Refereed papers

Quality of diagnostic coding and information flow from hospital to general practice

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ABSTRACT

Aims To describe the transfer of patient information from hospital to general practice and compare the quality of coding of patient diagnoses in hospital and general practice systems.

Method Setting: Wellington Hospital and patients registered with 12 general practitioners (GPs) from two local computerised general practices. Discharge and outpatient letters for the period June to August 2003 were analysed and diagnostic coding compared between letters and electronic health records (EHR) in hospital and general practice. A questionnaire was sent to 167 consultants and 112 GPs from Wellington city region with a 71% response rate.

Results GPs received 55% of 284 discharge letters and 97% of 612 outpatient letters with a mean time of 9.4 days (range 0–70 days) and 14 days (range 0–120 days). The mean number of diagnostic codes recorded in discharge letters was 2.9 per letter, in the GPs’ EHR 0.9 per letter, and in the hospital EHR 3.5 per letter. GPs were sent new diagnostic information in 30% of discharge and 36% of outpatient letters. There was more coding agreement between GP’s EHR and discharge letters than between the hospital EHR and discharge letters (65% versus 35%), GPs duplicated coding for 71% of all letters, and 74% of diagnoses were coded within the classification section of the GP’s EHR. More GPs than hospital doctors coded patient diagnoses (85% versus 15%), had any formal training in coding (25% versus 2%), and thought coding improved patient care (75% versus 50%). Most doctors in both groups experienced considerable delay of information flow and favoured an electronic transfer of information.

Conclusions There is delay in information flow from hospital to general practice and poor comparison of diagnostic coding across the two systems. Attitudinal differences and inefficient coding practices will need to be addressed to produce an integrated information system between hospital and general practice.

Keywords: diagnostic coding, electronic health record, information flow

Introduction

The prompt and reliable flow of accurate information between primary and secondary health care is integral to the quality of continuity of care provided for patients by a health system. In New Zealand, the most important information flowing from general practice to hospital services concerns requests by general practitioners (GPs) for opinions on diagnosis, investigation or treatment for patient care. Conversely, the
The most important information flowing from hospital services to general practice relates to notification of the fact of a patient’s encounter with the hospital, together with consequent opinion by specialists on diagnosis, investigation or treatment.

The primary purpose of information flow for clinical care is clarity of communication between the parties about a patient’s problem. The design of an integrated information system is meant to assist in this flow by providing timely movement of information by electronic means. However, the traditional means of information flow in New Zealand is via letters. The information about a patient’s encounter in hospital is mailed to the GP, which is then transferred to the GP’s electronic health record (EHR) system. Such transfers of information affect the quality of shared information between primary and secondary care adversely by causing delay and by delivery failure. At the same time, the information stored in the hospital information system is also subject to delay and failure. Implementation of an information system requires an understanding of the complexity of healthcare tasks to avoid failure.

Coding of diagnoses is one of those tasks and requires the interpretation of information gathered during a clinical encounter to assign a term and code found in one of many diagnostic coding schemes. The benefits of coding are that it allows for data compression, standardised terminology, statistical analyses, support for health management and use by computer decision-support systems.

Previous research has described the characteristics of the EHR in primary care and the efficacy of different coding systems, but there is a lack of research comparing the quality of diagnostic coding in primary and secondary care. Coding systems in hospitals have been developed to manage large-scale information flows, not only to collect the precise description of the cause of an episode, but also to collect national and international morbidity and mortality data. In contrast, general practice coding systems have been developed for small-scale information flows with the focus on individual patients’ symptoms and diagnosis as part of continuity of care. Furthermore, health information systems have been developed and maintained by experts in administration and information technology. Health professionals are using these systems to record diagnostic information with little knowledge about the training and commitment needed to code patients’ diagnostic information.

