Outcome	
Death	4.16 (837)
Readmission	15.09 (3038)

Note: From 20,136 different patients.

*Plus-minus values are means ± s.d.

associated with postdischarge mortality. Abnormal pulse within 24 hours of discharge and unaddressed abnormal diagnostic results at discharge were associated with readmission.

Table 4 reports the adjusted odds ratios for those patient characteristics, comorbidities and comorbidity/surgery interactions that were significantly associated with the risk of an adverse outcome. The portion of variance explained by patient characteristics alone was 14.8 percent for postdischarge death and 5.1 percent for readmission. The area under the receiver operating curve (ROC) was 0.809 for the mortality model and 0.661 for the readmission

Table 3: Discharge Screen Failures and Unadjusted Postdischarge Mortality and Readmission Rates for 20,136 California Medicare Admissions (7/1/87–6/30/88)

Characteristic	*Screen Failure No.*	*Mortality % (no.)*	*Readmission Rate % (no.)*
PRO Generic Screens†			
Nurse Screens			
Adequacy of discharge planning			
1. No documented discharge planning	1564	2.37 (37)***	16.18 (253)
Indications of medical stability of the patient at discharge			
2a. Abnormal blood pressure	195	5.13 (10)	16.92 (33)
2b. Elevated temperature	48	22.92 (11)***	8.33 (4)
2c. Abnormal pulse	67	7.46 (5)	19.40 (13)
2d. Unaddressed abnormal diagnostic results	2854	4.84 (138)	17.31 (494)***
2e. IV fluids or drugs	288	7.29 (21)**	18.06 (52)
2f. Wound drainage	43	0.00 (0)	16.28 (7)
Physician Screens‡			
Indications of medical stability of the patient at discharge			
2a. Abnormal blood pressure	20	10.00 (2)	30.00 (6)
2b. Elevated temperature	11	27.27 (3)**	18.18 (2)
2c. Abnormal pulse	12	16.67 (2)	41.67 (5)*
2d. Unaddressed abnormal diagnostic results	257	7.00 (18)*	26.46 (68)***
2e. IV fluids or drugs	33	0.00 (0)	21.21 (7)

*$p < .05$; **$p < .01$; ***$p < .001$.

†See Appendix.

‡Physician screen of wound drainage was not included in the univariate analyses because it had fewer than five screen failures.

model. Several diseases (e.g., hypertension and ischemic heart disease) were found to have a relative odds for adverse outcome of less than 1. This suggests that these diseases were coded only when more severe conditions were not present (Jencks, Williams, and Kay 1988; Iezzoni, Foley, Daley, et al. 1992; Romano and Mark 1994).

Table 5 shows the odds ratios for the PRO screens after adjusting for patient characteristics, comorbidities, and comorbidity/surgery interactions.

Table 4: Odds Ratio of Postdischarge Mortality and Readmission in a Multiple Logistic Regression, Including All Significant Patient Characteristics of the 20,136 California Medicare Admissions (7/1/87–6/30/88)

Characteristic	*Mortality*	*95% C.I.*	*Readmission*	*95% C.I.*
Patient/Admission-related				
Age (5-year increments)	1.31***	(1.24, 1.37)	NS§	
Type of admission:†				
Emergency	3.32***	(2.55, 4.34)	1.34***	(1.19, 1.50)
Urgent	2.63***	(2.02, 3.43)	1.31***	(1.17, 1.46)
Total number of diagnoses	1.34***	(1.25, 1.44)	1.09***	(1.06, 1.13)
Prior hospitalizations within 180 days	1.20***	(1.14, 1.27)	1.36***	(1.32, 1.41)
Comorbidity				
Hypertension	0.65***	(0.53, 0.79)	0.82***	(0.74, 0.91)
Ischemic heart disease	0.58***	(0.47, 0.70)	1.13*	(1.03, 1.24)
Cancer	7.94***	(6.17, 10.14)	1.88***	(1.68, 2.09)
Pneumonia	1.50***	(1.28, 1.76)	NS	
Congestive heart failure	1.56***	(1.31, 1.86)	1.36***	(1.23, 1.51)
Acute myocardial ischemia	1.73***	(1.26, 2.38)	NS	
Renal failure	1.88***	(1.41, 2.51)	1.34**	(1.12, 1.61)
Psychological disease	1.53**	(1.16, 2.02)	NS	
Liver disease	2.88***	(1.87, 4.46)	1.59**	(1.17, 2.15)
Interaction Terms between Comorbidity and Surgery‡				
Cancer/Surgery	0.55***	(0.42, 0.73)	NS	
Acute myocardial ischemia/Surgery	NS		1.56***	(1.27, 1.92)
Stroke/Surgery	1.39*	(1.08, 1.80)	0.84*	(0.71, 0.98)
R^2	14.8%		5.1%	
ROC (Receiver operating curve)	0.809		0.661	

