Deficits in Communication and Information Transfer Between Hospital-Based and Primary Care Physicians

Implications for Patient Safety and Continuity of Care

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Context Delayed or inaccurate communication between hospital-based and primary care physicians at hospital discharge may negatively affect continuity of care and contribute to adverse events.

Objectives To characterize the prevalence of deficits in communication and information transfer at hospital discharge and to identify interventions to improve this process.

Data Sources MEDLINE (through November 2006), Cochrane Database of Systematic Reviews, and hand search of article bibliographies.

Study Selection Observational studies investigating communication and information transfer at hospital discharge (n=55) and controlled studies evaluating the efficacy of interventions to improve information transfer (n=18).

Data Extraction Data from observational studies were extracted on the availability, timeliness, content, and format of discharge communications, as well as primary care physician satisfaction. Results of interventions were summarized by their effect on timeliness, accuracy, completeness, and overall quality of the information transfer.

Data Synthesis Direct communication between hospital physicians and primary care physicians occurred infrequently (3%-20%). The availability of a discharge summary at the first postdischarge visit was low (12%-34%) and remained poor at 4 weeks (51%-77%), affecting the quality of care in approximately 25% of follow-up visits and contributing to primary care physician dissatisfaction. Discharge summaries often lacked important information such as diagnostic test results (missing from 33%-63%), treatment or hospital course (7%-22%), discharge medications (2%-40%), test results pending at discharge (65%), patient or family counseling (90%-92%), and follow-up plans (2%-43%). Several interventions, including computer-generated discharge summaries and using patients as couriers, shortened the delivery time of discharge communications. Use of standardized formats to highlight the most pertinent information improved the perceived quality of documents.

Conclusions Deficits in communication and information transfer at hospital discharge are common and may adversely affect patient care. Interventions such as computer-generated summaries and standardized formats may facilitate more timely transfer of pertinent patient information to primary care physicians and make discharge summaries more consistently available during follow-up care.

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As the specialty of hospital medicine expands, the transfer of responsibility for patient care between hospital-based physicians (hospitalists) and primary care physicians becomes increasingly common, creating an urgent need to improve communication and information transfer between inpatient and outpatient physicians at hospital discharge.[1-3] Timely transfer of accurate, relevant data about diagnostic findings, treatment, complications, consultations, tests pending at discharge, and arrangements for postdischarge follow-up may improve the continuity of this handoff.[4,5] By contrast, delayed communication or inaccuracies in information transfer among health care professionals, particularly during the early postdischarge period, may have substantial implications for continuity of care, patient safety, patient and clinician satisfaction, and resource use.[6-10]

The discharge summary is the most common method for documenting a patient's diagnostic findings, hospital management, and arrangements for postdischarge follow-up. The Joint

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Commission on Accreditation of Healthcare Organizations (JCAHO) requires that discharge summaries be completed within 30 days of hospital discharge and that they include the following elements: "the reason for hospitalization; significant findings; procedures performed and care, treatment, and services provided; the patient's condition at discharge; and information provided to the patient and family, as appropriate."[11] Moreover, a standard approach to handoff communications is included among JCAHO's national patient safety goals, as is the reconciliation of medications at care transitions.[12]

Despite the availability of these performance standards, the extent to which physicians successfully transfer timely and accurate patient information at hospital discharge is uncertain. We performed a systematic review of the literature to characterize the types and prevalence of deficits in communication and information transfer between hospital-based physicians and primary care physicians at hospital discharge, determine the efficacy of interventions to improve this process, and describe the association of information discontinuity with clinical outcomes.

METHODS

Data Sources

We initially searched MEDLINE (through November 2005) and the Cochrane Database of Systematic Reviews and hand searched bibliographies of relevant articles. Using the Boolean term "and," we combined the following 3 groups of key words and Medical Subject Headings (MeSH) in our MEDLINE search: (1) *hospitals*, *hospitalists*, *ambulatory care facilities*, *physicians' offices*, *outpatient clinics*, *ambulatory care*, *primary care*, *family practice*, *family physicians*, or *physicians*; (2) *patient discharge*, *continuity of patient care*, *patient transfer*, or *discharge*; and (3) *discharge summary*, *discharge letter*, *discharge communication*, *telecommunications*, *electronic mail*, *tele-facsimile*, *telephone*, *medical records*, *medical record linkage*, *computerized medical records systems*, *hospital records*, *interprofessional relations*, *hospital-physician relations*, or *communication*. We updated the literature search for interventions through November 2006.

Study Selection

Electronic citations, including available abstracts, were screened by at least 1 author (S.K., C.O.P., or P.B.) to select reports for full-text review. Using prespecified eligibility criteria, 2 authors (S.K., F.L.) then independently assessed each article for inclusion, resolving disagreements by consensus or with input from a third author (M.V.W.). The selection criteria for inclusion were as follows. For the first review objective, to characterize communication deficits at hospital discharge, eligible reports consisted of observational studies (ie, medical record audits and physician surveys) investigating communication and information transfer at hospital discharge between hospital-based physicians and physicians in adult primary care (ie, internal medicine, family medicine, and general practice). For the second review objective, controlled studies from any medical specialty testing an intervention to improve information transfer at hospital discharge were included if the intervention differed substantially from usual practice and if results pertaining to discharge communication were provided for intervention and control groups. Only English-language articles that appeared in peer-reviewed journals and were written in scientific format were eligible, including full-length articles, brief reports, and research letters.

Data Extraction

One author (S.K. or F.L.) extracted data for study design, population characteristics, sample size, setting, intervention specifics (if appropriate), and relevant outcome measures. All abstracted data were confirmed by a second author (S.K. or F.L.), and discrepancies were resolved by consensus.

Data Synthesis

Results of observational studies were categorized according to the common themes of availability, timeliness, content, and format of discharge communication, as well as primary care physician satisfaction. These results were summarized with descriptive statistics, including median and range. Interventions were categorized according to study design, and results pertaining to availability, timeliness, and other key domains were summarized. Quantitative synthesis (meta-analysis) was deemed not appropriate for this body of literature because of wide variability in research design, populations, types of interventions, and outcomes.

RESULTS

Of the 1064 citations identified through the initial electronic search and screened for possible inclusion, 170 publications were judged to warrant full review (FIGURE). A hand search of references from relevant articles yielded an additional 43 articles for review, and the updated literature search identified 1 more intervention. After exclusion of 2 duplicate or similar publications,[13,14] a total of 73 studies met inclusion criteria, including 55 observational studies (21 medical record audits,[15-35] 23 physician surveys,[36-58] and 11 combined audit-surveys[59-69]) and 18 trials of controlled interventions (3 randomized,[70-72] 7 nonrandomized with concurrent control,[73-79] and 8 with pre-post design[80-87]).

Deficits in Communication and Information Transfer at Hospital Discharge

The 55 observational studies were published between 1970 and 2005. Many of the earlier investigations were performed by individual practitioners, by group practices, or at a particular hospital, apparently as a local audit. Recent studies tended to be larger and more comprehensive.[16,52,66-68]

In this literature, direct communication between hospital physicians and primary care physicians during the dis-

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charge process occurred infrequently.[42,48,63] Only 3% of primary care physicians reported being involved in discussions about discharge,[49] and 17% to 20% reported always being notified about discharges.[46,52]

The most common formats for communicating information about the hospitalization were discharge summaries (physician-dictated, transcribed reports) and discharge letters (usually handwritten narratives but sometimes structured or typed, also called interim summaries).[33,41,44,45,47,53,62,64] Similar types of deficits in information transfer were reported for each format of discharge communication, but rates of particular deficits differed between letters and summaries.

