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# Medication reconciliation and discharge communication from hospital to general practice: a quantitative analysis

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## ABSTRACT

**Background.** The aim of this study was to assess the quality of effective discharge communication to primary practice from a hospital that uses ieMR (integrated electronic Medical Record), a complete electronic prescribing/medical record platform. **Methods.** A retrospective quantitative analysis of 232 discharge encounters from a major tertiary hospital assessed the discharge summary quality; timeliness, completeness and medication information. **Results.** Median time to discharge summary was 1 day. 22.0% of discharge summaries were incomplete at 30 days post discharge and 44.5% of discharge summaries were incomplete at 30 days post discharge if discharged on a weekend compared to weekday (*P*-value = 0.001). Rates of medication reconciliation were completed at approximately 35% at each point of the patient stay and 56.9% of patients had a GP discharge summary listing discharge medications. However, if certain progressive steps were completed (i.e. *Home Medications* recorded in ieMR, *Discharge Reconciliation* in ieMR, and *Patient Discharge Medication Record* in eLMs (Enterprise-wide Liaison Medication System)), then, the 'Medications on Discharge' was significantly more likely to be present in the discharge summary, at rates of 70.1%, 85.9%, and 98.6% respectively (*P*-value = 0.007, <0.001, <0.001). Conversely not doing these steps dropped rates of having medications listed in the discharge summary to 50.0%, 40.3% and 34.1% respectively. **Conclusions.** This study assessed current discharge summary quality since the introduction of electronic medical records. It demonstrated the significant value of correct use of electronic programs, including performing all crucial steps of reconciliation. Targeted interventions in future studies that rectify the shortfalls in discharge communication are warranted.

**Keywords:** communication, discharge, discharge summary, health education, medication, medication systems, medication therapy management, pharmacy administration, reconciliation.

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## Introduction

Communication at transitions of patient care between hospital discharge and the community is known to be an area of high risk to patient safety (Australian Commission on Safety and Quality in Healthcare 2017). Inadequate discharge communication is known to result in hospital re-admissions, patient-related harm, mortality, and associated costs (Van Walraven *et al.* 2002; Kripalani *et al.* 2007*a*, 2007*b*; Van Walraven *et al.* 2010; Tandjung *et al.* 2011; Okoniewska *et al.* 2015). The discharge summary is the most common method for communicating clinical information from hospital discharge to community healthcare providers and patients (Kripalani *et al.* 2007*a*; Australian Commission on Safety and Quality in Health Care 2017). It is vital for patient safety and to ensure continuity of care (Australian Commission on Safety and Quality in Healthcare 2017). Effective discharge communication from hospital to the community increases consumer and carer satisfaction, reduces medication adverse events, hospital re-admissions, complications post discharge and mortality (Newnham *et al.* 2017).

In the Australian context, discharge summaries are most commonly written by junior doctors (intern doctors and resident medical officers) (Stainkey *et al.* 2010). Poor discharge communication has been consistently documented in Australia and overseas for decades and continues to be documented despite technology advances to computer

generate discharge summaries (Balla and Jamieson 1994; Kripalani *et al.* 2007*b*; Callen *et al.* 2008; Tandjung *et al.* 2011). Discharge summaries are often incomplete, inaccurate, delayed and/or unhelpful for GPs (Stainkey *et al.* 2010; Tsopra *et al.* 2019; Wembridge and Rashed 2022).

A recent review (Gusmeroli *et al.* 2023) determined that Australian GPs view the desired qualities of effective discharge communication to be: timeliness of discharge summary receipt, completeness of the discharge summary, diagnosis or clinical discipline-specific information, readability of the discharge summary and medication-specific information.

There have been significant digital advances to hospital communication practices over the past 10–15 years with the implementation of technology-based methods to generate discharge summaries via computerisation and electronic medical records/prescribing platforms. The question that remains unanswered is: in the context of today's digital world where electronic medical records are becoming the standard of care, what is the current quality of discharge summaries? This research aims to investigate this.

