CLINICAL AUDIT

Secular trends in the medical discharge summary in an acute medical hospital

K M Chow, C C Szeto

Postgrad Med J 2006;**82**:615–618. doi: 10.1136/pgmj.2006.046789

See end of article for authors' affiliations

Correspondence to:
Dr K M Chow, Department of Medicine and Therapeutics, Prince of Wales Hospital, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong; Chow_Kai_Ming@alumni.cuhk.net

Submitted
16 February 2006
Accepted 8 May 2006

Background: Although recent research has reported an evolution in the level of medical care, little is known about secular trends in the medical discharge summary.

Methods: The audit evaluated the evolution of discharge summary abstract over a decade in an acute medicine hospital among three successive periods of 1994, 2000, and 2005.

Results: Of the 140 random samples of discharge summaries, significant between-cohort difference existed in the logarithm transformed length of discharge summary; the median length of discharge summary increased from 11 lines in 1994 to 26 lines in 2005 ($p < 0.001$ corrected for multiple comparison). The closest univariate associations of discharge summary length were positively with the year of hospitalisation, length of stay, length of wordings about discharge plan and duplication of previous discharge summary, and negatively with clinical or planned admission (all $p < 0.01$). In a multiple linear regression analysis, the year of patient admission correlated significantly with the length of discharge summary ($p < 0.001$).

Conclusions: Over the 10 year study period, significant secular trends were seen in the discharge summary length and discharge plan documentation. The causes and implications for these trends deserve further investigation.

After hospital discharge, the challenges to high quality transitions of care have been increasingly recognised.¹ Medical documents of discharge summary are essential to ensure communication between inpatient and outpatient physician, as well as to relay information to the physician in charge between hospital admissions.² Although quantitative and qualitative evidence increasingly shows an evolution in the level of medical care, little is known about secular trends in the medical discharge summary.

The first step to improving the quality of discharge summary is to recognise and address the secular trend in this domain of medical care. Recently, the importance of regular auditing discharge summaries has been emphasised.^{3–5}

⁵ This article is intended to audit the secular trend of medical discharge summary in an acute medical hospital.

PATIENTS AND METHODS

We carried out our study on the medical discharge summary in a tertiary care urban teaching hospital with over 300 acute medical beds in Hong Kong. All patients admitted to the internal medicine service during the years 1994, 2000, and 2005 were eligible for inclusion. To ensure a representative spread across the diversity of medical cases, the sample was randomly selected from these three periods using the hospital computer systems. In brief, we identified two patients admitted to each medical ward by predefined criteria according to the times and dates of admission in five months for each year. More cases were selected in the year 2005 because of the expansion in the number of medical wards. Patient records of the selected index admission were reviewed. Characteristics of patients, including age, sex, planned compared with emergency admission, comorbidity scores, length of stay, requirement of intensive care unit admission, number of consultations, outcomes, were obtained from chart review for each index admission. Coexisting conditions were evaluated by means of the Charlson comorbidity index,⁶ which was taken as a single composite variable reflecting comorbidity. To eliminate the

potential temporal effect of coding “creep” on the comorbidity estimates,⁷ the Charlson comorbidity index was scored by detailed chart review instead of physicians’ coding. Hospital length of stay was chosen as a measure for the intensity of care.⁸

The primary outcome of interest was the discharge summary for patients hospitalised in the years 1994, 2000, and 2005. By definition, the term “discharge summary” in this article refers to discharge summary abstract, instead of the list of diagnostic coding, procedures, or demographic information such as the dates of admission and discharge. No structural format of discharge summary abstract or standardised template was enacted throughout the study period. The length and content of each discharge summary were measured by counting the number of lines in the discharge summary abstract. For this purpose, if the discharge summary was printed on double line spacing format, the blank lines were not counted. Fixed font size of characters in the standardised discharge summary format throughout the study period allows the number of lines to be used as an acceptable estimate of the summary length. Duplication of wordings was computed by counting the number of lines that were exactly the same (verbatim) as another line(s) in the previous summary version. Identical excerpts of discharge summary were searched manually, by means of recognising verbatim text from the previous discharge summary from the same patient. Percentage of duplicated wordings was adjusted by taking into account the discharge summary’s length or total number of lines (denominator). Content of discharge plan was quantified by counting the number of lines with written arrangement or recommended plan for further care after discharge, including information about the proposed length of drug treatment, specified plan of medical care after patient transition out of the acute hospital, documentation about laboratory or radiological investigation results that are to be followed up after patients’ discharge, and all issues related to the patients’ discharge. Coding for the diagnosis and procedures, accuracy of information, and

