Paper 1 [Posted as supplied by the author]

Are discharge summaries produced from databases better than those dictated from medical records?

Abstract

Objective:

Hospital discharge summaries communicate information necessary for continuing patient care. They are most commonly dictated from medical records and are often of poor quality. The objective of this study was to compare dictated discharge summaries with those produced from a clinical database.

Methods:

A randomised trial was performed in which discharge summaries for patients discharged from general medicine at a teaching hospital were created by voice dictation (186 patients) or from a database (186 patients). Patients had been admitted between September 1996 and June 1997. For the database group, information on forms completed by junior doctors was entered into a database and collated into a discharge summary. For the dictation group, junior doctors dictated narrative letters. The proportion of patients for whom a summary was generated within 4 weeks of discharge was recorded. General practitioners receiving the summary rated its quality, completeness, organisation and timeliness on a 100-mm visual analogue scale.

Results:

Patients in the database group and the dictation group were similar. A summary was much more likely to be generated within 4 weeks of discharge for patients in the database group than for those in the dictation group (113 [70.6%] v. 86 [57.0%]; $p<0.001$). Summary quality was similar (mean rating 72.7 [standard deviation (SD) 19.3] v. 74.9 [SD 16.6]), as were assessments of completeness (73.4 [SD 19.8] v. 78.2 [SD 14.9]), organisation (77.4 [SD 16.3] v. 79.3 [SD 17.2]) and timeliness (70.3 [SD 21.9] v. 66.2 [SD 25.6]). Many information items of interest were more likely to be included in the database-generated summaries.

Discussion:

The database system significantly increased the likelihood that a discharge summary was created. General practitioners thought that the quality of summaries generated by the 2 methods was similar. The use of computer databases to create hospital discharge summaries should be implemented widely.

Introduction

Hospital discharge summaries are commonly used to communicate information between hospital doctors and general practitioners (GPs).[1] Previous studies have shown deficiencies in discharge summary content,[2-4] accuracy[5] and timeliness.[1,4,6,7]

Interventions to improve discharge summaries that have been tested in clinical studies include education,[8] handwritten interim reports[9-12] and standardisation of the summary's format.[13-18] To make voice dictation unnecessary, clinical databases have been used to generate discharge summaries.[19-33] Studies have suggested that with a database method, the likelihood of discharge summary generation is greater,[28,34,35] summary accuracy is greater[28] and summaries are created more quickly.[34,35] Database summaries are also preferred by general practitioners.[36-38] Since it is

unclear whether database-generated discharge summaries are better than dictated summaries, we conducted a randomised clinical trial to compare hospital discharge summaries created from a clinical database with those generated by voice dictation.

Methods

The study took place between September 1996 and June 1997 on the general medicine wards of a 700-bed teaching hospital. The 80-bed service consisted of 4 clinical teams, each composed of a consultant and junior staff. Throughout the study all junior doctors received individual sessions during which the study was described, methods to optimise the quality of dictated summaries were reviewed, and, during the randomised trial, the discharge summary database was explained. All patients admitted to general medicine during the study period were eligible for inclusion.

To create a dictated discharge summary, junior doctors decided what information was included and how it was organised. Dictations were transcribed in the medical records department and sent to the patient's GP. For most GPs, summaries were received within 3 working days of dictation.

Database fields were grouped into preadmission, hospital and discharge information and corresponded to fields on three separate forms. Junior doctors completed these forms during the patient's hospital stay. The day after discharge, information from the three completed forms was entered verbatim into the database by the principal investigator. If a form was blank, a sticker instructing the junior doctors to complete it was placed on the form. After data entry, a word processor macro command was used to collate the database information into a database discharge summary.