In this study we examined the transfer of patient diagnostic information from hospital to general practice. We assessed the quality of communication achieved on two dimensions: whether the hospital letter contained one or more diagnoses, and whether diagnostic information was transferred and entered into EHRs by GPs. We matched the assigned coding in hospital and GPs’ EHR with the assigned codes in discharge letters to compare the coding of diagnoses. Finally, we compared the attitudes of GPs and hospital doctors to coding patient diagnoses and the delay in information flow.

Method

Setting

Wellington Hospital provides secondary and tertiary services for the Wellington region of New Zealand. The hospital uses a read-only EHR for test results which includes typed but not handwritten discharge summaries; most but not all correspondence originates from the hospital, but none originates from general practice. Correspondence from hospital to general practice is typed. Inpatient medical records are paper-based. Trained coders code each patient’s clinical record using the International Classification of Diseases (ICD-10) coding scheme after inpatient and outpatient episodes. The codes are added to the hospital EHR.

Two general practices were selected that were both within five kilometres of Wellington Hospital and had a long experience of receiving mail from the hospital. One practice had nine GPs who provided primary care to 9500 registered patients, and the other had three GPs with 3500 registered patients. Both general practices had used MedTech 320™ computerised system for over five years for all patient records; this system comprises an EHR using Read codes for diagnoses.

Data collection

Definitions

In this study, a discharge letter was defined as any notification of discharge after a patient’s admission to hospital. These included any handwritten ‘discharge notice’, or a typed ‘discharge summary’, or a ‘short-stay record’, or an ‘operation day-case record’. Referral letters were defined as those letters sent from outpatient clinics to the general practices.

Flow of diagnostic information via discharge letters

All hospital correspondence is sent by mail to local general practices. In the past all patients had a discharge letter dictated by the registrar and typed. In an effort to improve communication, more recent
practice is for all patients to have their discharge letters handwritten and signed; then one copy is given to the patient, one copy is sent to the GP, and a third copy is filed in the patient's paper clinical records. The inpatient episode of care is later coded by the hospital's coders. Unfortunately, the discharge letter cannot be filed in the hospital EHR and is usually written by the most junior staff member. The coding is available in the EHR, but not the supporting documentation for the admission. Some patients additionally have typed discharge letters prepared.

We identified patients who were discharged from Wellington Hospital wards in the period June to August 2003 who were registered with the 12 GPs in the study. Diagnostic information for these discharges was electronically captured from the hospital Admission Discharge Transfer system. This is a separate system from the hospital EHR. At both general practices in the study, the EHR and paper-based clinical notes relating to these patients were reviewed to assess whether the practice had received copies of the hospital discharge or referral letters. If a letter had not been received by a general practice then it went to the hospital clinical records to try and determine the reason.

The patients' clinical notes in the GP practices were examined to see whether letters had been scanned into the EHR or filed into the paper records. The GPs' EHR were examined to see whether diagnostic codes were subsequently entered in the daily records section of the EHR system (where day-to-day records are stored), the classification section (where Read codes can be selected from a list), or both.

**Flow of diagnostic information via outpatient letters**

Patients who have had an outpatient attendance have a letter dictated by registrars or consultants. The letters are then typed, reviewed and corrected, and sent to the patient's GP. Patients registered with the 12 GPs seen at Wellington Hospital outpatients in the period June to August 2003 were identified. Outpatient letters were electronically captured from the hospital records. Patient GP clinical notes were reviewed as above.

**Matching diagnoses between information systems**

Since discharge or outpatient letters may not use formal diagnostic coding, an explicit diagnosis anywhere within the narrative of the letter was considered a 'diagnostic code' for comparison purposes. Each patient's set of diagnoses in the discharge letters were listed on an Excel database alongside the diagnoses listed for the patient in the GP's EHR system and the hospital EHR system. 'Agreement' in the diagnostic coding was defined as a match in the major diagnostic category between the discharge letter and the GP's EHR system, or between the discharge letter and the hospital EHR system.

**Survey of doctor perceptions of information flow and coding**

In February 2004, we sent a questionnaire to 167 consultants working in Wellington Hospital and to 112 GPs within the city region surrounding Wellington Hospital (including the 12 GPs surveyed above).