Table 1 Main demographic and clinical characteristics of the patients during the three survey periods

	1994 (n = 45)	2000 (n = 41)	2005 (n = 54)	p Value
Sex (male:female)	25:20	21:20	21: 23	0.83
Age (years)*	63.0 (17.7)	68.0 (15.7)	65.4 (18.5)	0.42
Number of cases with clinical or planned admission (%)	9 (20)	9 (22)	14 (26)	0.77
Charlson comorbidity index†	4.0 (2.8)	5.0 (3.0)	4.2 (3.0)	0.23
Length of stay (days)*	5.9 (4.0)	4.2 (4.0)	5.1 (3.5)	0.36
Number of cases requiring intensive care unit care (%)	1 (2.2)	1 (2.4)	1 (1.9%)	0.98
Number of cases with at least one consultation (%)	11 (24.4)	10 (24.4)	17 (31.5)	0.66
Inhospital mortality (%)†	4 (8.9)	3 (7.3)	4 (7.4)	0.95

*Mean (SD); †geometric mean (median).

the time taken to generate the discharge summary were not assessed in this study.

All data are reported as means (SD) unless otherwise specified. Data that were not normally distributed, such as the length of discharge summary (which display a positively skewed distribution), were transformed logarithmically before analysis. Differences were compared with use of the Wilcoxon rank sum test for quantitative variables and the χ^2 test for categorical variables. Analysis of variance was used to assess whether there was difference in the length and content of the discharge summary between the three survey periods. The Bonferroni procedure was used to control for the multiple pairwise comparisons. Correlation analysis that was appropriate for the normal (Pearson correlation) or non-normal distribution (Spearman correlation) of the variable was used to test for associations of the length of medical discharge summaries with a number of covariates. Correlations that were significant at the <10% level were entered in a multiple linear regression model that was fitted with the log-transformed discharge summary length as the outcome. Significance was defined at a level of 0.05.

All statistical analyses were performed using SPSS for Windows software version 11.5 (SPSS, Chicago, IL).

RESULTS

A total of 140 patient charts (45 from the year 1994, 41 from the year 2000, and 54 from the year 2005) were available for review. Table 1 shows the main demographic and clinical characteristics of the patients. Most of the cases (79%) were emergency admission and 129 patients (86%) survived to

discharge. The median length of stay was four days. No discernible differences in case-mix, as measured by the demographic characteristics, Charlson comorbidity index, requirement of intensive care, length of stay, and mortality, were noted among the three study periods.

Figure 1 shows the changes over time in the length of discharge summary between 1994 and 2005. Significant between-cohort difference existed in the logarithm-transformed length of discharge summary ($p < 0.001$ by one way analysis of variance). Bonferroni adjusted pairwise comparisons showed significant increase in the logarithm-transformed length of discharge summary; the median (interquartile range) length of discharge summary increased from 11 (9 to 13.5) lines in 1994 to 12 (8 to 19) lines and 26 (19 to 35) lines in 2000 and 2005 respectively (both $p < 0.001$ corrected for multiple comparison). Analyses also showed significant differences between groups in terms of discharge summary content. As table 2 shows, the proportion of cases with more than 30% duplication in discharge summary wordings and the number of lines about discharge plan differed across the three periods surveyed. None of the discharge summaries in 1994, as compared with 17% in 2005, contained more than 30% wordings duplication from previous summary versions. In addition, the number of lines with discharge plan in 1994 was significantly lower when compared with either 2000 ($p = 0.024$) or 2005 ($p < 0.001$) (table 2).