Admissions were randomised by the investigators, according to the first letter of their family name. If a patient was assigned to the database group, the hospital summary form and database "Dear Doctor" letter were placed in his or her medical record. Junior doctors were informed that a patient had been assigned to the dictation group by means of a form similar to the hospital summary form. Instead of having database fields, this form reminded the doctors to dictate the summary when they discharged the patient, to send a copy to the GP, and to include only information they thought was necessary for continuing patient care. Instead of the database "Dear Doctor" letter, the routinely used interim discharge letter was placed in the patient's medical record.

The primary outcomes included the proportion of admissions for which a discharge summary was created by 4 weeks after discharge and overall summary quality. The summaries were rated by GPs on a 100-mm visual analogue scale ranging from 0 (worst) to 100 (best). A high-quality summary was defined as one that efficiently communicates information necessary for continued patient care. The study's secondary outcomes, including summary completeness ("All necessary information was included"), organisation and timeliness ("time from patient discharge to summary receipt") were also rated by the GPs. The assessment form, along with a stamped addressed envelope, was sent to the GPs with the discharge summary. If the forms were not returned within 2 months, a reminder questionnaire and summary were sent. Assessments were received for 302 summaries.

Additional measures of these outcomes were recorded. Record reviews identified all consultations, procedures, medical therapies, complications and specific laboratory and radiology tests (Appendix 1). To measure summary completeness, we determined whether information found at record review was cited in the summary. The summaries were reviewed by one of two investigators. Summary organisation was measured as the proportion of content items reported with a heading or cited in the first sentence of a paragraph. Finally, timeliness was recorded as

the number of days from patient discharge to summary generation.

Summaries created more than 4 weeks after discharge (16.4% of the summaries) were excluded from analysis since these summaries are usually different from those generated closer to patient discharge in purpose, content and length (personal observation). Study results did not change when these summaries were included.

We compared continuous measures using Student's t-test. Categorical measures were compared by means of the χ^2 test. Kaplan-Meier plots of time to summary creation were compared with the log-rank test. A 2-tailed p value less than 5% was considered significant for all analyses, which were performed with SPSS for Windows (version 7.0, SPSS Inc., Chicago).

Results

Randomised trial profile

Patient flow through the randomised trial is shown in Fig. 1. The dictation and database groups had data for 151 and 142 patients respectively available for analysis. The two groups were similar except that patients in the database group were more likely than those in the dictation group to be in a monitored bed (22.5% v. 11.9%; p = 0.02) (Table 1). The groups were also similar when only patients for whom a discharge summary was actually generated were compared.

A summary was much more likely to be generated within 4 weeks of discharge for patients in the database group (113 [79.6%] v. 86 [57.0%] ($p<0.001$). This large difference remained when the four-week "deadline" imposed by the study's protocol was removed and when data for patients whose length of stay was less than two days were excluded. The groups did not differ with respect to the junior doctor's level of training. The proportion of summaries in the two groups assessed by a GP was similar.

GPs' assessments

During the randomised trial, assessments were available for 151 (50%) of 302 summaries. With one exception, the summaries in the dictation and database groups were similar for all outcomes, including quality, even when adjusted for monitored bed status. However, GPs gave higher timeliness ratings to database-generated summaries than to dictated summaries (mean rating 72.2 [standard deviation (SD) 22.7] v. 62.6 [SD 28.2]; p=0.04).

Other assessments

The completeness of the database and dictated summaries is shown in Table 2. Fifteen items were cited with significantly different frequency in the 2 groups. Seven of these items (including discharge diagnosis, discharge medications and planned follow-up) were more commonly cited in the database summaries than in the dictated summaries, whereas dictated summaries were more likely to list the social history, admission diagnosis, hospital consultations and functional status at discharge.

Database-generated summaries were longer than dictated summaries (mean 57.3 [SD 17.1] lines v. 64.8 [SD 26.6] lines; p=0.03) and placed 8 of 14 content items (including chief complaint, admission medications, physical examination, treatment, complications, pending laboratory results and recommendations) under their own headings more frequently. Considering only patients for whom a summary was created within 4 weeks of discharge, database-generated summaries were produced more quickly: 94.7% of the summaries in this group were generated within one week of discharge, compared with 80.2% in the dictation group (log-rank statistic

72.56, $p<0.001$).

