Adequacy of Hospital Discharge Summaries in Documenting Tests with Pending Results and Outpatient Follow-up Providers

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BACKGROUND: Poor communication of tests whose results are pending at hospital discharge can lead to medical errors.

OBJECTIVE: To determine the adequacy with which hospital discharge summaries document tests with pending results and the appropriate follow-up providers.

DESIGN: Retrospective study of a randomly selected sample

PATIENTS: Six hundred ninety-six patients discharged from two large academic medical centers, who had test results identified as pending at discharge through queries of electronic medical records.

INTERVENTION AND MEASUREMENTS: Each patient's discharge summary was reviewed to identify whether information about pending tests and follow-up providers was mentioned. Factors associated with documentation were explored using clustered multivariable regression models.

MAIN RESULTS: Discharge summaries were available for 99.2% of 668 patients whose data were analyzed. These summaries mentioned only 16% of tests with pending results (482 of 2,927). Even though all study patients had tests with pending results, only 25% of discharge summaries mentioned any pending tests, with 13% documenting all pending tests. The documentation rate for pending tests was not associated with level of experience of the provider preparing the summary, patient's age or race, length of hospitalization, or duration it took for results to return. Follow-up providers' information was documented in 67% of summaries.

CONCLUSION: Discharge summaries are grossly inadequate at documenting both tests with pending results and the appropriate follow-up providers.

KEY WORDS: tests with pending results; continuity of care; patient safety; discharge summary; medical errors.

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BACKGROUND

Up to 41% of patients are discharged from the hospital with pending test results, and 9% of these tests require a change in patient management.¹ However, managing results that return after hospital discharge can be challenging, especially given frequent failures in communication during transition of care from the inpatient to outpatient setting.² Errors in communication reportedly contribute to over half of all preventable adverse events³ and are associated with twice as many deaths when compared with errors due to clinical inadequacy.⁴ With sicker patients getting discharged earlier from hospitals⁵ and as the number of hospitalists (dedicated inpatient providers) continues to grow,⁶ it is ever more crucial that pending tests at discharge are properly managed.

The first step in facilitating follow-up and proper management of pending test results is to correctly communicate the list of pending tests to the responsible outpatient provider in a timely manner. Discharge summaries have traditionally played a critical role in this communication. Discharge summaries that document the recommended workup lead to better completion of recommendations, and access to the discharge summary during outpatient follow-up after hospital discharge is associated with reduced rates of re-hospitalization.⁷ JCAHO now requires that discharge summaries be completed within 30 days of hospital discharge and that the summary document the appropriate "care, treatment, and services provided."⁸ Recognizing the importance of incorporating information about pending tests in discharge summaries, the Society of Hospital Medicine's Quality and Patient Safety Committee included "all pending labs or tests, [and] the responsible person to whom results will be sent" in a checklist of elements required for an ideal discharge summary.⁹

While there is general agreement that discharge summaries should comprehensively document pending tests and the follow-up providers, very few studies have evaluated the adequacy of summaries in this area. Wilson et al. found that 36.4% of discharge summaries contained errors or inaccuracies, but gave little specific detail about the accuracy in documenting pending test results or the follow-up provider.¹⁰ An audit of discharge summaries by Foster et al. found that only 12% of them mentioned pending tests.¹¹ However, this study did not measure the proportion of pending tests that were not documented, and also did not examine whether the tests mentioned as pending actually had no result back at the time of discharge. In addition, several studies evaluating pending tests have used the wrong 'denominator' for pending tests to assess errors related to missed tests. As an example, Moore et al. used tests documented as pending in the

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discharge summary as the ‘denominator’ to conclude that test ‘follow-up errors occurred in 8% of all discharged patients, and in half of those discharged with pending tests.’¹² Without knowing what percentage of pending tests were mentioned in the discharge summaries, it is likely that the conclusions reached in this study regarding error-rates related to missed tests were inaccurate.

We aimed to formally evaluate how well discharge summaries incorporate all pending laboratory work or tests and the responsible person to follow up these tests. If large deficiencies exist, strategies will be needed to improve this documentation. This paper reports a study that evaluated the adequacy with which discharge summaries document pending tests and the follow-up provider at two large hospitals in Indianapolis, Indiana. We describe (1) a protocol using data in an electronic medical record to accurately determine which tests have pending results at the time of discharge, (2) results of an evaluation of the quality of discharge summaries in documenting both pending tests and follow-up provider, and (3) regression analyses for factors correlated with inadequate documentation.