Finally, linear as well as multiple regression analyses were applied to identify independent factors associated with the length of discharge summary. Table 3 presents the unadjusted correlation between each covariate of interest. In bivariate analyses, the year of admission, length of stay, length of discharge plan, wordings with direct duplication, consultation to other specialties, male patient sex, and age were found to be positively associated with the length of discharge summary. Moreover, planned or clinical admission (compared with emergency admission) was correlated inversely (negative correlation) with the summary length. No significant correlation was seen between the discharge summary length and Charlson comorbidity index, requirement of intensive care unit admission, or in-hospital mortality. Using multiple linear regression analysis, we tested the year of admission, length of stay, content of discharge plan and duplicated wordings, clinical admission, consultation to other specialties, sex, and age in years as independent determinants of discharge summary length. In the final model (table 4), factors that remained significantly correlated with logarithm-transformed length of discharge summary included the year of admission, length of stay, discharge plan documentation, clinical or planned admission (negative correlation), and male sex.

Figure 1 Secular trends in the length of discharge summary ($p < 0.001$ by one way analysis of variance for logarithm-transformed data).

Table 2 Discharge summary audit results for the three survey periods

	1994 (n = 45)	2000 (n = 41)	2005 (n = 54)	p Value*
Summary length (number of lines)†	11 (9 to 13.5)	12 (8 to 19)	26 (19 to 35)	< 0.001
Number of cases with over 30% direct duplication of wordings from previous summary (%)	0 (0)	3 (7)	9 (17)	0.012
Number of cases with at least one sentence of discharge plan included (%)	32 (71)	36 (88)	50 (93)	0.011
Number of lines about discharge plan‡	1 (0 to 2)	2 (1 to 2)	3 (2 to 4)	< 0.001‡

*Analysis of variance was used to calculate the p values. †Values are expressed as median (interquartile range).

‡Variables for the number of lines about discharge plan were transformed to a logarithmic scale. Specifically, this variable (y) was transformed to log (y + 1) because it included the value zero.

DISCUSSION

In this retrospective hospital based study, we described several important evolutions in the discharge summary over a 10 year survey period. We found an overwhelming increase in the length of discharge summary between 1994 and 2005 despite similar case-mix. The contents of duplicated wordings and discharge plan documentation have also increased during this period. After adjustment for the difference in length of stay and clinical information, the year of admission remains a significant determinant of discharge summary length. Furthermore, our study concurs with previous investigations that the summary length was similar between patients who died in hospital and those discharged alive.⁵

There are several potential explanations for the prevailing secular trends in discharge summary. Firstly, technological changes in the hospital information system may account for the characteristics of discharge summary. Before 1995, discharge summary was transcribed verbatim from hand written discharge summary using word processed operation sheets. After approval of the typewritten summary by physicians, a word processor macro command was used to collate the database information into a database discharge summary. Subsequent implementation of the computer based real time clinical database capture and retrieval system enabled the discharge summary to be directly typed at individual workstations that are linked with a main computer server by a local area network.

Thus, previous hospital discharge summary can be readily retrieved electronically and, if necessary, copied into the new discharge summary. Not surprisingly, the "cut and paste" approach facilitated by the computerised summary abstracting system could potentially inflate the length of the summary.

Secondly, there are other reasons for the secular trend besides those generated by computers or data processing systems. Because of problems with overcapacity and high volume patient care, patients are now more often diverted to physicians different from the attending physician of record. In teaching hospitals, furthermore, multiple team members are involved in ordering tests and making decisions. Our finding of an increase in the length of patient summary pertaining to discharge plan could have reflected an exercise to facilitate continuity of care, minimising the errors of overlooking actionable laboratory and radiological test results returning after hospital discharge.⁹

Our analysis, none the less, does not specifically address the complex question of the appropriateness of an increasing length of discharge summary. Because of the observational nature of our study and the limited measures of discharge summary content, we cannot grade and compare the quality of individual discharge summaries. This caveat must be noted. On the other hand, it has been previously reported that the quality of the reporting decreased as the length of the discharge summary increased.⁴ According to this survey, perceived quality decreased significantly when summary length exceeded two pages. Brevity of discharge summary was also rated as an important element of high quality discharge summary in another published survey.¹⁰ Of particular concern is the recent finding of increased quality of discharge summaries, as measured by a comprehensive rating scale, associated with a decrease in the length.⁸ Given the lack of gold standard for judging the quality of discharge summaries,¹¹ such findings need to be replicated in another setting with objective criteria. Although the appropriate length of discharge summary is beyond the scope of this article, there is legitimate concern that administrative changes in our health care system may be responsible for the observed secular changes. Less concise discharge summary, for instance, could have arisen from the prevailing teaching hospital setting, where junior staff or house officers in training may be responsible for some or all of the discharge summary writing and, under new working hour restrictions,¹² may frequently change services or work in shifts. Such hypotheses are also consistent with our findings that the discharge summary length correlated significantly with the year of admission even after adjustment for the patients' characteristics and surrogate measures for intensity of care.