Discussion

The likelihood that a summary would be generated was significantly greater with the database system than with the dictation system. GPs considered the database and dictated summaries to be similar. The database summaries contained more information and, despite being longer, were created more quickly.

The better summary generation with the database system has the potential to increase communication between hospital doctors and GPs. This could lead to better continuity of care and less duplication of health care services. With minimal extra work, the database summary made dictation unnecessary.

GPs found that the database and dictated summaries were of similar quality. Given the 95% confidence limits around the difference between the groups, it is unlikely that their quality differed by more than 7.5 mm on a 100-mm scale.[39,40] In our pilot study only 18 (25%) of 72 respondents chose a minimal important difference of less than 7.5 mm. Therefore, if the participants were representative, 75% would consider database-generated and dictated summaries to be of equal quality.[41]

Database-generated summaries were more likely to contain many content items. We believe this is because the database forms completed by junior doctors prompted them for this information, making data omission less likely. Many of the content items that were more commonly cited in the database summaries, including discharge diagnosis, discharge medications and patient follow-up care, have been identified in several surveys as important for discharge summary quality.[36,37,42] However, we are unsure what effect this change in summary content would have on patient care.

Our study has three strengths compared with previous assessments. First, patients were randomly assigned to the method of summary generation. Second, one of the primary outcomes was the GPs' assessment of quality. Thus, the view of doctors who used the summary for continuing patient care were measured. Third, the outcomes chosen for the study were comprehensive. For these reasons, we believe our results are generalisable to all hospital discharges.

Our study had some limitations. First, junior doctors were not blinded to the intervention, which made cointervention and contamination between groups possible. Second, 9.4% of summaries were not sent and not every GP returned the summary assessment form. Therefore, intention-to-treat analysis was not possible for the summary assessment, though such an analysis would have been inappropriate. Third, completed database forms were entered into the database by the primary investigator. Outside a study, data would have to be entered by other workers, such as medical records clerks. Since the investigator directly transcribed data from the completed forms, we believe that medical records clerks could produce similar database summaries.

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Figure 1: Patient flow through randomised study comparing hospital discharge summaries created by dictation with those generated from a clinical database.