## Context

In 2017, the 'National Guidelines for On-Screen Presentation of Discharge Summaries', was published by the Australian Commission on Safety and Quality in Healthcare. This document details the expected standard for the core elements of discharge summaries in the Australian context for electronic medical records (Australian Commission on Safety and Quality in Health Care 2017). This document does not provide guidance around requirements for specific measurable time to discharge summary completion or receipt, or level of completeness of discharge summaries (Australian Commission on Safety and Quality in Health Care 2017). This study aims to gather baseline evidence to potentially inform future guidelines.

## Context: medication reconciliation

Medication reconciliation is the process of ensuring that the medications that the patient should be prescribed match what is prescribed and what is also intended for their discharge plan. It is a method of reducing the risk of medication errors and unintended medication changes at points of transition of care (Australian Commission on Safety and Quality in Healthcare 2022).

At Townsville University Hospital (TUH), medication reconciliation is intended to occur at multiple steps across the patient journey using the electronic platform, ieMR (integrated electronic Medical Records). With best practice, the following steps should occur:

- Medication reconciliation occurs on admission, where a pharmacist takes a best possible medication history from the patient. This is documented in ieMR as the 'Home Medications'.
- Medications are then charted in ieMR by a doctor in the treating team where medication reconciliation will occur against the 'Home Medications'.
- In preparation for discharge from hospital, a doctor in the treating team will then perform the 'Discharge Medication Reconciliation'. Here, the doctor reconciles both the 'home medications' and the charted medications to document the intended plan for medications on discharge.
- The pharmacist then reconciles the 'Discharge Medication Reconciliation' against the home medications and charted medications. The pharmacist then creates a discharge medication record, where a patient medication list can be generated. That discharge medication list can also be imported into the program EDS (Enterprise Discharge Summary) by a doctor. Alternatively, a doctor can manually type medication information into the EDS discharge summary. EDS is the program that is used statewide (Qld) by public hospital doctors to collate and generate the discharge information package.

Information is transferred at each step of reconciliation. Therefore, if one or more steps are incomplete or poorly executed, the quality of subsequent steps is likely to be poorer (Australian Commission on Safety and Quality in Healthcare 2022). This may also be exacerbated by the risk of transcription errors (Australian Commission on Safety and Quality in Healthcare 2022), where the pharmacist creating a 'Discharge Medication Record' and the doctor writing the discharge summary in the program EDS use two separate software platforms to ieMR.

## Aims and objectives

The primary aim of this study is to assess the qualities of effective discharge communication (in terms of completeness and format, timeliness and medication information), within a hospital that uses a complete electronic medical record, to evaluate current discharge summary quality.

The objective of this study is to examine current discharge communication quality via quantitative analysis. Specific parameters for quality that were assessed include:

- Completeness and format – proportion of core elements completed, as outlined in the 'National Guidelines for On-Screen Presentation of Discharge Summaries' (Australian Commission on Safety and Quality in Health Care 2017) and proportion of discharge summaries not completed within 30 and 90 days of discharge. Understanding if a discharge summary is more or less likely to be complete for specific patient characteristics or clinical disciplines/ward areas.
- Timeliness – median and mean time to discharge summary completion. The range (days) is also reported on.

- Medication Information – proportion of core elements of medication information completed within the discharge summaries. Investigate whether 'Home Medications' documented in ieMR on admission, doctor completed 'Discharge Medication Reconciliation', or pharmacist completed 'Discharge Medication Record' affects whether medications are listed in the discharge summary.

## Methods

This study was designed as a quantitative analysis of retrospective data. An audit tool was created based on the guidance document 'National Guidelines for On-Screen Presentation of Discharge Summaries' (Australian Commission on Safety and Quality in Health Care 2017). The audit tool can be seen in Table S1. This tool was designed to assess the sample for completeness, format, and medication information; these being three of the five parameters for discharge summary quality, as found in the scoping review by Gusmeroli *et al.* (2023).