**Questionnaire design**

The questionnaire comprised questions about the respondents' coding practice, their training for coding, and their teaching experience in coding of diagnoses. Visual-analogue scales measured attitudes to diagnostic coding, computerised clinical records, diagnostic problem lists, and their perceptions of information flow between hospital and general practice. Open-ended questions explored the barriers and virtues of diagnostic coding. Analysis used Statview™ for Macintosh and compared differences between categories using the $\chi^2$ test, or the Mann–Whitney test, where appropriate. Responses to open-ended questions were subjected to a content analysis in order to identify themes. There was one reminder letter sent.

Ethical approval for this study was obtained from the Wellington Ethics Committee.

**Results**

**Information flow from hospital discharges to local general practices**

In total 284 discharges from Wellington Hospital for 208 patients from the two practices were identified for the period June to August 2003. The mean age (SE) of patients at discharge was 41.0 (1.7) years (range 1 day to 97 years old) and 71% were female.

**Discharge letters received by GPs**

The GPs received a discharge letter for 155 (55%) patients discharged from hospital (95% CI: 49%–60%). The mean (SE) time for a discharge letter to reach the patients' GPs was 9.4 (0.9) days (range 0–70 days). Thirty-two percent of the discharge letters reached the GPs within three days; 66% within one week and 7% took over one month to reach the GPs.
Eighty-six letters (55%) had a signature from a house surgeon or registrar. There was no difference between the time taken for letters to reach the GPs that did or did not have a signature (mean difference = 2.54 days, student t value = 1.33, P = 0.1864).

**Discharge letters not received by GPs**

No discharge letters had been received by three months after discharge in 129 cases. The largest group were 58 discharge letters about births (30 were about the children born, and 28 were about women that gave birth). One patient had transferred to a different hospital shortly after delivery and 22 birth-related discharge letters were lost. The remaining 35 birth-related discharge letters remained within the hospital’s paper files and none had the name of the patient’s GP recorded. (In total there were 69 births and the GPs received discharge letters for 11 of these.) Among the remaining 71 discharge letters, 45 had no clear reason why they were not sent, 15 did not have any note in the hospital file about discharge, six did not have the name of a GP on the patients’ files, two files were lost, two patients had discharged themselves from hospital with no identifiable GP, and one file had an incorrect GP name.

**Comparing diagnostic coding between systems**

The hospital EHR system recorded 854 ICD-10 diagnostic codes among the 284 discharged patients sampled for the study. Figure 1 compares the number of diagnoses per discharged patient. Ninety-eight percent of patients had at least one diagnostic code recorded in the hospital EHR, and 39% of patients in the GPs’ EHR, compared to 51% of patients in the discharge letters.

Among the 155 discharge letters received by the GPs, 5% had an assigned code for the diagnoses, 84% had the diagnoses recorded in free text and 11% had no diagnosis recorded. By contrast, it was found that in the GPs’ EHR system, 56% had an assigned Read code for the diagnoses, 18% had the diagnoses recorded as free text and 26% had no diagnosis recorded.

The mean (SE) number of coded diagnoses recorded in the GPs’ EHR system was 0.9 (0.1) per letter received, the mean number of diagnostic codes actually written in these discharge letters was 2.9 (1.8) per letter, and the mean number of diagnostic codes in the hospital EHR system was 3.5 (2.8) per letter.

Scrutiny of the GPs’ EHR found that 30% of discharge letters provided new diagnostic information. Younger patients were more likely to have new diagnoses recorded than older patients (mean [SE] age 37.5 [3.8] versus 56.3 [2.3] years, student t = – 4.33, P < 0.0001).

**Information flow from outpatient clinics to local general practices**

In total 612 outpatient letters were identified for 363 patients from the two practices for the period June to August 2003. The mean age (SE) of patients was 47.8 (1.7) years (range 2 months to 103 years) and 61% were female.