CONCLUSIONS

In conclusion, our study highlights the dynamic nature and secular trends in patient discharge summary within a tertiary care teaching hospital from 1994 to 2005. It seems that the year of patient hospitalisation correlated significantly with the length of discharge summary, irrespective of the length of

Table 3 Univariate correlations of the logarithm-transformed length of the patient discharge summary with other variables

	Coefficient of correlation (r value)	p Value
Year of admission	0.606	< 0.001
Log-transformed length of stay (days)	0.353	< 0.001
Log-transformed length of discharge plan (number of lines)	0.409	< 0.001
Log-transformed length of discharge summary wordings with direct duplication of previous ones (number of lines)	0.229	0.007
Clinical or planned admission (compared with emergency admission)	-0.216	0.010
Requirement of consultation to other specialties	0.193	0.023
Male sex	0.182	0.032
Age (years)	0.168	0.047
Charlson comorbidity index	0.117	0.17
Requirement of intensive care unit admission	0.048	0.58
Death (in-hospital mortality) outcome	-0.004	0.97

Table 4 Multiple linear regression model on determinants of the logarithm-transformed length of the patient discharge summary*

	B, unstandardised coefficient	β , standardised coefficient	p Value
Year of admission	0.362	0.480	<0.001
Log-transformed length of stay (days)	0.285	0.303	<0.001
Length of discharge plan (log-transformed number of lines)	0.218	0.188	0.005
Length of discharge summary wordings with direct duplication of previous ones (log-transformed number of lines)	0.045	0.052	0.41
Clinical or planned admission	-0.268	-0.178	0.004
Requirement of consultation to other specialties	0.042	0.029	0.64
Male sex	0.199	0.156	0.009
Age (years)	0.003	0.096	0.12

*Independent variables significant at the <10% level in univariate analysis were entered in the analysis. Adjusted $R^2 = 0.535$, $p < 0.001$.

stay and other important clinical factors. Appropriateness of the increased summary length must be continuously assessed and evaluated.

ACKNOWLEDGEMENTS

We thank Ms Linda Leung and Hong Ki Yau for clerical support.

Authors' affiliations

K M Chow, C C Szeto, Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, Hong Kong, SAR, China

Funding: none.

Conflicts of interest: none.

REFERENCES

- 1 Coleman EA, Berenson RA. Lost in transition: challenges and opportunities for improving the quality of transitional care. *Ann Intern Med* 2004;**141**:533-6.
- 2 Card WI, Sircus W, Smith AN. Evidential value of the hospital record in clinical decision making. *BMJ* 1979;i:1305-8.
- 3 Macaulay EM, Cooper GC, Engeset J, et al. Prospective audit of discharge summary errors. *Br J Surg* 1996;**83**:788-90.
- 4 van Walraven C, Rokosh E. What is necessary for high-quality discharge summaries? *Am J Med Qual* 1999;**14**:160-9.
- 5 Sumi M, Satoh H, Yamashita YT, et al. Improving the quality of discharge summaries. *CMAJ* 2001;**165**:16.
- 6 Charlson ME, Pompei P, Ales KL, et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987;**40**:373-83.
- 7 Simborg DW. DRG creep: a new hospital-acquired disease. *N Engl J Med* 1981;**304**:1602-4.
- 8 Rao P, Andrei A, Fried A, et al. Assessing quality and efficiency of discharge summaries. *Am J Qual Med* 2005;**20**:337-43.
- 9 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**:121-8.
- 10 King MH, Barber SG. Towards better discharge summaries: brevity and structure. *West Engl Med J* 1991;**106**:40-1, 55.
- 11 Mann R, Williams J. Standards in medical record keeping. *Clin Med* 2003;**3**:329-32.
- 12 Chow KM, Szeto CC. Impact of enforcing the Labour Ordinance, with one-in-seven-day off for hospital doctors, on weekend hospital discharge rate. *J Public Health (Oxf)* 2005;**27**:189-91.