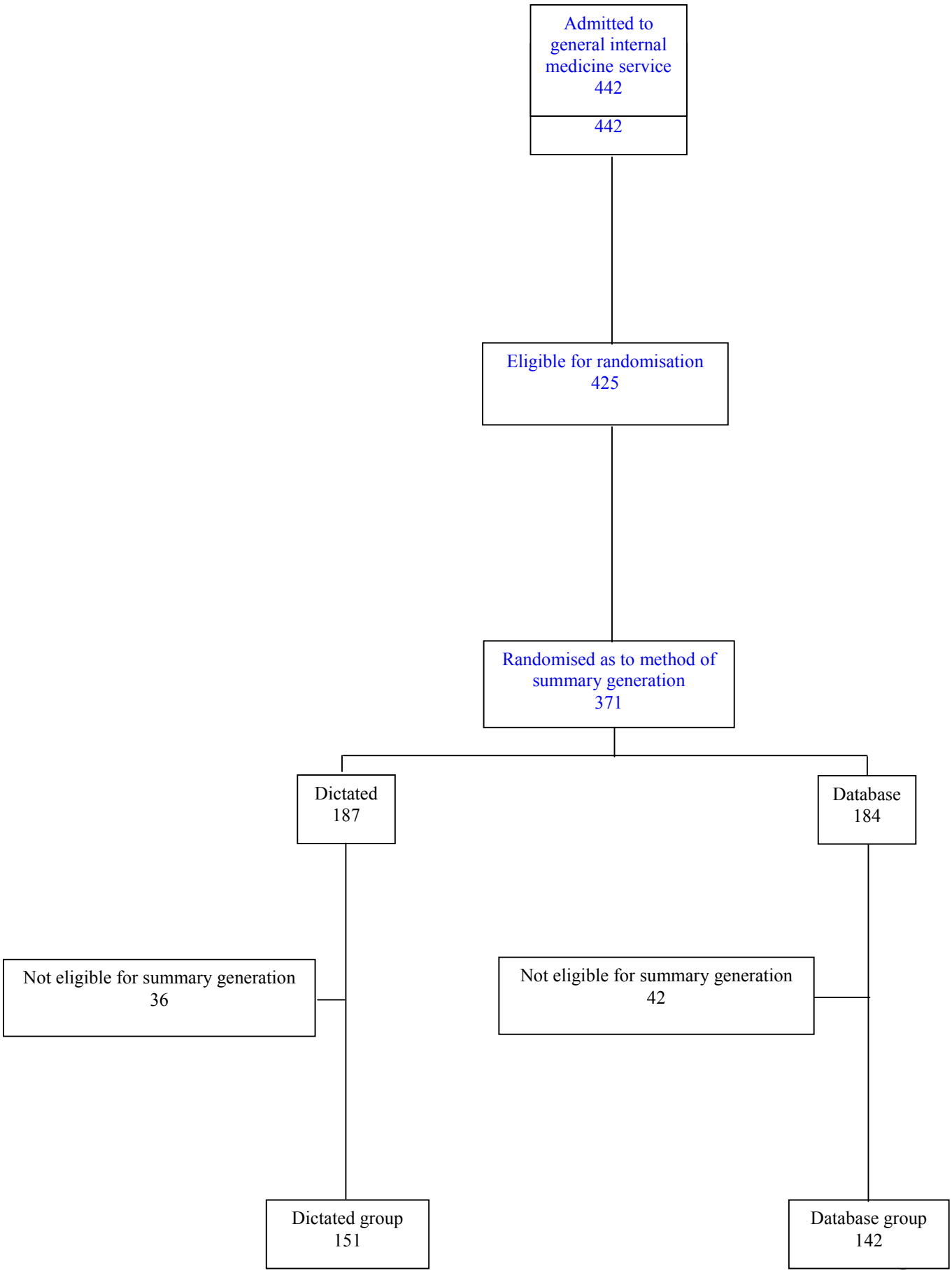

Table 1: Preadmission and in-hospital characteristics of patients for whom discharge summaries were either dictated or generated from a database.

	Group	
Characteristic	**Dictation n=151**	**Database n=142**
Mean age (and SD), yr	62.9 (18.5)	65.7 (17.5)
% female	46.4	52.8
Mean no. of preadmission diagnoses (and SD)	2.6 (1.7)	2.8 (2.1)
Preadmission diagnosis, no. (and %) of patients		
Hypertension	33 (21.9)	42 (29.6)
Coronary artery disease	27 (17.9)	32 (22.5)
Congestive heart failure	21 (13.9)	16 (11.3)
Asthma or chronic lung disease	26 (17.2)	25 (17.6)
Diabetes mellitus with or without complications	33 (21.9)	29 (20.4)
Cancer	17 (11.3)	9 (6.3)
Mean length of stay (and SD), d	5.5 (5.4)	5.6 (4.7)
Mean no. of new therapies (and SD)	2.40 (1.9)	2.30 (1.9)
In-hospital characteristics, no. (and % of patients)		
Admitted to monitored bed	18 (11.9)	32 (22.5)
With at least 1 extreme laboratory result *	82 (54.3)	81 (57.0)
With at least 1 diagnostic test *	132 (87.4)	132 (93.0)
With at least 1 consultation	86 (57.0)	78 (54.9)
With at least 1 complication	25 (16.6)	27 (19.0)
With at least 1 procedure	59 (39.1)	46 (32.4)
Mean no. of discharge medications (and SD)	3.82 (2.7)	3.90 (2.9)
Primary discharge diagnosis, no. (and %) of patients		
Respiratory system disorders	31 (20.5)	24 (17.0)
Circulatory system disorders	16 (10.6)	30 (21.3)
Digestive system disorders	30 (19.9)	31 (22.0)
Injuries/poisonings/undefined	12 (7.9)	12 (8.5)
Neoplastic/blood disorders	20 (13.2)	10 (7.1)
Endocrine/nutritional disorders	11 (7.3)	8 (5.7)

Note: SD = standard deviation.