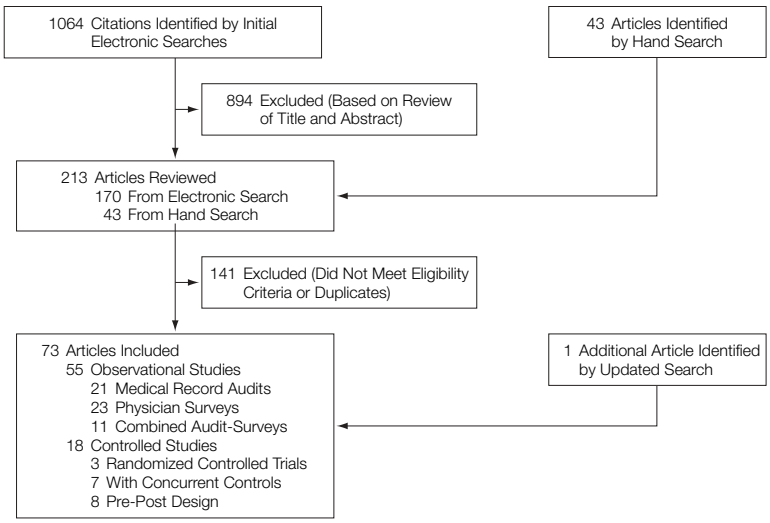
Discharge letters, which are often hand delivered by patients or posted by mail on the day of discharge, reached primary care physicians more quickly than did dictated and transcribed summaries (TABLE 1). For example, 1 week after discharge, a median of 53% (range, 30%-94%) of letters had arrived[19,20,25,26,28,43,61,63] vs only 14.5% (range, 9%-20%) of summaries.[19,28] Of concern, approximately 11% of discharge letters and 25% of discharge summaries never reached the primary care physician.* No patient or program characteristics consistently explained variations in the timeliness or availability of discharge communications. One study reported that patients' comorbidity and hospital course did not affect the availability of discharge documents,[67] whereas in another study, community physicians were more likely to receive discharge information if medications were changed during the hospitalization.[22]

Primary care physicians generally rated the following information as most important for providing adequate follow-up care: main diagnosis, pertinent physical findings, results of procedures and laboratory tests, discharge medications with reasons for any changes to the previous medication regimen, details of follow-up arrangements made, information given to the patient and family, test results pending at discharge, and specific follow-up needs.† Despite agreement from hospital physicians on the importance of this content,[51,54,56] audits of hospital discharge documents demonstrated frequent lack of these important details, as well as other administrative and medical information (Table 1). For example, discharge summaries often did not identify the responsible hospital physician (missing from a median of 25%), the main diagnosis (17.5%), physical findings (10.5%), diagnostic test results (38%), discharge medications (21%), and specific follow-up plans (14%).‡ The highest rates of missing information were observed with tests pending at discharge (65%) and counseling provided to patients or families (91%).[19,33,69] Audits of discharge letters showed comparable problems with missing information (Table 1), and in addition, legibility was a concern in 10% to 50%.[19,20,36,45,69]

After being discharged from the hospital, patients often contacted or were treated by their primary care physician before the physician had received a discharge letter (16%-53%) or detailed summary (66%-88%),[19,25,26,52,66,67] meaning that patients or their families were often the first source of information about the hospitalization.[25,49,57,60] One study showed a nonsignificant trend toward higher hospital readmission rates when follow-up occurred without a discharge summary available.[66] Outpatient physicians estimated that their follow-up management was affected adversely in about 24% of cases by delayed or incomplete discharge communications,[60] and they expressed dissatisfaction over these deficiencies.[52,58,69] Primary care physicians reported greater satisfaction with discharge communications that arrived quickly, usually no later than 1 week after discharge.[36,47,56,59,60]

Communication of diagnostic test results presented another patient safety concern, with microbiological and radiologic studies posing the greatest problems.[31,40,65] In one recent investigation, 41% of patients had test results pending on the day of discharge, and nearly 10% of these results were rated as potentially actionable, some requiring urgent attention.[65] An earlier study found that 75% of patients had a laboratory report that returned after

Figure. Selection Process for Study Inclusion



*References 19, 21, 22, 25, 26, 28, 43, 61, 68, 69.

†References 16, 36-39, 47, 49-52, 54-56, 60.

‡References 15, 18, 19, 23, 24, 27, 30, 33, 34, 59, 68, 69.

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hospital discharge and that 15% of the reports contained an abnormal result.[31] Approximately 60% of hospital-based physicians and primary care physicians were unaware of the results.[31,65] Had they known, patients' diagnoses or treatment would have changed in 1% to 2% of discharges.[31,65]

Interventions to Improve Information Transfer at Hospital Discharge

The 18 intervention studies were published during a wide period (1977 to 2005), and they varied considerably in their populations, interventions, and outcome measures (TABLES 2, 3, and 4).[70-87] The most common intervention was a comparison of computer-generated and manually created discharge summaries.[71,73,76-78,80,82] Other interventions involved changing the mode of delivery (eg, hand delivered, electronic, fax)[70,74,84-86] or changing the format of the document.[75,79,81,83,87]

These studies most commonly reported outcomes of timeliness and, less commonly, quality of discharge communications. However, no standardized measures were used. Some investigations reported timeliness in terms of when discharge documents were completed by hospital physicians,[71,76,77,83] whereas others noted when they were received by the primary care physician,[70,74,75,82,84,85] and one study reported both.[80] Results were presented either as the mean or median time to completion or receipt or as the percentage of documents completed or received by certain times. In assessing the quality of discharge communications, researchers examined the number or percentage of omitted items,[73,77,80] or they devised a rating scale.[71,72,78,79,81,87] No 2 studies used the same quality indicators. Many investigations also did not report statistical significance,[70,73,76,77,80,84,85] thus limiting the ability to interpret observed differences between intervention and control groups.

Only 3 randomized studies were found (Table 2).[70-72] Sandler and Mitchell[70] found that hand delivery of the discharge letter by the patient to the primary care physician decreased the median time to receipt from 4 days to

Table 1. Timeliness, Completeness, and Accuracy of Information Transfer at Hospital Discharge*