### Inclusion and exclusion

Discharge encounters from TUH acute inpatient ward areas from 1 October 2021 to 30 November 2021 were included in the study. Discharge encounters from the TUH emergency department, discharges to residential aged care facilities and interhospital transfers were excluded from the study as the discharge process differs to the standard process studied.

### Sample

The sampling was designed as single-staged sampling through the Townsville Hospital and Health Service (THHS) Clinical Information Service. From 1 October 2021 to 30 November 2021, there were 3509 overnight discharge encounters from TUH, excluding emergency presentations. A randomised sample of 258 discharge encounters were assessed, with 232 meeting the inclusion criteria. Twenty-six discharge encounters did not meet the inclusion criteria and were excluded from the study. Excluded encounters included 14 discharged to residential aged care, two being boarders and 10 being interhospital transfers to other facilities. It is noted that over this time period, there was no noticeable difference in the usual total number of admissions that would lead researchers to believe that data may have been affected by the coronavirus disease 2019 (COVID-19) pandemic.

### Data analysis

Data were managed using Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and analysed using R software (R Foundation, Vienna, Austria). Descriptive statistics, Pearson Chi-Squared statistical tests and odds ratio statistical tests were performed, where appropriate.

### Ethical considerations

Ethics was approved by The Townsville Hospital and Health Service Human Research Ethics Committee (HREC) – (HREC/QTHS/82041).

## Results

### Patient characteristics within the sample

Table 1 describes the patient demographic data of the 232 discharge encounters. The median age of patients within the sample was 62.0 years (range 17–99 years). Although 15.1% of the sample were born in countries other than Australia, 100% of the total sample had identified English as their primary language. In this study, 14.7% of the sample was representative of First Nations people (Table 1), which is greater than the national average of 3.3% and 7.9% average that reside in Townsville (Australian Bureau of Statistics 2016; Australian Bureau of Statistics 2018). Of the sample, 2.3% of patients were discharged against medical advice.

### Timeliness

The median time to discharge summary completion was 1 day (range −5 to 126 days), with a mean of 8.26 days.

### Completeness

From 232 discharge encounters, 22.0% of discharge summaries were not completed within 30 days of discharge (Table 2). Within 90 days of discharge, the number of discharge summaries not completed reduced to 18.1%.

**Table 1.** Patient characteristics of the sample.

| | | *n* | % |
|---|---|---|---|
| Age (years) | >18 | 227 | 97.8 |
| | <18 | 5 | 2.2 |
| Age (years) | >65 | 107 | 46.1 |
| | <65 | 125 | 53.9 |
| Postcodes | TSV region | 196 | 84.5 |
| | Non-TSV region | 36 | 15.5 |
| Nationality | Australia | 197 | 84.9 |
| | Non-Australian | 35 | 15.1 |
| First Nations status | Not FN | 198 | 85.3 |
| | A not TSI | 28 | 12.1 |
| | Both A and TSI | 3 | 1.3 |
| | TSI not A | 3 | 1.3 |
| Sex | Male | 129 | 55.6 |
| | Female | 103 | 44.4 |

A, Aboriginal; FN, First Nations; TSI, Torres Strait Islander; TSV, Townsville.

**Table 2.** Proportion of discharge summaries completed or not completed within 30 and 90 days of discharge.

| Discharge summary completed within: | *n* | Yes % (*n*) | No % (*n*) |
|---|---|---|---|
| 30 days | 232 | 78 (181) | 22.0 (51) |
| 90 days | | 81.9 (190) | 18.1 (42) |

**Table 3.** Pearson chi-squared statistical analysis and proportions reported on for discharge summaries not completed within 30 days of discharge for specific patient characteristics.