One-hundred-and-forty-five outpatient letters (24%) were for a first visit by the patient at the outpatient clinic for that problem, 428 outpatient letters were for subsequent visits and one outpatient letter was in reply to a note from the GP. It was unclear for 38

![Figure 1](image-url) Comparing the number of diagnoses per patient in the hospital computer system, discharge letters and general practice computer system. N=284 patients discharged from hospital
outpatient letters whether or not it was a first or subsequent visit. Ninety-seven percent of letters reached the GPs. Six percent of outpatient letters were addressed to the incorrect GP within the practice.

The mean (SE) number of days for outpatient letters to reach the GPs was 14 (0.42) days (range 0–120 days). Six percent of outpatient letters arrived within three days, 26% arrived within a week and 5% took over one month to reach the GPs.

Among the 541 outpatient letters received by the GPs, 10% had an assigned code for the diagnoses, 21% had the diagnoses recorded in free text and 70% did not have a recorded diagnosis. By contrast, it was found that in the GPs’ EHR system, 35% had an assigned Read code for the diagnoses, 9% had the diagnoses recorded as free text and 57% had no diagnosis recorded.

There were 1044 diagnoses mentioned within the 612 outpatient letters sampled for the study. Only 12% of the letters contained a list of diagnoses, the remainder had them within the body of the text. Scrutiny of the GPs’ EHR found that 36% of outpatient letters provided new diagnostic information.

Comparison of assigned diagnostic coding

Scrutiny of all 214 discharge letters found that when the assigned diagnostic codes in the hospital EHR system were compared with the GPs’ EHR system, they were in agreement for only 100 (35%) diagnostic codes.

There were 145 discharge letters where there was at least one diagnostic code found in a letter. Among these discharge letters, the hospital EHR system had codes assigned for 99% of diagnoses found in the discharge letters compared to 74% assigned in the GPs’ EHR system. Thirty-five percent of diagnostic codes assigned in the discharge letters were in agreement with the coding assigned in the hospital EHR system. In contrast, 64% of the diagnostic codes assigned in the discharge letters were in agreement with the codes assigned in the GPs’ EHR system.

The placement of diagnostic coding in GPs’ EHR

Among the letters received by the general practices, 73% of outpatient letters and 44% of discharge letters had been scanned into the GPs’ EHR system. The remainder were filed into the patients’ paper records.

There were 541 outpatient letters and discharge letters where GPs had coded patients’ diagnoses in their EHR system. Only 3% were coded only within the summary or classification section of the EHR records, 26% were coded only within the daily records section and 71% were duplicated in both.

Survey of doctor attitudes on diagnostic coding and information flow

Response rate

Of the 287 people contacted, seven had left the area, two refused and 199 responded, with a similar rate (79/112=71%) of GPs and hospital consultants (120/167=72%). The hospital consultants comprised 30 surgical specialists, 29 internal medicine specialists, 16 psychiatrists, 15 anaesthetists, 11 paediatricians, six obstetricians and gynaecologists, five oncologists, four psychologists, three radiologists and one microbiologist. Five GPs (6%) and 101 hospital doctors (84%) worked in hospital outpatient clinics.

A much higher proportion of GPs (85%) than hospital doctors (15%) stated that they coded patient diagnoses (df=1, χ²=102.87, P<0.0001). Among the 85 respondents who coded, 68% used Read codes, 7% used the ICD coding scheme, 10% used other coding schemes and 14% did not state the scheme they used.

Few GPs (9%) and hospital doctors (11%) had received any formal training in coding of diagnoses from handwritten clinical records (df=1, χ²=102.87, P=0.6347). However, 25% of GPs had received formal training in coding of diagnoses in computerised clinical records, compared with 2% of hospital doctors (Fisher’s exact test, P<0.0001). Few GPs (6%) or hospital doctors (4%) taught coding of diagnoses to students (P=0.4989).