*$p < .05$; **$p < .01$; ***$p < .001$.

†As compared with elective.

‡Any surgery performed at the index admission.

§NS: Nonsignificant.

The statistically significant discharge screens in the final mortality model were nurse screens of absence of documentation of discharge planning, elevated temperature on the day before or the day of discharge, and unaddressed abnormal diagnostic results at discharge. The nurse screen of absence of documentation of discharge planning, as well as physician screens of abnormal pulse within 24 hours of discharge and unaddressed abnormal diagnostic results at discharge, were the only significant discharge screens in the final readmission model. When the PRO screens were included along with patient characteristics, the explanatory power of the model improved only slightly and the odds ratios on significant patient characteristics changed very little. The proportion of the variance in postdischarge mortality explained by the variables in the "best" regression equation was 15.7 percent for postdischarge death and 5.3 percent for readmission. The area under the ROC curve is 0.814 for the mortality model and 0.665 for the readmission model.

Since only 12 patients failed the physician screen of abnormal pulse, this small group of admissions might bias the results. We repeated the analysis by excluding admissions that failed the physician screen of abnormal pulse and got similar results. We also repeated the analysis with the variable of physician screen result of abnormal pulse deleted and again got similar results.

Table 6 shows the adjusted and unadjusted confidence intervals (C.I.) for the odds ratio of discharge screens that were not significantly associated with adverse outcomes in the final models. The adjusted odds ratio and confidence interval associated with each nonsignificant discharge screen in Table 6 was obtained by including the nonsignificant screen in a regression along with significant patient characteristics (Table 4) and significant PRO screens (Table 5). For nonsignificant screens with narrow confidence intervals for the relative odds (e.g., nurse screens on abnormal blood pressure and on IV fluids or drugs), it is unlikely that any association between these screens and adverse outcomes is medically important. For nonsignificant screens with wide confidence intervals for the relative odds (e.g., physician screens on abnormal blood pressure and elevated temperature), there were an insufficient number of patients with abnormal screens to adequately evaluate the association. Since these screens were rarely positive, it may not be cost-effective to include them in the generic screens.

DISCUSSION

The purpose of the generic screens is efficient identification of physician and hospital errors in the treatment and management of patients. Our results show

Table 5: Odds Ratio of Postdischarge Mortality and Readmission of the 20,136 California Medicare Admissions (7/1/87–6/30/88) for All Significant PRO Screens, Adjusted for Patient Characteristics

Characteristic	*Mortality*	*95% C.I.*	*Readmission*	*95% C.I.*
Discharge Screens†				
Nurse Screens				
Adequacy of discharge planning				
1. No documented discharge planning	0.70*	(0.50, 0.99)	1.17*	(1.01, 1.35)
Indications of medical stability of the patient at discharge				
2b. Elevated temperature right before discharge	6.06***	(2.72, 13.56)	NS	
2d. Unaddressed abnormal diagnostic results	1.24*	(1.02, 1.51)	NS	
Physician Screens				
Indications of medical stability of the patient at discharge				
2c. Abnormal pulse	NS		3.97*	(1.18, 13.39)
2d. Unaddressed abnormal diagnostic results	NS		1.88***	(1.41, 2.52)
Events Occurring during the Admission†				
Nurse Screens				
4a. Elevated temperature 72 hours after admission	1.73*	(1.14, 2.64)	NS	
6e. Hospital-acquired decubitus ulcer	5.32***	(3.02, 9.38)	NS	
6f. Life-threatening complications not related to admitting signs	NS		1.84*	(1.10, 3.06)
R^2	15.7%		5.3%	
ROC (Receiver operating curve)	0.814		0.665	

*$p < .05$; ***$p < .001$.