| | | *n* | Discharge summary not completed within 30 days | |
|---|---|---|---|---|
| | | | % (*n*) | *P*-value |
| Age (years) | >18 | 227 | 21.6 (49) | 0.325 |
| | <18 | 5 | 40 (2) | |
| Age (years) | >65 | 107 | 21.5 (23) | 0.868 |
| | <65 | 125 | 22.4 (28) | |
| Post codes | TSV region | 196 | 23.5 (46) | 0.202 |
| | Non-TSV region | 36 | 13.9 (5) | |
| Nationality | Australia | 197 | 21.3 (42) | 0.563 |
| | Non-Australian | 35 | 25.7 (9) | |
| First Nations status | Not FN | 198 | 22.2 (44) | 0.781 |
| | A not TSI | 28 | 21.4 (6) | |
| | Both A and TSI | 3 | 33.3 (1) | |
| | TSI not A | 3 | 0 (0) | |
| Sex | Male | 129 | 24.8 (32) | 0.245 |
| | Female | 103 | 18.4 (19) | |

A, Aboriginal; FN, First Nations; TSI, Torres Strait Islander; TSV, Townsville.

There was no association between patient characteristics and whether a discharge summary was completed (Table 3).

Table 4 compares weekday to weekend discharges and rates of discharge summary completion within 30 and 90 days. On weekdays, 18.2% were not completed within 30 days of discharge. However, if the discharge occurred on a weekend, this changed to 44% not being completed within 30 days (*P*-value = 0.001, OR (95%CI) 3.553 (1.649–7.652)).

Table 5 details the proportions the summary core elements complete based on what the 'National Guidelines for On-Screen Presentation of Discharge Summaries'. Note that 'Medications on Admission' is not a core element however is a required field within TUH discharge summaries, and so was additionally reported on in these results.

### Medication information

Rates of medication reconciliation were complete at approximately 35% at each point of the patient stay. Table 6 demonstrates that if certain progressive steps were completed (i.e. *Home Medications* recorded in ieMR, *Discharge Reconciliation* in ieMR, and *Patient Discharge Medication Record* in eLMs), then, the 'Medications on Discharge' was significantly more likely to be present in the discharge summary, at rates of 70.1%, 85.9%, and 98.6% respectively (*P*-value = 0.007, <0.001, <0.001). Conversely, not doing these steps drops the rate of having medications listed in the discharge summary to 50.0%, 40.3% and 34.1% respectively.

## Discussion

This study has investigated current discharge summary quality since the introduction of ieMR as key to improving continuity of care from hospital discharge to the community.

### Timeliness

The median time to discharge summary completion was found to be 1 day after discharge. This provides baseline evidence since the introduction of ieMR, where previously this information had not been reported. Although there is no specific measurable national guidance regarding what the time to discharge summary completion should be, this finding is faster than the recommended 48 h, as outlined within the TUH 'Admission, Transfer and Discharge of Patients' procedure (Townsville Hospital and Health Service 2021). The absence of specific measurable national guidance on time to discharge summary completion highlights the need for the National Safety and Quality Health Service (NSQHS) Standards to include specific and measurable key performance indicators relevant to timeliness to ensure consistency between healthcare organisations nationally. Further research is required to understand if GPs and healthcare consumers are satisfied with the current timeliness and what their preferences are for time to discharge summary completion.

**Table 4.** Weekend compared to weekday day of discharge and discharge summary completion within 30 and 90 days.

| | *n* | Discharge summary not completed within 30 days | | | Discharge summary not completed within 90 days | | |
|---|---|---|---|---|---|---|---|
| | | % (*n*) | *P*-value | Odds ratio (OR) (95%CI) | % (*n*) | *P*-value | Odds ratio (OR) (95%CI) |
| Discharged on a weekday | 198 | 18.2 (36) | 0.001 | 3.553 (1.649–7.652) | 14.6 (29) | 0.001 | 3.608 (1.627–7.997) |
| Discharged on a weekend | 34 | 44.5 (15) | | | 38.2 (13) | | |

**Table 5.** Proportion of discharge summary core elements completed for all discharges summaries within 90 days of discharge.