Attitudes towards coding of all respondents is shown in Figure 2 (items A, B, C and D). More GPs welcomed the opportunity to enter patients’ clinical data directly into computerised clinical records than hospital consultants (median [IQR] 70 [30] versus 50 [30], Mann–Whitney U test P<0.0001). They were also more confident in carrying out coding of diagnoses in patients’ records (median [IQR] 70 [30] versus 50 [30], Mann–Whitney U test P<0.0001), and more likely to agree that coding of diagnostic information improved patient care (median [IQR] 75 [40] versus 50 [30], Mann–Whitney U test P<0.0001); more GPs were likely to agree that a diagnostic problem list was useful in the day-to-day management of a patient than hospital consultants (median [IQR] 90 [20] versus 80 [39], Mann–Whitney U test P=0.0004).

Attitudes about delays in communicating information are also shown in Figure 2 (items E, F and G). There was no difference between GPs and hospital consultants in their opinion that information took over one week to move from Wellington Hospital to local general practices for either outpatient letters (median
Figure 2 The attitudes of 199 respondents towards diagnostic coding and delays in information flow (a visual scale was used for each question; box plots show maximum and minimum values, median, and first and third quartiles):

(A) how welcoming the respondents were of the opportunity to enter patients’ clinical data directly into computerised clinical records in their place of work (100 = extremely welcoming, 0 = extremely unwelcoming)
(B) how confident the respondents were in carrying out coding of diagnoses in patients’ records (100 = extremely confident, 0 = extremely unconfident)
(C) how much the respondent agreed or disagreed that coding of diagnostic information improves patient care (100 = strongly agree, 0 = strongly disagree)
(D) how useful the respondents found a diagnostic problem list in the day-to-day management of a patient (100 = extremely useful, 0 = totally useless)
(E) the respondents estimated percentage of patients’ outpatient letters where there was a delay greater than one week for information reaching local general practices from Wellington Hospital (100 =100%, 0 =0%)
(F) the respondents’ estimated percentage of patients’ handwritten discharge letters following admission where there was a delay greater than one week for information reaching local general practices from Wellington Hospital (100=100%, 0=0%)
(G) the respondents’ estimated percentage of patients’ typed discharge letters where there was a delay greater than one week for information reaching local general practices from Wellington Hospital (100=100%, 0=0%)

[IQR] 80 [25] versus 80 [45], Mann–Whitney U test \( P=0.5395 \), handwritten discharge letters (median [IQR] 50 [40] versus 50 [45], Mann–Whitney U test \( P=0.1884 \) or typed discharge letters (median [IQR] 90 [28] versus 85 [31], Mann–Whitney U test \( P=0.6123 \)).

Qualitative analysis
One-hundred-and-two respondents (51%) commented on the advantages and difficulties of diagnostic coding and information flow. Among these respondents, only 8% did not have difficulties with the process of coding diagnoses in the clinical encounter, compared to 30% who did. Most found it too difficult to pick the right code for a diagnosis. Others found that the quality of coding varied when done by non-medical coders. A few thought coding took too much time. Seventeen percent of respondents reported having difficulties with the principle of coding diagnoses. Most objected to coding being done primarily for administration, financial or statistical purposes, rather than for individual patient care.

Sixteen percent of responders denied that there were problems with the flow of information from the hospital to the general practices compared to 77% who felt that there were problems. Most found the flow of information was slow and needed improvement. The speed of information transfer was reported to vary from different hospital departments; often the delay was perceived to be due to overworked hospital typists. Some respondents thought the letters sent from the hospital were generally of poor quality. A quarter (25%) of responders felt that information flow could be improved; a few thought the solution was better use of phone or fax communication, but the majority favoured the development of electronic transfer of information.
Quality of diagnostic coding and information flow from hospital to general practice

Discussion

This study found considerable delay in the flow of diagnostic information from the hospital to local general practices. A third of discharge letters and two-thirds of outpatient letters were delayed more than one week. Furthermore, only 55% of discharge letters had reached the GP after three months.