* See Appendix 1 for definition

Table 2: Discharge summary completeness*

	Group; no. (and %) of summaries with item		
Item	**Dictated n=86**	**Database n=113**	**P value †**
Chief complaint	84/86 (97.7)	113/113 (100)	0.19
History of presenting illness	84/86 (97.7)	109/113 (96.5)	
Active past medical history	72/83 (86.7)	106/106 (100)	0.001
Social history	32/86 (37.2)	7/113 (6.2)	0.001
Preadmission medications	57/86 (66.3)	113/113 (100)	0.001
Results of physical examination at admission	75/86 (87.2)	112/113 (99.1)	0.001
Admission diagnosis	61/86 (70.9)	1/113 (0.9)	0.001
Consultations ‡	37/79 (46.8)	19/100 (19.0)	0.001
Procedures ‡	37/48 (77.1)	33/46 (71.7)	
New medical therapy ‡	123/239 (51.5)	128/262 (48.8)	
Complications ‡	8/19 (42.1)	16/27 (59.2)	
Extreme result of blood testing ‡	41/136 (30.1)	63/130 (48.5)	0.002
Results of diagnostic blood tests ‡	19/114 (16.7)	39/130 (30.0)	0.01
Results of radiology tests ‡	90/230 (39.1)	112/238 (47.0)	0.08
Discharge diagnosis	56/86 (65.1)	113/113 (100)	0.001
Discharge medications	80/86 (93.0)	113/113 (100)	0.006
Medical follow-up	76/80 (95.0)	104/105 (99.0)	
Community services	18/86 (20.9)	46/113 (40.7)	0.003
Discharge functional status	9/86 (10.5)	1/113 (0.9)	0.003
Pending laboratory tests	8/86 (9.3)	46/113 (40.7)	0.001
Recommendations	33/86 (38.4)	61/113 (54.0)	0.03

* The denominations vary because not all items applied to all summaries.

† Provided only if less than 0.2.

‡ The occurrence of these items was determined by a review of medical and laboratory records.

Appendix 1: Laboratory and radiologic data abstracted from each patient's Hospital discharge summary, summarative laboratory report and radiologic data summary.

Extreme results *	
Hematology	Leukocyte count <2.0 or >15.0 x 10^9 /L Hemoglobin concentration <100 or >180 g/L International normalised ratio > 5.0
Serum biochemistry	Sodium level <125 or >150 mmol/L Sodium bicarbonate level <15 mmol/L Creatinine level >300 μmol/L Total calcium level >3.0 mmol/L Creatinine kinase level >200 IU/L with MB isoenzyme fraction >5%
Microbiology	Blood culture (except for Streptococcus viridans) Urine culture (>100 million colony-forming units per litre of urine) Cerebrospinal fluid (any organism)
Diagnostic tests †	
Protein-based tests	Thyroid-stimulating hormone Parathyroid hormone Cholesterol Serum vitamin B_{12} (cobalamin) Serum or erythrocyte folate Ferritin Hemoglobin A_{1c}
Serology	HIV Hepatitis A Hepatitis B Hepatitis C
Radiology	Radiography of chest, abdomen or extremity Ultrasonagraphy of abdomen or pelvis Doppler ultrasonography or carotid arteries or leg veines Computed tomography of head, chest, abdomen or pelvis
Nuclear medicine	Ventilation-perfusion scan

* For tests indicating severity of illness.

† Tests helpful for continuing patient care.