†See Appendix.

‡NS: Nonsignificant.

that for discharge screens, the process may not be efficient. As judged by the proportion of cases ultimately judged by a physician reviewer to be a quality problem, the nurse screens generate large numbers of false positives. From our data we are unable to determine whether many of the confirmed quality problems detected by physician reviewers affected the outcomes measured in this study: postdischarge mortality and readmission within 30 days.

Table 6: Adjusted* Odds Ratios and Confidence Intervals For Nonsignificant Discharge Screens for 20,136 California Medicare Admissions (7/1/87–6/30/88)

	Mortality		*Readmission*	
Characteristic	*Odds Ratio*	*95% C.I.*	*Odds Ratio*	*95% C.I.*
PRO Generic Screens†				
Indications of medical stability of the patient at discharge				
2a. Abnormal blood pressure	0.98	(0.50, 1.95)	1.11	(0.75, 1.65)
2b. Elevated temperature	–‡‡	–	0.44	(0.15, 1.28)
2c. Abnormal pulse	1.45	(0.52, 4.03)	0.95	(0.44, 2.03)
2d. Unaddressed abnormal diagnostic results	–	–	1.10	(0.98, 1.24)
2e. IV fluids or drugs	1.45	(0.89, 2.34)	1.00	(0.73, 1.38)
2f. Wound drainage	Not Estimable§	Not Estimable§	1.06	(0.46, 2.44)
Physician Screens‡				
Indications of medical stability of the patient at discharge				
2a. Abnormal blood pressure	1.93	(0.33, 11.20)	1.89	(0.66, 5.37)
2b. Elevated temperature	1.68	(0.28, 10.19)	1.02	(0.20, 5.17)
2c. Abnormal pulse	5.10	(0.88, 29.53)	–	–
2d. Unaddressed abnormal diagnostic results	1.34	(0.77, 2.30)	–	–
2e. IV fluids or drugs	Not Estimable††	Not Estimable††	0.83	(0.34, 2.02)

*Adjusted for significant patient characteristics (Table 4) and significant PRO screens (Table 5) in the final model.

†See Appendix.

‡Confidence intervals of physician screen of wound discharge were not calculated because it had fewer than five screen failures.

§None of the patients with nurse screen failures on the wound drainage were dead 30 days after discharge.

††None of the patients with physician screen failures on the IV fluids or drugs were dead 30 days after discharge.

‡‡Significant discharge screen.

For the screens that are associated with postdischarge adverse outcomes, the question remains whether the association is due to substandard care or to unmeasured characteristics of patients. Although the analysis is adjusted for several characteristics associated with outcomes, claims data often lack critical information associated with outcomes. Patients with unaddressed abnormal diagnostic results may have higher rates of adverse outcomes not because of quality of care but because abnormal diagnostic results may be a marker for more severely ill patients. The appropriate comparison group to examine the effect of this screen is patients with addressed abnormal diagnostic results, not all other patients. Similarly, an abnormal pulse at discharge may indicate a more severely ill patient rather than a premature discharge. Also the lower risk of postdischarge mortality for patients with inadequate discharge planning may indicate that most patients who failed this screen were not critically ill. However, the association of inadequate discharge planning with readmissions may be caused by inadequate or inappropriate care. Randomized clinical trials have shown that intensive discharge planning results in a lower readmission rate when compared to regular discharge planning (Naylor 1990).

To simulate the patient population that PRO generic screens are applied to, we studied all eligible patients in the California 3 percent random sample regardless of primary diagnoses. Kosecoff, Kahn, Rogers, et al. (1990) showed that 8 percent of patients discharged in an unstable condition were dead 30 days postdischarge versus 4 percent of patients discharged in stable condition. As in our study, their measures included a broader range of items than those in the PRO discharge screens. It would be interesting to see whether those additional items are significant predictors of postdischarge mortality.