| | | % (*n*) |
|---|---|---|
| Proportion of discharge summary components completed | Patient details | 100 (195) |
| | Hospital details | 100 (195) |
| | Author | 100 (195) |
| | Presentation details | 97.9 (191) |
| | Problems and diagnoses | 100 (195) |
| | Procedures | 41 (80) |
| | Clinical summary (inpatient clinical management) | 89.2 (174) |
| | Allergies/adverse reactions | 99.5 (194) |
| | Medications on admission | 3.1 (6) |
| | Medications on discharge | 56.9 (111) |
| | Medications ceased | 23.6 (46) |
| | Alerts | 99.5 (194) |
| | Recommendations to GP | 98.5 (192) |
| | Follow-up arrangements | 14.9 (29) |
| | Information to patient | 44.6 (87) |
| | Investigation results | 80.5 (157) |
| | GP listed as a recipient | 92.3 (180) |

**Table 6.** Rates of medication reconciliation, and whether this impacts 'Medications on Discharge' listed in the discharge summary.

| | | | | 'Medications on Discharge' listed in discharge summary | |
|---|---|---|---|---|---|
| | | *n* | % | % (*n*) | *P*-value |
| 'Home Medications' recorded on admission (ieMR) | Yes | 67 | 34.4 | 70.1% (47) | 0.007 |
| | No | 128 | 65.7 | 50.0% (64) | |
| Medical Officer completed 'Discharge Medication Reconciliation' (ieMR) | Yes | 71 | 36.4 | 85.9% (61) | <0.001 |
| | No | 124 | 63.6 | 40.3% (50) | |
| Pharmacist completed 'Discharge Medication Record' | Yes | 69 | 35.4 | 98.6% (68) | <0.001 |
| | No | 126 | 64.6 | 34.1% (43) | |

## Completeness

At 30 days post discharge, 18.2% of weekday discharge summaries were not complete. This increased to 44.5% not completed within 30 days if the patient was discharged on a weekend. This was noted to be statistically significant outcomes. These are novel findings since the introduction of ieMR. Although NSQHS Standards do not specify a timeframe that a discharge summary is to be completed by, these findings do not meet the expectations as specified in TUH guidelines (Townsville Hospital and Health Service 2021), where it is outlined that a discharge summary is to be completed within 48 h of discharge. Having measurable key performance indicators relating to completeness within the NSQHS standards could potentially raise the proportion of completed discharge summaries.

Possible reasons for inadequate rates of discharge summary completeness may include workload constraints, or shorter staffing, as indicated by the rates of discharge summary completion on weekdays compared to weekends, where there is normally less staffing available on the weekends. This is similarly consistent with what Latimer *et al.* (2023) describes relating to weekend organisational resources impacting the ability to undertake medication reconciliation and impacting time to discharge.

This study has provided sound quantitative evidence; however, follow-up qualitative research that explores the reasons why discharge summaries are not being completed, and the perspective of the receiving clinicians and healthcare consumers, is warranted.

For the proportion of completed discharge summary core elements, those that are automatically generated from the EDS or ieMR have close to, if not 100%, rates of completion. This highlights the benefit and value of automation and automatic feeding of data in electronically generating discharge summaries.

Most components that are manually typed, are greater than 85% complete. The anomaly to this was the 'Information to Patient' core element, where it was only 44.6% complete. Possible reasons for this might include the provision of verbal discharge communication at point of hospital discharge or assumptions by the doctors authoring the discharge summaries that the target audience for the discharge summary is primarily the GP.

It is evident that discharge summary core elements such as 'Procedures', 'Medications Ceased' or 'Follow up Arrangements' may not be relevant to all admitted patients, and so it would be expected that these components would have lower rates of completion. It could be suggested that statements such as 'no procedures were performed' or 'no medications ceased' or 'no specific follow up required' could be used, instead of leaving these fields blank.

Medication information within the discharge summaries was also poorly completed, with 'Medications on Admission' complete 3.1% of the time, 'Medications on Discharge' 56.9% of the time and 'Medications Ceased' 23.6%. It was expected that with best use of ieMR, rates of medication information listed in the discharge summary would be higher.