This rate is well below the 77% observed in Australia.8 The retrospective nature of the study made it difficult to identify the exact reason for the loss of information; however, 45% of the discharge letters that were never received were about births. Many of these had a copy of the discharge letters in the hospital file and it is of note that among the birth discharge forms there was no space to record the patient’s GP. Many of these delays might be circumvented if a fax, email or intranet information system were to be used by the hospital and local general practices.

There were considerable differences between the hospital and general practice information systems. Firstly, there was more variation within the hospital system. The discharge and outpatient letters differed in that the former were largely handwritten and contained lists of diagnoses, whereas the outpatient letters were largely typed and did not contain lists of diagnoses. Furthermore, the lists of diagnoses from the discharge letters differed from the codes for the admission based on an independent assessment of the whole record by non-medical coders within the hospital EHR system, whereas the diagnoses contained in outpatient letters are not coded by the hospital administration. In contrast, GPs coded their own diagnoses within their EHR system from both discharge and outpatient letters they had received.

Secondly, there was a greater volume of diagnostic coding per patient within the hospital EHR system compared to the GPs’ EHR systems. Individual patients can have more problems coded within the hospital EHR system because the system collects information other than that needed for the diagnostic encounter, such as coding for cost recovery purposes unrelated to clinical care. GPs, in contrast, only code those diagnoses medically relevant to the patient’s clinical encounter.

Thirdly, there was considerable disagreement between the GP and hospital EHR systems for diagnostic codes assigned in discharge letters. The disagreement may be in part due to different kinds of coding schemes used in hospital (ICD-10) and general practice (Read codes). However, disagreement was more likely because the people who made the diagnoses were not necessarily the people selecting the codes for the hospital EHR. Furthermore, the diagnoses listed on the discharge letter did not use any form of standardised language and illegible writing was common.

Disagreement on diagnosis codes poses the risk of a serious loss of information between hospital and general practice, and could have an impact on patient safety.

Finally, there were marked differences in the attitudes of GPs and hospital doctors. Most GPs embraced computers and diagnostic coding, whereas few hospital consultants did so. Other studies confirm this difference in attitudes, which may be explained either because GPs have more investment in EHR systems – they buy their own computers and are more likely to have computer training – whereas hospital consultants have the systems imposed by their hospital administration, and at present there is no facility for hospital doctors to add codes to the EHR, apart from in dictated letters, and no electronic tools available to support clinician coding.6,9,10

The above differences have an impact on the quality of information flow from hospital to general practice. These information flows could be improved if an integrated system were to be put in place, with considerable buy-in from all those involved in both primary and secondary care settings. There is a strategic plan for Wellington Hospital to develop a new internet-based infrastructure with linkages to primary care services, but few Wellington GPs know about it.11 Improving information flows through such a plan requires a careful understanding of the social and professional cultures of hospital and GP organisations.2,12 For example, many of the doctors surveyed in our study complained about the delays in the present system and suggested that electronic transfer of information might be a solution, so presumably they would welcome internet linkages. However, we also found that most of the outpatient letters written by specialists did not contain lists of diagnoses nor any coding, yet GPs preferred such lists and the coding of diagnoses. Furthermore, GPs often duplicated their coding of patients’ diagnoses in their EHR, and for a quarter of diagnoses did not code them within the ‘classification’ sections of their EHR system that would allow for useful retrieval of summarised patient information. These differences in attitudes, and inefficient coding practices, suggest that different strategies will be needed for hospital and GPs to use comparable coding of information when they consult with patients.

Conclusion

In conclusion, this study found that there was considerable delay in the flow of patients’ diagnostic information from hospital to general practice. GPs embrace diagnostic coding and computer use more
than their hospital colleagues. Attitudinal differences will need to be addressed if an integration of the coding schemes used in the two systems is to be achieved.

REFERENCES

CONFLICTS OF INTEREST
None.

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