Our analysis has several limitations. Although the initial sample size is quite large and should be sufficient to detect significant associations, the rate of screen failure is so low for a few screens that the confidence intervals for the odds ratio of these discharge screens are wide. Second, we lacked access to medical records required to determine with certainty if particular readmissions were planned and whether they were unrelated to initial admissions. Finally, while the outcomes of postdischarge death and readmission may not be sensitive to quality of care indicators at discharge, it is possible that discharge screen failures are associated with patients' quality of life or satisfaction with care.

Our results suggest several policy options for the process of peer review. If generic screening is to continue, the performance of the screens needs to be evaluated with respect to efficiency, accuracy, the types of medical errors uncovered, and relationship to patient outcomes. Our analysis reveals

that several of the discharge screens may not be related to important patient outcomes. These screens should be reevaluated for their relevance in screening for quality. The practice of medicine changes, and practices that would have been considered malpractice 15 years ago, such as sending a patient with myocardial infarction home in six days, are now the norm. The screen for drainage from postoperative wounds is probably obsolete, as increased availability of home health services makes it quite reasonable to send home stable patients who still require care for drainage from operative wounds. The generic quality screens employed by the PROs have been in place for at least ten years with little reexamination. It is time for that reexamination.

APPENDIX: GENERIC QUALITY SCREENS

Screen No.

1. **Adequacy of discharge planning**
   No documented plan for appropriate follow-up care or discharge planning as necessary, with consideration of physical, emotional, and mental status/needs at the time of discharge

2. **Medical stability of the patient at discharge**
   a. Blood pressure on day before or day of discharge
      systolic: less than 85 or greater than 180
      diastolic: less than 50 or greater than 110
   b. Temperature on the day before or day of discharge greater than 101 degrees oral (rectal 102 degrees)
   c. Pulse less than 50 (or 45 if the patient is on a beta blocker) or greater than 120 within 24 hours of discharge
   d. Abnormal results of diagnostic services that are not addressed or explained in the medical record
   e. IV fluids or drugs on the day of discharge (excludes KVOs, antibiotics, chemotherapy, or total parenteral nutrition)
   f. Purulent or bloody drainage of a postoperative wound within 24 hours prior to discharge

3. **Deaths**
   a. During or following elective surgery
   b. Following return to intensive care unit, or coronary care/special care unit within 24 hours of being transferred out
   c. Other unexpected death

4. **Nosocomial infection**
   a. Temperature increase of more than 2 degrees more than 72 hours after admission
   b. Indication of an infection following an invasive procedure (e.g., suctioning, catheter insertion, tube feedings, surgery, etc.)

5. **Unscheduled return to surgery within same admission for same condition as previous surgery or to correct operative problem (exclude "staged" procedures)**

Continued

APPENDIX: Continued

Screen No.	
6.	**Trauma suffered in the hospital**
a.	Unplanned removal or repair of a normal organ (i.e., removal or repair not addressed in operative consent)
b.	Fall with injury or untoward effect (including but not limited to fracture, dislocation, concussion, laceration, etc.)
c.	Life-threatening complications of anesthesia
d.	Life-threatening transfusion error or reaction
e.	Hospital-acquired decubitus ulcer
f.	Care resulting in serious life-threatening complications, not related to admitting signs and symptoms, including but not limited to the neurological, endocrine, cardiovascular, renal, or respiratory body systems (e.g., resulting in dialysis, unplanned transfer to special care unit, lengthened hospital stay)
g.	Major adverse drug reaction or medication error with serious potential for harm or resulting in special measures to correct (e.g., intubation, cardiopulmonary resuscitation, gastric lavage), including but not limited to:
i.	Incorrect antibiotic ordered by the physician (e.g., inconsistent with diagnostic studies or the patient's history of drug allergy)
ii.	No diagnostic studies to confirm which drug is correct to administer (e.g., C & S)
iii.	Serum drug levels not performed as needed
iv.	Diagnostic studies or other measures for side effects not performed as needed (e.g., BUN, creatinine, intake and output)

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