## Medication information

Rates of medication reconciliation occur at approximately 35% at each step of the patient stay ('Home Medications' 34.4% complete, 'Discharge Medication Reconciliation' 36.4% complete and 'Discharge Medication Record' 35.4% complete). But at each point progressing in the patient stay if the reconciliation was completed, this led to 'Medications on Discharge' being more likely to be present in the discharge summary. Conversely, if medication reconciliation processes

are not complete across the patient's stay, this negatively impacted whether 'Medications on Discharge' is listed in the discharge summary ($P$-value = 0.007, <0.001, <0.001).

This highlights the importance of the best use of electronic medical records. The value of each step of reconciliation during the patient's stay is evident in the results, ultimately leading to 'Medications on Discharge' more likely to be present in the discharge summary. Further research is required to understand why rates of medication reconciliation across the patient stay are not higher, and therefore what needs to be done to improve this.

This builds upon earlier findings by Keable and Perks (2022), where they investigated rates of medication reconciliation with the use of ieMR. Their study found that rates of incomplete 'Discharge Medication Reconciliation' were decreased if 'Home Medications' were entered into the software at admission (Keable and Perks 2022).

These findings bring light to the value of pharmacists and their role in being able to support medical staff in documenting an accurate list of medications within the discharge summary. Pharmacists could play a greater role in this space, similar to other practices within Australia and overseas. Biggs and Biggs (2020) has described, using expanded scope prescribing pharmacists, complete discharge summaries in the UK. They found within the pharmacist arm that the time to discharge summary completion dropped significantly. Similarly, deClifford *et al.* (2009) in Victoria describes the use of a pharmacist who prepared discharge prescriptions, medication lists and medication information within the discharge summary to be signed off by the treating clinician. Models similar to these may be of particular value and a possible solution to address workload constraints.

The rates of medication reconciliation across the patient's stay and the rates of 'Medications on Discharge', as identified in this study, do not meet the expectations as outlined within standard 4 of the NSQHS Standards and is subsequently not acceptable for clinical care.

This study emphasises the importance of the best use of electronic medical records; if not used correctly, this can have significant consequences on the information listed in the discharge summary.

### Implications for current and future research, practice and policy

In assessing the qualities of effective discharge communication, this study has provided quantitative contextual evidence to inform current and future research, practice, and policy. Future research could expand on the findings of this study by assessing the level of accuracy in discharge summaries. This was not assessed within the scope of this study; however, this should not take away from the importance and gravity of the results demonstrating large gaps in discharge communication information.

Within practice, there could be greater scope to incorporate more automation of importation of data fields. Future practice could also include pharmacists having an expanded scope role in assisting with discharge communication practices, whether it be within medication reconciliation processes or in completing discharge summaries. This may add value in addressing medical workforce shortages.

For policy, this research has highlighted the need for more measurable and specific key performance indicators within the NSQHS Standards, 'National Guidelines for On-Screen Presentation of Discharge Summaries'.

### Recommendations

The findings from this study indicate median timeliness to discharge summary completion is faster than the expectations outlined within local procedures. However, overall, discharge summary rates of completion and rates of medication reconciliation do not meet expectations as outlined within the NSQHS Standards and are subsequently not acceptable for clinical care. This study once again confirmed the critical importance of 'correct use of electronic platforms', demonstrating that if not correctly used, data communication outcomes get significantly worse than when using the system correctly.

This research has identified opportunities for future research and practice change in the following areas:

- Understanding if GPs are satisfied with the current discharge summary quality and what their preferences are for discharge communication.
- The need for more specific, measurable key performance indicators within the NSQHS Standards and 'National Guidelines for On-Screen Presentation of Discharge Summaries'.
- Specific investigations into why best use of electronic software is not followed.
- Possible future scope for pharmacists to assist in improving service delivery at the point of hospital discharge to the community.
- Further studies auditing multiple sites on a larger scale.

## Supplementary material

Supplementary material is available online.

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**Data availability.** The data that support this study will be shared upon reasonable request to the corresponding author.

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