	Median % (Range)	
	Discharge Letters	Discharge Summaries
Availability and timeliness		
Received by primary care physician		
Within 48-72 h	25.5 (8-75)[25,28,43,61]	1[28]
Within 1 wk†	53 (30-94)[19,20,25,26,28,43,61,63]	14.5 (9-20)[19,28]
Within 2 wk	62 (42-80)[25,28,60,63]	29[28]
Within 4 wk	79.5 (43-90)[26,28,32,61,63]	52 (51-77)[20,21,28,59]
At all	89 (39-99)[19,22,25,26,28,43,61]	75 (27-95)[19,21,28,68,69]
Available in hospital medical record	82 (77-85)[16,30,67]	85 (82-93)[30,68,69]
Content missing or incorrect		
Administrative information		
Patient's full name	1.5 (0-30)[16,19,20,33]	5.5 (0-11)[19,33]
Patient's age	17.5 (3-30)[16,19,20,33]	26.5 (20-33)[19,33]
Dates of admission and discharge	31 (20-42)[16,20]	
Name of responsible hospital physician	17.5 (2-21)[16,19,20,26,28,33]	25 (23-27)[19,33]
Name of physician preparing discharge summary	17 (8-48)[16,20,33]	7[33]
Name of primary care physician	17.5 (8-27)[20,33]	16 (7-58)[33,59,69]
Medical information		
Main diagnosis	13 (2-31)[15,16,19,20,26,28,33]	17.5 (10-39)[15,18,19,33,34,59,68,69]
Other diagnoses	83[16]	28 (7-37)[34,59,69]
Presenting symptoms	48.5 (28-69)[16,33]	20 (19-21)[33,69]
History of present illness	29[16]	
Medical history	48[16]	
Social history	84[16]	
Physical examination findings	45.5 (21-70)[16,33]	10.5 (1-20)[33,68]
Diagnostic test results	65 (20-75)[16,19,26,33]	38 (33-63)[19,23,33,68]
Consultant recommendations	33[17]	52[35]
Treatment/hospital course	29.5 (22-45)[16,19,26,33]	14.5 (7-22)[19,33]
Discharge medications	25 (7-48)[16,20,33,49]	21 (2-40)[24,33,59,68,69]
Test results pending at discharge	88[20]	65[69]
Follow-up plans	30 (23-48)[16,19,28,33,49]	14 (2-43)[19,24,27,30,33,68,69]
Patient or family counseling	92 (92-97)[19,26,33]	91 (90-92)[19,33]

*Values represent the median percentage and range reported across studies (superscript citations).
†Results for the interval 5 to 9 days since discharge were accepted to accommodate variable reporting across studies.

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1 day. Van Walraven et al[71] reported that generation of the discharge summary from a hospital database resulted in a higher percentage of summaries completed at 4 weeks compared to dictated summaries. The database-generated summaries also were more likely to include many of the items judged important by primary care physicians, including the main discharge diagnosis (100% vs 65%; $P=.001$), pertinent physical findings (99% vs 87%; $P=.001$), radiology test results (47% vs 39%; $P=.08$), laboratory test results (30% vs 17%; $P=.01$), discharge medications (100% vs 93%; $P=.006$), medical follow-up (99% vs 95%; $P=.57$), and test results pending at discharge (41% vs 9%; $P=.001$). Dictated summaries were significantly more likely to include social history (37% vs 6%) and information about consultations (47% vs 19%; $P=.001$ for each).

The third randomized study, by Marks et al,[72] tested a multimodal "enhanced discharge planning" intervention on patients with asthma, including a telephone call to the primary care physician, a follow-up appointment scheduled for the patient, and educational booklets for the patient and primary care physician. Compared with usual care, the intervention resulted in primary care physicians reporting higher ratings for their understanding of the hospital management, quality of hospital communication, and involvement in posthospital care. This was the only intervention study to evaluate the impact of their intervention on clinical outcomes. During 3 months, no significant differences were observed between groups in the frequency or severity of asthma symptoms, bronchodilator usage, number of emergency department visits, or hospital readmissions.[72]

Among all the interventions aimed at improving the timeliness of discharge communication,[70,71,74-77,80,82-86] all except 1[83] reported improvements associated with the intervention, although not all of these differences were statistically significant. Of note, several of these studies, including the trial by van Walraven et al,[71] tested database- or computer-generated summaries against handwritten or dictated summaries, using relatively basic information systems that merged patients' administrative and clinical data into a structured template.[71,76,77,80,82,84] Results often indicated large improvements in discharge summary completion rates or timeliness of delivery, although the performance of the control group and magnitude of change in the intervention group varied substantially across studies. Only 1 investigation, by Kendrick and Hindmarsh,[75] noted the timing of discharge communications relative to patient follow-up visits, reporting that intervention patients were slightly more likely to be treated by primary care physicians who had received discharge information (86% vs 77% in the control group; $P=.20$).

Interventions to improve the quality of discharge communications showed improvements in most[72,77-81,87] but not all

Table 2. Interventions to Improve Physician Communication at Hospital Discharge: Randomized Controlled Trials

Source (Location)	Participants	Intervention	Control	Results: Outcomes	Intervention	Control	*P* Value
Sandler and Mitchell,[70] 1987 (England)	294 Patients admitted to a medical ward during 4 mo	Hand delivery of discharge letter by patient to GP	Mail delivery of discharge letter to GP	Time to receipt, median, d	1	4	NR
				Received by 2 d, %*	66	22	NR
				Received by 7 d, %*	85	72	NR
				Received by 28 d, %	97	96	NR
van Walraven et al,[71] 1999 (Canada)	371 Patients admitted to the medical service at 1 hospital during 9 mo	Database-generated discharge summary	Dictated discharge summary	Completed by 4 wk, %	80	57	<.001
				Overall quality*†	73	75	NS
				Overall completeness*†	73	78	NS
				Overall organization*†	76	78	NS
				Overall timeliness*†	66	70	NS
Marks et al,[72] 1999 (Australia)	60 Children with asthma and a regular GP admitted to 1 hospital	Enhanced discharge planning‡	Usual discharge planning‡	GP understanding of hospital management, %§	96	62	.005
				Quality of hospital communication, %§	96	48	<.001
				GP involvement in posthospital care, %‖	75	45	.02
				Emergency department visits within 3 mo, No.	3	8	.08
				Readmissions within 3 mo, No.	3	6	>.2

Abbreviations: GP, general practitioner; NR, not reported; NS, reported as nonsignificant.
*Results extrapolated from Figure.
†Rated on visual analog scale (0-100).
‡Enhanced planning consisted of usual care plus (1) telephone call to GP at or before discharge, (2) individualized easy-to-read treatment orders and asthma action plan, (3) patient education booklets given to patient and GP, and (4) follow-up appointment made before discharge. Usual care included (1) handwritten discharge letter given to patient, (2) typed discharge summary mailed to GP, (3) information package given to parents, and (4) asthma action plan.
§Percentage replying good to extremely good.
‖Percentage replying moderately to very involved.

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studies.[71,73] In reports by Lissauer et al[77] and Janik et al,[80] the omission rate for essential items decreased with the use of computer-generated summaries. In another study of computer-generated summaries, approximately 70% of physicians expressed a preference for this format, observing that the structured summaries were shorter and more clear than dictated summaries.[78] Van Walraven et al[79] also found a preference for dictated summaries that followed a standardized format with clear subheadings, compared to narrative summaries. The standardized format was significantly shorter ($P<.005$), and physicians indicated that it provided easier access to the information most relevant for follow-up care ($P<.001$).[79] Rao et al[87] developed a standardized template for discharge dictations and reported that the quality and efficiency of dictations improved significantly ($P<.001$). Overall, however, improvement in measures of quality was not as consistent as seen for timeliness.