METHODS

Study Setting

We performed this study at two large urban midwestern hospitals (Hospital A and Hospital B). Hospital A is served by a comprehensive electronic medical record system (EMRs), and all orders and discharge summaries are entered electronically. Hospital B also has an EMRs, but most orders are handwritten by providers and then transcribed into the electronic system. Discharge summaries from the General Internal Medicine Hospitalist Services (GIMHS) at this institution are dictated and later transcribed into an electronic format. Both hospitals are serviced by more than five GIMHS, with staffing varying a little between the hospitals—services are composed of an attending physician working with housestaff, an attending physician with a nurse practitioner, or a solo attending physician. In these teams, orders can be entered and discharge summaries dictated by any team member. Both hospitals participate in the regional health information exchange, which stores records about patient admission and discharge, the ordered tests, and the results of these tests. The study was approved by the institutional review board of Indiana University-Purdue University at Indianapolis, IN.

Identifying Patients with Pending Laboratory Tests at Discharge

We used data stored in the Indiana Network for Patient Care (INPC),¹³ the regional health information exchange, to identify patients admitted to the GIMHS at the two hospitals between July and September 2007 who had pending laboratory test results at the time of discharge. Tests with pending results were defined as those ordered during the hospitalization, but whose final results were unavailable in the EMRs at the time the patient was discharged—as such, these tests could not have been reviewed by clinicians before discharge. Using queries of the INPC database, we selected a random sample of 696 unique patients (356 from hospital A and 340 from

hospital B) with pending results for inclusion into the study—this sample was derived from a total of 2,205 discharged patients from the two hospitals. The discharge summary for each study patient was manually reviewed by two investigators (MCW, JC) to remove patients who had died during the hospitalization, who had been transferred to another team other than to another GIMHS, or who had been discharged to hospice or transferred to another hospital. Data for the remaining patients were analyzed.

Determining Which Pending Tests Were Documented in the Discharge Summary

Discharge summaries for all remaining patients were reviewed by two of four physician investigators (MCW, JC, CA, and BK). Two of the reviewers were board-certified Internal Medicine physicians (MCW and BK), and the other two were 3rd-year categorical residents in Internal Medicine. If a physician-reviewer was involved in the care of a patient who had a pending result at discharge, that summary was reviewed by one of the other three reviewers. The two reviewers independently abstracted all tests mentioned as having pending results in the discharge summary. If there was disagreement between the reviewers on whether a test was mentioned as having pending results in the discharge summary, the reviewers discussed the case to achieve consensus. In the rare case that the two reviewers could not agree, then a third reviewer acted as a tie-breaker.

Abstracting Follow-up Providers Mentioned in the Discharge Summary

Reviewers also abstracted details about follow-up providers from the discharge summary. From each summary, two independent reviewers extracted several items: whether the outpatient primary care follow-up provider was mentioned, whether details of the primary care provider’s clinic were described (e.g., clinic address or phone number), and whether any other follow-up providers were mentioned. The information extracted had to be specific enough to identify the exact provider name or clinic—for example, statements like ‘follow-up with Endocrinology’ did not count as a mention of ‘other follow-up providers.’ Reviewers discussed abstracted provider information and came up with a consensus where there had been disagreements. In the rare case that a disagreement could not be resolved, a third reviewer acted as an independent tie-breaker.

Identifying Actionable Results Returning after Discharge

We used an algorithm modified from Roy et al.¹ to identify whether results returning after discharge required clinical action. Two physician-reviewers independently analyzed each result of a pending test that returned within 6 months after a patient was discharged from the hospital. Reviewers used their clinical judgment, the discharge summary, and data contained in the patient’s record to determine whether the test result was actionable. Test results were considered actionable if any of the following criteria were met: required starting, discontinuing, or changing treatment; required a new test or a change in

diagnostic testing; required scheduling of an earlier appointment with the primary care provider or referral to a specialist.¹ The reviewer rated the result as “definitely actionable,” “probably actionable,” “probably not actionable,” or “definitely not actionable.”

Outcomes

The primary outcomes of interest were the adequacy with which pending tests and the follow-up providers were documented in the discharge summaries. The percentage of actionable tests that were documented was also identified. We also analyzed factors associated with incorporation of pending tests into the summary.

Statistical Analyses

Patient characteristics were tabulated using simple summary statistics. Inter-rater reliability for identifying actionable tests was estimated with the kappa statistic. We used generalized estimating equations (GEE) to calculate the percentage of pending tests that were mentioned in the discharge summary, taking into account clustering of mentioned results by the provider preparing the summary.