COMMENT

Deficits in communication and information transfer between hospital-

Table 3. Interventions to Improve Physician Communication at Hospital Discharge: Nonrandomized Studies With Concurrent Control Group

Source (Location)	Participants	Intervention	Control	Results: Outcomes	Intervention	Control	*P* Value
Jelovsek et al,[73] 1977 (United States)	382 Infants admitted to nursery during 3 mo, each with discharge summary in 2 formats	Computer-generated discharge summary	Manual discharge summary	Omitted diagnoses, range, %	2.4-9.4	0-6.8	NR
				Omitted procedures, range, %	0-3.6	0-3.1	NR
Dover and Low-Beer,[74] 1984 (England)	207 Patients cared for by 1 of 2 house physicians	Hand delivery of discharge letter by patient to GP	Mail delivery of discharge letter to GP	Time to delivery, median, d	2.5	7.5	<.001
				Received by 2 d, %	58	3	NR
Kendrick and Hindmarsh,[75] 1989 (England)	110 Emergency hospital admissions from 2 group practices during 1 y	Discharge letter combined with medication prescriptions*	Medication prescriptions and discharge letter on separate forms*	Time to receipt of discharge letter, median, d	2.1†	3.1	.03
				Discharge letters received, %	72	73	NR
				Time to receipt, discharge summary, median, d	17	18.5	.80
				Discharge summaries received, %	72	60	NR
Llewelyn et al,[76] 1988 (England)	147 Admissions to 3 hospital physicians during 3 mo	Computer-generated discharge summary, edited by physician	Handwritten discharge summary	Completed at 7 d, %	80	33	NR
Lissauer et al,[77] 1991 (England)	133 Infants admitted to intensive and special care during 6 mo, each with discharge summary in 2 formats	Computer-generated discharge summary	Dictated discharge summary	Completed, %	98	71	NR
				Time to completion	At discharge	1-26 wk	NR
				Omitted items, No.	94	506	NR
				Errors, No.	0	9	NR
				Readability (0-10 score), median	6	8	NR
Archbold et al,[78] 1998 (England)	Paired example discharge summaries rated by 147 GPs	Computer-generated discharge summary	Dictated discharge summary	Preferred format, %	69	28	<.001
				Clearer format, %	67	28	<.001
van Walraven et al,[79] 1998 (Canada)	9 Paired example discharge summaries rated by 160 family physicians	Discharge summary in standardized format	Discharge summary in narrative format	Overall rating (0-7 scale), mean (95% confidence interval)	4.28 (3.99-4.57)	3.84 (3.55-4.13)	.04

Abbreviations: GP, general practitioner; NR, not reported.
*Typed discharge summaries were used in both groups.
†As reported in the article.

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based physicians and primary care physicians are substantial and ubiquitous. The traditional methods of completing and delivering discharge summaries are suboptimal for communicating timely, accurate, and medically important patient data to the physicians who will be responsible for follow-up care. Urgent improvements are needed in the processes and formats used for transferring information to primary care physicians at hospital discharge.

Table 4. Interventions to Improve Physician Communication at Hospital Discharge: Nonrandomized Studies With Pre-Post Design

Source (Location)	Participants	Intervention	Control	Results			
				Outcomes	Intervention	Control	*P* Value
Janik et al,[80] 1978 (United States)	68 Infants with discharge summaries 1 mo before and after intervention	Computer-generated discharge summaries	Manual discharge summaries	Time to completion, range, d	4-5	16-180	NR
				Time to receipt, d	7	21	NR
				Omission rate, %	4	19	NR
Flyer et al,[81] 1988 (United States)	11 Second-year medical residents who dictated 142 discharge summaries	30-min Educational intervention teaching residents standardized format	Nonstandardized format	Overall rating, mean (SD)*	4.1 (0.94)	3.7 (1.1)	<.05
Smith and Holzman,[82] 1989 (United States)	207 Patients discharged from gynecology services of 1 hospital during 2 separate 1-mo periods	Computer-generated discharge summary	Typed discharge summary	Time to receipt, median, d	2	5	NR
				Time to receipt, mean, d	3.8	20.9	.001
Kenny,[83] 1991 (England)	239 Patients randomly sampled before and after change in policy	Discharge letter combined with medication prescriptions	Medication prescriptions and discharge letter on separate forms	Completed by 2 d, %	71	71	NS
				Completed at 3-7 d, %	23	25	NS
				Completed after 7 d, %	6	4	NS
				Received by GP, %	85	80	NS
				Received by patient, %	94	68	<.001
Branger et al,[84] 1992 (the Netherlands)	27 GPs at 2 hospitals participating in new electronic records program	Electronic notification and summary of discharge	Mailed discharge summary	Time to receipt, hospital 1, median, d	<1	2	NR
				Time to receipt, hospital 2, median, d	<1	4	NR
Curran et al,[85] 1992 (Ireland)	149 Patients discharged from geriatric medical unit during 4 mo	Written and verbal instructions to hand deliver discharge letter to GP	Verbal instruction to hand deliver discharge letter to GP	Time to receipt , median, d	2	4	NR
				Time to receipt, mean, d	3.0	4.9	NR
Mant et al,[86] 2002 (Australia)	122 GPs who participated in at least 1 QI workshop	QI workshops intended to improve hospital-GP communication	Baseline practice before QI workshops	GPs receiving discharge summary by fax, %	27	2	<.001
Rao et al,[87] 2005 (United States)	150 Discharge summaries randomly selected from a medical unit during 3 y	Standardized dictation template, educational sessions for residents performing dictation	Discharge summaries dictated without standardized template	Overall quality score†	34	28	<.001
				No. of dictated lines	35	81	<.001

Abbreviations: GP, general practitioner; NR, not reported; NS, reported as nonsignificant; QI, quality improvement.
*Average of subscores on 7 domains rated by faculty members on 0- to 5-point Likert scale.
†Total score on 0- to 41-point scale, compiling 4 subscales: (1) inclusion of relevant information, (2) exclusion of extraneous information, (3) clarity, and (4) consistency of material with main diagnosis.

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Box. Suggestions to Improve Communication and Information Transfer Between Inpatient and Outpatient Physicians at Hospital Discharge

On the day of discharge, a summary document should be sent to the primary care physician by e-mail, fax, or mail. If a complete discharge summary cannot be sent on the day of discharge, then an interim discharge note should be sent. At minimum, it should include the diagnoses, discharge medications, results of procedures, follow-up needs, and pending test results.

Discharge summaries should include the following:

- Primary and secondary diagnoses
- Pertinent medical history and physical findings
- Dates of hospitalization, treatment provided, brief hospital course
- Results of procedures and abnormal laboratory test results
- Recommendations of any subspecialty consultants
- Information given to the patient and family
- The patient's condition or functional status at discharge
- Reconciled discharge medication regimen, with reasons for any changes and indications for newly prescribed medications
- Details of follow-up arrangements made
- Specific follow-up needs, including appointments or procedures to be scheduled, and tests pending at discharge
- Name and contact information of the responsible hospital physician

Discharge summaries should be structured with subheadings to organize and highlight the information most pertinent to follow-up care and to ensure that all essential topics are addressed.

To the extent possible, hospitals should use information technology to extract information into discharge summaries to ensure accuracy (eg, medication names and doses) and to facilitate rapid completion of summaries.

If possible, patients should be given a copy of the discharge summary or note and told to bring it to their follow-up visit.

Historically, the discharge summary was used mainly for documentation of acute hospital care, and there was little need for information transfer because the same physician often provided inpatient and outpatient care. The advent of hospitalists, however, has created a division of labor in the spectrum of patient care and inherent discontinuity between acute hospitalization and community management.[3,88,89] In this new model of care, the discharge summary becomes a vital tool for communication and information transfer. The current JCAHO performance standard that discharge summaries be completed within 30 days of hospitalization is insufficient from a patient safety perspective and does not meet the needs of primary care physicians and patients, who commonly follow up much sooner.[11]

Unless the timeliness and accuracy of hospital discharge communication are improved, patients who have complex medical problems and require early postdischarge follow-up often will be treated by their primary care physician before the physician's receipt of information about the hospitalization, pending test results, and specific follow-up needs.[19,25,26,52,65-67] Research is beginning to show that poor information transfer and discontinuity are associated with lower quality of care on follow-up, as well as adverse clinical outcomes. Moore et al[10] found that errors related to discontinuity of care occurred for about 50% of patients and that lapses in communication related to diagnostic evaluations were associated with a significantly higher risk of readmission. Van Walraven et al[66] demonstrated a trend toward greater risk of readmission among patients who were treated in follow-up by a physician who had not received a discharge summary. Conversely, in a population-based cohort study in Canada, patients following up with the same physician who provided inpatient care had a 5% decrease in the relative risk of death or readmission.[9] Other studies have highlighted concerns about potential adverse events related to discontinuity, including a report by Roy et al,[65] which showed that about 40% of patients have test results that return after hospital discharge and that physicians are commonly unaware of these results, even though about 10% of them require some action. Finally, erroneous information sometimes enters into discharge communications, and it is rarely questioned once documented as part of the medical record.[15] Incomplete or inaccurate information about the hospitalization can contribute to faulty medical decision-making or failure to adequately monitor a patient's condition during follow-up care. To promote patient safety at transitions of care, the timeliness, accuracy, and relevance of discharge communications must be improved.

According to the results of this review, we suggest several steps to improve communication between inpatient and outpatient physicians at hospital discharge (BOX).§ The delivery and perhaps quality of discharge summaries can be improved substantially through health information technology.[71,76-78,80,82,84] Such technology offers the potential to quickly extract information about diagnoses, medications, and test results into a structured discharge document that can be reviewed for accuracy by the hospital physician and augmented with specific instructions to outpatient physicians about pending test results and other follow-up needs. An electronic medical record can ensure integrity and speed in the data capture process. It could be configured to deliver information through fax or e-mail to designated outpatient physicians on the day of discharge, or outpatient physicians

§References 11, 16, 36-39, 47, 49-52, 54-56, 60.

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could be allowed to access the information on their own.[90-96]

In addition to computer-based solutions, a number of other interventions proved effective in improving aspects of information transfer. For example, giving a copy of the most pertinent data to newly discharged patients should increase the likelihood that this information will be available to the primary care physician at the first follow-up visit.[70,74,75,85] Multifaceted approaches, using a combination of technology and simple paper-based solutions, may be needed to overcome potential barriers, as well as provide backup mechanisms to ensure timely, accurate communication of discharge information.

The primary limitations of this review relate to the consistency and quality of this body of evidence. First, interpretation and synthesis of the findings are restricted by the high degree of variability among studies in their patient populations, outcome measures, and types of interventions tested. Second, interventions to improve the quality of discharge summaries were more difficult to interpret and synthesize because the available trials contained limited outcome data and used different metrics for their outcomes, some of which had unclear clinical significance.[71,77,79,81] Third, there was a relative lack of high-quality investigations, with only 3 randomized controlled trials identified. The nonrandomized studies are subject to numerous biases, including the possible noncomparability of groups at baseline, and pre-post studies may also be affected by the confounding effects of secular time trends. Many studies did not include an appropriate analysis of outcomes, lacking statistical testing for example, and few investigations made attempts to measure and control for potential confounding variables. Fourth, the generalizability of these results is uncertain. Most of the included studies were conducted outside the United States in countries with a single-payer or national health system. There may be substantial differences in the feasibility and impact of interventions if implemented in a heterogeneous medical system as found in the United States. Even within a single medical system, differences in logistics and efficiency across hospitals may create unique challenges and opportunities that need to be addressed at the local level.

Despite these methodologic limitations, we believe that the conclusions of this report reflect the general state of affairs for the majority of medical practices. Although the precise rates of specific communication deficits may vary across sites, the delays and omissions reported in the summarized observational studies are consistently large. As for the interventions, the consistent improvement observed across investigations highlights the potential for reducing deficits in information transfer even while the optimal approach or the comparative effectiveness of these interventions cannot be determined from the existing literature. Furthermore, these results have high face validity. Deficits in communication are commonly encountered by practicing physicians, and anecdotal examples of poor communication are widespread.

We chose to focus this review on discharge communications, but other aspects of communication between inpatient and outpatient physicians may also require improvement. Many primary care physicians are not routinely notified about patient admissions or complications during the hospital course.[52] Conversely, some primary care physicians may not provide sufficient information to hospitalists at admission, visit or call hospitalized patients, participate in discharge planning, or contact patients who have missed postdischarge follow-up appointments.[4,97-100] Lee and Garvin[101] have stressed the need to "move beyond traditional practices of information transfer (based on a 1-way monologue) and toward a more useful and appropriate notion of information exchange (based on 2-way dialogue)." In moving forward, interested readers may also wish to consult a number of noteworthy articles describing uncontrolled interventions to improve hospital discharge communication,[102-115] complementary literature on emergency department discharge,[116-124] an effective patient-centered approach to improve care transitions,[125] and recent research abstract presentations[126-133] that did not meet the inclusion criteria for the present review.

In conclusion, with the rapid growth in hospitalists and development of the specialty of hospital medicine, it has become increasingly important for hospital-based physicians and primary care physicians to communicate relevant patient information at hospital discharge. Delays and omissions in discharge communications are common and may lower the quality of posthospital care. A number of interventions appear effective in improving the timeliness and perhaps quality of discharge summaries, and application of health information technology bears particular promise. The baton of responsibility for patient care must be passed with confidence and certainty while ensuring that important information is not dropped during patient transitions from acute hospital care to the community.

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Study concept and design: Kripalani, Phillips, Williams, Basaviah, Baker.
Acquisition of data: Kripalani, LeFevre, Phillips, Basaviah.
Analysis and interpretation of data: Kripalani, LeFevre, Phillips, Basaviah, Baker.
Drafting of the manuscript: Kripalani, LeFevre, Phillips.
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REFERENCES