All calculations were done at the 95% confidence interval. A similar approach was used to calculate the percentage of actionable results and follow-up provider information mentioned in the discharge summary. To explore the relationship between various factors and the rates of incorporation of pending tests into the discharge summary, we built clustered multivariable regression models. Individual effect was assessed at the statistical significance level of 0.05 (two-sided). Clustered analyses were performed using PROC GENMOD of SAS 9.1.3.

RESULTS

Patients with Pending Test Results at Time of Hospital Discharge

Of the 696 randomly selected patients who were discharged during this period from the GIMHS, 28 were removed from the study because they died during the admission (14), were transferred to another hospital (5), or went to hospice care at discharge (9)(Figure 1). The remaining 668 patients were included in the study, and their baseline characteristics are available in Table 1. All discharge summaries for study patients at Hospital A were prepared electronically and finalized prior to patient discharge. In Hospital B, almost all summaries (327 of 340, 96%) had been dictated within 24 h after patient discharge.

Characteristics of Pending Tests

All 668 patients analyzed in our study had tests with pending results at discharge based on retrospective analysis of electronic medical records. Of the 2,927 results that were pending, 289 (9.9%) were rated as ‘actionable’ and 2,568 (87.7%) as ‘not actionable’ by both reviewers (kappa=0.88). Reviewers discussed the 70 tests (2.4%) that had been rated differently and came to a consensus that 7 of these were in fact ‘actionable,’

bringing the total number of tests rated as actionable to 296 (10%). The most common categories of pending tests were microbiology (47.7%), hematology (17.1%), and chemistry (10.8%) studies. Pending pathology and rheumatology studies were more likely than other categories of tests to have actionable results (Table 2).

Adequacy of Incorporating Pending Tests into the Discharge Summary

Of the 2,927 tests with pending results, only 482 (16%) were documented in discharge summaries. Of the 668 discharge summaries for the study patients, only 168 (25%) mentioned any pending tests. All pending tests were documented in only 86 (13%) of the summaries. We examined the correlation between documenting whether a test was pending and the type of provider who prepared the discharge summary. Three hundred fifty-two (53%) of the discharge summaries were prepared by 56 residents, 227 (34%) by 24 attending physicians, 81 (12%) by 7 nurse practitioners, and 5 (0.8%) by 2 medical students. Results from the GEE with exchangeable correlation structure did not indicate any significant correlation between documentation of pending tests and the type of provider. Although it seemed that medical students tended to include the fewest pending tests (8%, 95% CI: 2%–25%) compared to attending physicians (14%, 95% CI: 7%–24%), nurse practitioners (19%, 95% CI: 10%–32%), and residents (17%, 95% CI: 11%–25%), this difference was not significant.

There was also no correlation between documentation of a pending test and the number of days it took for a result to return. The median time for a test result to return was 5.0 days (range 0–139) for tests not mentioned as pending and 5.3 days (range 0–128) for tests mentioned as pending. GEE with exchangeable correlation structure also did not indicate any significant correlation between the mention of the pending test in the discharge summary with length of hospitalization, days before discharge that a test was ordered, or with patient’s age and race.

Only 84 (28%, 95% CI: 23%–35%) of the actionable tests had been mentioned in the discharge summaries as pending. There was significantly ($p<0.0001$) more mention of actionable tests than non-actionable tests, of which only 398/2,631 (15%, 95% CI: 12%–19%) were included in the discharge summaries.

Adequacy of Incorporating Follow-up Provider in the Discharge Summary

Three hundred thirty-four discharge summaries (50%) mentioned the primary care provider responsible for following up the patient after discharge; 163 (24%) had enough information to identify the follow-up primary care clinic. Overall, it was possible to tell which primary care outpatient provider a result should be sent to in 397 (59%) discharge summaries. Additional providers (e.g., follow-up consultants) were identified in 172 (26%) of the summaries. Taking into account information about the primary care provider, the clinic, and any other provider, it was possible to discern the provider or clinic to which a result could be sent in 446 (67%) of the discharge summaries.

Figure 1. Study population.

It was possible to identify the follow-up primary care provider in 141 (48%) of 296 tests that returned with actionable results. The clinic where the actionable tests would be sent was identifiable in 37/166 (22%) of the discharge summaries for patients who had actionable results. Overall, it was possible to identify a provider or a clinic to which an actionable result could be sent for 160 (54%) of the 296 results with actionable tests. There was no difference in the rate of mentioning the follow-up provider between the institutions.