1. Society of Hospital Medicine. Growth of hospital medicine nationwide. http://www.hospitalmedicine.org/Content/NavigationMenu/Media/GrowthofHospitalMedicineNationwide/Growth_of_Hospital_M.htm. Accessed July 17, 2006.
2. Wachter RM. An introduction to the hospitalist model. *Ann Intern Med*. 1999;130:338-342.
3. Wachter RM, Goldman L. The hospitalist movement 5 years later. *JAMA*. 2002;287:487-494.
4. Alpers A. Key legal principles for hospitalists. *Am J Med*. 2001;111:5S-9S.
5. Goldman L, Pantilat SZ, Whitcomb WF. Passing the clinical baton: 6 principles to guide the hospitalist. *Am J Med*. 2001;111:36S-39S.
6. Poon EG, Gandhi TK, Sequist TD, Murff HJ, Karson AS, Bates DW. "I wish I had seen this test result earlier!" dissatisfaction with test result management systems in primary care. *Arch Intern Med*. 2004;164:2223-2228.
7. Coleman EA, Berenson RA. Lost in transition: challenges and opportunities for improving the quality of transitional care. *Ann Intern Med*. 2004;141:533-536.
8. Coleman EA, Min SJ, Chomiak A, Kramer AM. Posthospital care transitions: patterns, complications, and risk identification. *Health Serv Res*. 2004;39:1449-1465.
9. van Walraven C, Mamdani M, Fang J, Austin P. Continuity of care and patient outcomes after hospital discharge. *J Gen Intern Med*. 2004;19:624-631.
10. Moore C, Wisnivesky J, Williams S, McGinn T. Medical errors related to discontinuity of care from an inpatient to an outpatient setting. *J Gen Intern Med*. 2003;18:646-651.
11. *Standard IM.6.10: Hospital Accreditation Standards*. Oakbrook Terrace, Ill: Joint Commission on Accreditation of Healthcare Organizations; 2006:338-340.
12. Joint Commission on Accreditation of Healthcare Organizations. Joint Commission national patient safety goals. http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/. Accessed July 17, 2006.
13. Branger PJ, Duisterhout JS. Electronic data interchange in medical care: an evaluation study. In: Proceedings of the Annual Symposium on Computer Applications in Medical Care. 1991:58-62.
14. Pantilat SZ, Lindenauer PK, Katz PP, Wachter RM. Primary care physician attitudes regarding communication with hospitalists. *Dis Mon*. 2002;48:218-229.
15. Adhiyaman V, Oke A, White AD, Shah IU. Diagnoses in discharge communications: how far are they reliable? *Int J Clin Pract*. 2000;54:457-458.
16. Bertrand D, Francois P, Bosson JL, Fauconnier J, Weil G. Quality assessment of discharge letters in a French university hospital. *Int J Health Care Qual Assur Inc Leadersh Health Serv*. 1998;11:90-95.
17. de Cruppe W, Hennch C, Reas D, Wild B, Herzog W. Reporting psychosomatic consultations in the discharge letter: an examination of communication between inpatient and primary care physicians. *Gen Hosp Psychiatry*. 2002;24:343-352.
18. Demlo LK, Campbell PM. Improving hospital discharge data: lessons from the National Hospital Discharge Survey. *Med Care*. 1981;19:1030-1040.
19. Fair JF. Hospital discharge and death communications. *Br J Hosp Med*. 1989;42:59-61.
20. Foster DS, Paterson C, Fairfield G. Evaluation of immediate discharge documents: room for improvement? *Scott Med J*. 2002;47:77-79.
21. Gammon DA. Communication really is vital. *Med J Aust*. 1980;1:663-664.
22. Haikio JP, Linden K, Kvist M. Outcomes of referrals from general practice. *Scand J Prim Health Care*. 1995;13:287-293.
23. Liesenfeld B, Heekeren H, Schade G, Hepp KD. Quality of documentation in medical reports of diabetic patients. *Int J Qual Health Care*. 1996;8:537-542.
24. Lipworth BJ, Allan J, Jackson CM, Dhillon PD, Winter JH, Clark RA. An audit of hospital discharge letters in patients admitted with acute asthma. *Scott Med J*. 1993;38:116-119.
25. Lockwood E, McCallum FM. Patients discharged from hospital: an aspect of communication in the Health Service. *Health Bull (Edinb)*. 1970;28:75-80.
26. Mageean RJ. Study of "discharge communications" from hospital. *Br Med J (Clin Res Ed)*. 1986;293:1283-1284.
27. Mathur R, Clark RA, Dhillon DP, Winter JH, Lipworth BJ. A repeat audit of hospital discharge letters in patients admitted with acute asthma. *Scott Med J*. 1997;42:19-21.
28. Penney TM. Delayed communication between hospitals and general practitioners: where does the problem lie? *BMJ*. 1988;297:28-29.
29. Qvist P, Rasmussen L, Bonnevie B, Gjorup T. Repeated measurements of generic indicators: a Danish national program to benchmark and improve quality of care. *Int J Qual Health Care*. 2004;16:141-148.
30. Raval AN, Marchiori GE, Arnold JM. Improving the continuity of care following discharge of patients hospitalized with heart failure: is the discharge summary adequate? *Can J Cardiol*. 2003;19:365-370.
31. Solis DH. The postdischarge loose laboratory report: medical significance. *J Am Med Rec Assoc*. 1982;53:26-32.
32. Temple J. General practice follow-up of patients discharged from hospital. *Practitioner*. 1988;232:148-150.
33. Tulloch AJ, Fowler GH, McMullan JJ, Spence JM. Hospital discharge reports: content and design. *BMJ*. 1975;4:443-446.
34. van Walraven C, Demers SV. Coding diagnoses and procedures using a high-quality clinical database instead of a medical record review. *J Eval Clin Pract*. 2001;7:289-297.
35. van Zyl LT, Davidson PR. Delirium in hospital: an underreported event at discharge. *Can J Psychiatry*. 2003;48:555-560.
36. Adams DC, Bristol JB, Poskitt KR. Surgical discharge summaries: improving the record. *Ann R Coll Surg Engl*. 1993;75:96-99.
37. Al-Rashed SA, Wright DJ, Roebuck N, Sunter W, Chrystyn H. The value of inpatient pharmaceutical counselling to elderly patients prior to discharge. *Br J Clin Pharmacol*. 2002;54:657-664.
38. Bado W, Williams CJ. Usefulness of letters from hospitals to general practitioners. *Br Med J (Clin Res Ed)*. 1984;288:1813-1814.
39. Balla JI, Jamieson WE. Improving the continuity of care between general practitioners and public hospitals. *Med J Aust*. 1994;161:656-659.
40. Bartlett RC, Lobel S. Laboratory reports issued on or after discharge date. *J Am Med Rec Assoc*. 1991;62:32-33.
41. Boyle CM, Young RE, Stevenson JG. General practitioners' opinions of a new hospital-discharge letter. *Lancet*. 1974;2:466-467.
42. Cartwright A. The relationship between general practitioners, hospital consultants and community nurses when caring for people in the last year of their lives. *Fam Pract*. 1991;8:350-355.
43. Colledge NR, Smith RG, Lewis SJ. The delivery of interim discharge summaries to general practitioners by the elderly. *Health Bull (Edinb)*. 1992;50:219-222.
44. Holyoake TI, Semple PD. Comparison of acceptability by general practitioners of word processor and conventional discharge letters. *Health Bull (Edinb)*. 1990;48:29-35.
45. Howard DJ. Structured discharge letter in a department of geriatric medicine. *Health Trends*. 1986;18:12-14.
46. Isaac DR, Gijsbers AJ, Wyman KT, Martyres RF, Garrow BA. The GP-hospital interface: attitudes of general practitioners to tertiary teaching hospitals. *Med J Aust*. 1997;166:9-12.
47. King MH, Barber SG. Towards better discharge summaries: brevity and structure. *West Engl Med J*. 1991;106:40-41, 55.
48. Mant A, Rotem WC, Kehoe L, Kaye KI. Compliance with guidelines for continuity of care in therapeutics from hospital to community. *Med J Aust*. 2001;174:277-280.
49. Meara JR, Wood JL, Wilson MA, Hart MC. Home from hospital: a survey of hospital discharge arrangements in Northamptonshire. *J Public Health Med*. 1992;14:145-150.
50. Munday A, Kelly B, Forrester J, Timoney A, McGovern E. Do general practitioners and community pharmacists want information on the reasons for drug therapy changes implemented by secondary care? *Br J Gen Pract*. 1997;47:563-566.
51. Newton J, Eccles M, Hutchinson A. Communication between general practitioners and consultants: what should their letters contain? *BMJ*. 1992;304:821-824.
52. Pantilat SZ, Lindenauer PK, Katz PP, Wachter RM. Primary care physician attitudes regarding communication with hospitalists. *Am J Med*. 2001;111:15S-20S.
53. Sexton J, Ho YJ, Green CF, Caldwell NA. Ensuring seamless care at hospital discharge: a national survey. *J Clin Pharm Ther*. 2000;25:385-393.
54. Solomon JK, Maxwell RB, Hopkins AP. Content of a discharge summary from a medical ward: views of general practitioners and hospital doctors. *J R Coll Physicians Lond*. 1995;29:307-310.
55. Stalhammar J, Holmberg L, Svardsudd K, Tibblin G. Written communication from specialists to general practitioners in cancer care: what are the expectations and how are they met? *Scand J Prim Health Care*. 1998;16:154-159.
56. van Walraven C, Rokosh E. What is necessary for high-quality discharge summaries? *Am J Med Qual*. 1999;14:160-169.
57. Wagstaff R, Berlin A, Stacy R, Spencer J, Bhopal RA. Information about patients' deaths: general practitioners' current practice and views on receiving a death register. *Br J Gen Pract*. 1994;44:315-316.
58. Williams EI, Fitton F. General practitioner response to elderly patients discharged from hospital. *BMJ*. 1990;300:159-161.
59. Bolton P, Mira M, Kennedy P, Lahra MM. The quality of communication between hospitals and general practitioners: an assessment. *J Qual Clin Pract*. 1998;18:241-247.
60. Harding J. Study of discharge communications from hospital doctors to an inner London general practice. *J R Coll Gen Pract*. 1987;37:494-495.
61. Kljakovic M, Abernethy D, de Ruiter I. Quality of diagnostic coding and information flow from hospital to general practice. *Inform Prim Care*. 2004;12:227-234.
62. Lloyd BW, Barnett P. Use of problem lists in letters between hospital doctors and general practitioners [letter]. *BMJ*. 1993;306:247.
63. Long A, Atkins J. Communications between general practitioners and consultants. *BMJ*. 1974;4:456-459.
64. Rawal J, Barnett P, Lloyd BW. Use of structured letters to improve communication between hospital doctors and general practitioners [letter]. *BMJ*. 1993;307:1044.
65. Roy CL, Poon EG, Karson AS, et al. Patient safety concerns arising from test results that return after hospital discharge. *Ann Intern Med*. 2005;143:121-128.
66. van Walraven C, Seth R, Austin PC, Laupacis A. Effect of discharge summary availability during postdischarge visits on hospital readmission. *J Gen Intern Med*. 2002;17:186-192.
67. van Walraven C, Seth R, Laupacis A. Dissemination of discharge summaries: not reaching follow-up physicians. *Can Fam Physician*. 2002;48:737-742.
68. van Walraven C, Weinberg AL. Quality assessment of a discharge summary system. *CMAJ*. 1995;152:1437-1442.
69. Wilson S, Ruscoe W, Chapman M, Miller R. Gen-