DISCUSSION

In this study, we use a method that is more rigorous than that used in earlier studies to identify tests with pending results at hospital discharge. Whereas prior studies have used the number of pending tests noted in the discharge summary to determine how often test results are followed up, we identified pending tests at discharge as all tests ordered during hospi-

talization whose results were not final until after discharge. Identification of pending tests using our criteria was achieved by querying an electronic medical record system. We demonstrate that large quality-gaps exist in documenting both laboratory tests with pending results at discharge and the appropriate follow-up provider for the tests in discharge summaries. All study patients had pending test results at the time of discharge, but discharge summaries for 75% of these

Table 2. Categories for Tests with Pending Results

Test category	All pending tests N (%)	Actionable pending tests N (%)
Microbiology	1,397 (47.7)	140 (47.3)
Hematology	501 (17.1)	32 (10.8)
Chemistry	317 (10.8)	23 (7.8)
Immunology	159 (5.4)	16 (5.4)
Endocrine ^a	132 (4.5)	25 (8.5)
Toxicology ^b	115 (3.9)	4 (1.4)
Pathology ^c	100 (3.4)	34 (11.5)
Other	86 (2.9)	7 (2.4)
Cardiac ^d	73 (2.5)	3 (1.0)
Rheumatology	30 (1.0)	12 (4.1)
Urine studies ^e	17 (0.6)	0 (0.0)
Total	2,927 (100.0)	296 (100.0)

^aEndocrine: Category includes both regular endocrine studies (e.g., TSH) and also neuro-endocrine studies (e.g., serum catecholamines)

^bToxicology: Category includes drug screens (e.g., serum alcohol levels, urine toxicology screen) and also therapeutic drug levels (e.g., phenytoin levels)

^cPathology: Category includes surgical pathology and also cytological studies, e.g., fluid cytology.

^dCardiac: Category includes CK, CK-MB, troponin, and brain natriuretic protein (BNP) tests

^eUrine studies: Category includes urinalysis and microscopy, and urine electrolyte studies. Urine culture studies are in the microbiology category

Table 1. Patient Characteristics

Characteristics	Study patients (n=668)
Mean age, years (range)	56 (19–103)
Female gender, %	53
Ethnicity, %	
Black	38
Hispanic	1
White	56
Other	5
Mean length of hospitalization, days (range)	4.9 (0–50)
Mean tests pending at the time of discharge, n (range)	4.4 (1–21)

patients did not mention any pending tests, and only 13% of all summaries accurately incorporated all pending tests.

Our findings highlight several points, namely: (1) that current discharge summaries cannot be relied on to comprehensively reflect tests that have results pending at discharge, (2) that deficiencies in documentation are likely due to more complex and possibly systemic reasons and should not be attributed simply to provider experience, patient characteristics, or test characteristics, and (3) that strategies are needed to improve incorporation of both pending tests and the follow-up provider(s) into the discharge summary. The fact that there was no statistical difference in documentation rates among the various types of providers suggests that there is room for improvement by all providers from students to attending physicians.

Any test with a pending result at discharge holds within it the potential for an error due to a missed action. Steps must therefore be taken to ensure that the appropriate follow-up provider is made aware of these pending tests and that the results (as they return) are consistently communicated to that provider. Some strategies that might be adopted to improve the incorporation of pending tests into the discharge summary include: (1) using a checklist that contains a reminder to list pending tests at the time the summary is being created, (2) enforcing documentation of pending tests, either by having a dedicated space for putting this information (which cannot be left blank) or by linking documentation rates to performance evaluation for providers, and (3) automatically identifying the pending tests by querying the admission-discharge-transfer system, the order entry system, and the laboratory information system, and displaying these tests to the discharging provider so that she can choose which ones to place in the summary.

Most of the above strategies can also be employed to improve documentation of information about the follow-up provider into the discharge summary. It could also be possible in an EMR (which contains patient-provider encounter information) to automatically display details of outpatient providers who have previously taken care of the patient. As the follow-up provider will in most cases be someone who has seen the patient previously, this approach should make it easier to document and thereby transmit information for follow-up. In some cases, the decision of who is to be the follow-up provider will need to be resolved before the summary is finalized, so that the information can be appropriately recorded in the summary.

Several limitations of our study deserve mention. The study was done in two tertiary care centers in teams led by hospitalists, and our findings may not be generalizable to institutions without these characteristics. Not all institutions have EMRs, and thus our method of determining pending tests through queries of the EMRs might not be easily translatable to other institutions. We used implicit review and judgments by investigators to categorize actionable test results, and this approach could have introduced bias.

CONCLUSION

Discharge summaries have large deficiencies in documenting tests with pending results and the provider who should follow up on them. Strategies to close this quality gap are needed so as to reduce errors related to missed test results. Queries of electronic medical records offer an approach to automatically identify tests with pending results at the time of hospital discharge.

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