 ©2007 American Medical Association. All rights reserved.

eral practitioner-hospital communications: a review of discharge summaries. *J Qual Clin Pract*. 2001;21:104-108.
70. Sandler DA, Mitchell JR. Interim discharge summaries: how are they best delivered to general practitioners? *Br Med J (Clin Res Ed)*. 1987;295:1523-1525.
71. van Walraven C, Laupacis A, Seth R, Wells G. Dictated versus database-generated discharge summaries: a randomized clinical trial. *CMAJ*. 1999;160:319-326.
72. Marks MK, Hynson JL, Karabatsos G. Asthma: communication between hospital and general practitioners. *J Paediatr Child Health*. 1999;35:251-254.
73. Jelovsek F, Smith R, Blackmon L, Hammond W. Computerized nursery discharge summary. *Methods Inf Med*. 1977;16:199-204.
74. Dover SB, Low-Beer TS. The initial hospital discharge note: send out with the patient or post? *Health Trends*. 1984;16:48.
75. Kendrick AR, Hindmarsh DJ. Which type of hospital discharge report reaches general practitioners most quickly? *BMJ*. 1989;298:362-363.
76. Llewelyn DE, Ewins DL, Horn J, Evans TG, McGregor AM. Computerised updating of clinical summaries: new opportunities for clinical practice and research? *BMJ*. 1988;297:1504-1506.
77. Lissauer T, Paterson C, Simons A, Beard R. Evaluation of computer generated neonatal discharge summaries. *Arch Dis Child*. 1991;66:433-436.
78. Archbold RA, Laji K, Suliman A, Ranjadayalan K, Hemingway H, Timmis AD. Evaluation of a computer-generated discharge summary for patients with acute coronary syndromes. *Br J Gen Pract*. 1998;48:1163-1164.
79. van Walraven C, Duke SM, Weinberg AL, Wells PS. Standardized or narrative discharge summaries: which do family physicians prefer? *Can Fam Physician*. 1998;44:62-69.
80. Janik DS, Swarner OW, Henriksen KM, Wyman ML. A computerized single entry system for recording and reporting data on high-risk newborn infants. *J Pediatr*. 1978;93:519-523.
81. Flyer B, Rubenstein LZ, Robbins AS, Wieland GD, Henry D, Cugalj N. An intervention to improve the hospital discharge summary. *J Med Educ*. 1988;63:407-409.
82. Smith RP, Holzman GB. The application of a computer data base system to the generation of hospital discharge summaries. *Obstet Gynecol*. 1989;73:803-807.
83. Kenny C. Hospital discharge medication: is seven days supply sufficient? *Public Health*. 1991;105:243-247.
84. Branger PJ, van der Wouden JC, Schudel BR, et al. Electronic communication between providers of primary and secondary care. *BMJ*. 1992;305:1068-1070.
85. Curran P, Gilmore DH, Beringer TR. Communication of discharge information for elderly patients in hospital. *Ulster Med J*. 1992;61:56-58.
86. Mant A, Kehoe L, Cockayne NL, Kaye KI, Rotem WC. A Quality Use of Medicines program for continuity of care in therapeutics from hospital to community. *Med J Aust*. 2002;177:32-34.
87. Rao P, Andrei A, Fried A, Gonzalez D, Shine D. Assessing quality and efficiency of discharge summaries. *Am J Med Qual*. 2005;20:337-343.
88. Auerbach AD, Nelson EA, Lindenauer PK, Pantilat SZ, Katz PP, Wachter RM. Physician attitudes toward and prevalence of the hospitalist model of care: results of a national survey. *Am J Med*. 2000;109:648-653.
89. Wachter RM, Goldman L. The emerging role of "hospitalists" in the American health care system. *N Engl J Med*. 1996;335:514-517.
90. Bates DW, Gawande AA. Improving safety with information technology. *N Engl J Med*. 2003;348:2526-2534.
91. Weiner M, Callahan CM, Tierney WM, et al. Using information technology to improve the health care of older adults. *Ann Intern Med*. 2003;139:430-436.
92. Hersh W. Health care information technology: progress and barriers. *JAMA*. 2004;292:2273-2274.
93. Weiner SJ, Barnet B, Cheng TL, Daaleman TP. Processes for effective communication in primary care. *Ann Intern Med*. 2005;142:709-714.
94. Chaudhry B, Wang J, Wu S, et al. Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. *Ann Intern Med*. 2006;144:742-752.
95. Sujansky WV. The benefits and challenges of an electronic medical record: much more than a "word-processed" patient chart. *West J Med*. 1998;169:176-183.
96. Delpierre C, Cuzin L, Fillaux J, Alvarez M, Massip P, Lang T. A systematic review of computer-based patient record systems and quality of care: more randomized clinical trials or a broader approach? *Int J Qual Health Care*. 2004;16:407-416.
97. Lloyd J, Davies GP, Harris M. Integration between GPs and hospitals: lessons from a division-hospital program. *Aust Health Rev*. 2000;23:134-141.
98. McInnes E, Mira M, Atkin N, Kennedy P, Cullen J. Can GP input into discharge planning result in better outcomes for the frail aged: results from a randomized controlled trial. *Fam Pract*. 1999;16:289-293.
99. Rutherford A, Burge B. General practitioners and hospitals: continuity of care. *Aust Fam Physician*. 2001;30:1101-1107.
100. Wachter RM, Pantilat SZ. The "continuity visit" and the hospitalist model of care. *Am J Med*. 2001;111:40S-42S.
101. Lee RG, Garvin T. Moving from information transfer to information exchange in health and health care. *Soc Sci Med*. 2003;56:449-464.
102. Wilkin TJ, Dodd W, Leach R, Crooks J. A new hospital discharge system designed to prevent transcription errors. *Health Bull (Edinb)*. 1978;36:16-19.
103. van Domburg RT, Simoons ML. Computer-generated discharge letters in the coronary care unit. *Med Inform (Lond)*. 1985;10:259-266.
104. South J. A computer summary used as a discharge letter. *J R Coll Gen Pract*. 1972;22:28-32.
105. Sandler DA, Heaton C, Garner ST, Mitchell JR. Patients' and general practitioners' satisfaction with information given on discharge from hospital: audit of a new information card. *BMJ*. 1989;299:1511-1513.
106. Sandler D, Mitchell J, Fellows A, Garner S. Is an information booklet for patients leaving hospital helpful and useful? *BMJ*. 1989;298:870-874.
107. Pillai A, Thomas S, Garg M. The electronic immediate discharge document: experience from the south west of Scotland. *Inform Prim Care*. 2004;12:67-73.
108. Philp I, Mutch WJ, MacWalter RS, Satkurunathan S, Watson J. Is a functionally orientated discharge summary of use to general practitioners? *Health Bull (Edinb)*. 1988;46:291-294.
109. Paterson JM, Allega RL. Improving communication between hospital and community physicians: feasibility study of a handwritten, faxed hospital discharge summary: Discharge Summary Study Group. *Can Fam Physician*. 1999;45:2893-2899.
110. Oetgen WJ, Steinweg DL, Kimball DB. The hospital discharge summary: a new format. *Mil Med*. 1982;147:1054-1055.
111. Massy-Westropp M, Giles L, Law D, Phillips P, Crotty M. Connecting hospital and community care: the acceptability of a regional data linkage scheme. *Aust Health Rev*. 2005;29:12-16.
112. Crosswhite R, Beckham S, Gray P, Hawkins P, Hughes J. Using a multidisciplinary automated discharge summary process to improve information management across the system. *Am J Manag Care*. 1997;3:473-479.
113. Clements D. An improved "interim discharge letter" a successful outcome from audit. *J R Coll Physicians Lond*. 1992;26:169-171.
114. Castleden WM, Stacey MC, Norman PE, Lawrence-Brown MM, Brooks JG. General practitioners' attitudes to computer-generated surgical discharge letters. *Med J Aust*. 1992;157:380-382.
115. Bolch D, Johnston J, Giles L, Whitehead C, Phillips P, Crotty M. Hospital to home: an integrated approach to discharge planning in a rural South Australian town. *Aust J Rural Health*. 2005;13:91-96.
116. Dunnion ME, Kelly B. From the emergency department to home. *J Clin Nurs*. 2005;14:776-785.
117. Goldman RD. Community physicians' attitudes toward electronic follow-up after an emergency department visit. *Clin Pediatr (Phila)*. 2005;44:305-309.
118. Vinker S, Kitai E, Or Y, Nakar S. Primary care follow up of patients discharged from the emergency department: a retrospective study. *BMC Fam Pract*. 2004;5:1-6.
119. Jansen JO, Grant IC. Communication with general practitioners after accident and emergency attendance: computer generated letters are often deficient. *Emerg Med J*. 2003;20:256-257.
120. O'Neill K, Silvestri A, McDaniel-Yakscoe N. A pediatric emergency department follow-up system: completing the cycle of care. *Pediatr Emerg Care*. 2001;17:392-395.
121. Johnson PH, Wilkinson I, Sutherland AM, Johnston ID, Hall IP. Improving communication between hospital and primary care increases follow-up rates for asthmatic patients following casualty attendance. *Respir Med*. 1998;92:289-291.
122. Taylor DM, Chappell-Lawrence J, Graham IS. Facsimile communication between emergency departments and GPs, and patient data confidentiality. *Med J Aust*. 1997;167:575-578.
123. Jones JS, Young MS, LaFleur RA, Brown MD. Effectiveness of an organized follow-up system for elder patients released from the emergency department. *Acad Emerg Med*. 1997;4:1147-1152.
124. Wass AR, Illingworth RN. What information do general practitioners want about accident and emergency patients? *J Accid Emerg Med*. 1996;13:406-408.
125. Coleman EA, Parry C, Chalmers S, Min S. The Care Transitions Intervention: results of a randomized controlled trial. *Arch Intern Med*. 2006;166:1822-1828.
126. Myers JS, Jaipaul CK, Kogan JR, Krekun S, Bellini LM, Shea JA. The effects of a discharge summary curriculum on the quality of discharge summaries in an internal medicine residency program [abstract]. *J Gen Intern Med*. 2005;20:165.
127. Kramer JM, Bria WF, Lim S, et al. The discharge navigator: a web-based innovation to better manage information flow during hospitalization [abstract]. *J Gen Intern Med*. 2004;19:108.
128. Kramer JM, Bria WF, Lim S, et al. Using a web-based discharge navigator to improve the transfer of clinical information from the hospital to the outpatient physician [abstract]. *J Gen Intern Med*. 2004;19:233.
129. Knight AM, Collins MG, Brecht Sands M, Frake A, Kravet SJ. Two birds with one stone: a computer template that simultaneously generates hospital discharge summaries and patient instructions [abstract]. *J Gen Intern Med*. 2003;18:134.
130. Bell CM, Auerbach AD, Kaboli PJ, et al. Association of communication between hospital-based physicians and primary care providers with patient outcomes [abstract]. *J Gen Intern Med*. 2006;21:17.
131. Moore C, Halm EA. Tying up loose ends: discharging patients with unresolved medical issues [abstract]. *J Gen Intern Med*. 2006;21:153.
132. Halasyamani L, Manning D, Kripalani S, et al. Transition of care for hospitalized elderly: the development of a discharge checklist for hospitalists. *J Hosp Med*. 2006;1:40-41.
133. Deitelzweig S, Torcson PJ, Kemmerly S. A multidisciplinary effort to create a standardized hospital discharge. Abstract presented at: Society of Hospital Medicine Annual Meeting, April 29-30, 2005, Chicago, Ill.

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