Comparison of pharmacy technicians' and doctors' medication transcribing errors at hospital discharge

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ABSTRACT

Objectives To compare the transcribing error rates of discharge prescriptions between pharmacy technicians and doctors in an acute hospital setting.

Methods Pharmacy technicians were trained in the transcribing of discharge medications from inpatient to discharge medication charts. Prospective prescribing audits were undertaken over 5 days on eight hospital medical wards by ward pharmacists to compare pharmacy technician (on four wards) and doctor (on four wards) discharge transcribing error rates. Transcribed discharge medications were compared with the inpatient medication list by ward pharmacists to identify any transcription errors. Transcribing data for each technician and doctor, and number of items and errors, were input into SPSS and analysed using relevant statistical tests.

Results Doctors (n=12) transcribed 77 discharge prescriptions, and 678 items with 127 errors recorded (18.7% error rate). Pharmacy technicians (n=8) transcribed 63 discharge prescriptions, and 654 items with 25 errors recorded (3.8% error rate), a significant difference between groups in error frequency ($\chi^2(1)=58.6$, $p<0.005$) with a 14.9% difference between groups.

Conclusions Pharmacy technicians have significantly lower discharge transcribing error rates compared with doctors. This service intervention has the potential to improve patient safety and minimise inefficiencies from correcting errors. Further work is needed to explore the views and opinions of service users of the intervention, and why technician-transcribing error rates are significantly lower than doctors.

INTRODUCTION

Discharge prescribing errors are common in hospital settings in the UK.^{1–3} Where prescribing errors occur on discharge from hospital (to take out or TTO prescriptions), there is a risk that discharge can be delayed, resources wasted, patients harmed and hospital readmission rates increased with accurate completion of TTOs essential to ensure patient safety during transitions between care interfaces.^{4,5}

In the UK, once prescribed, a prescription can be transcribed, that is copied from one source to another without any alterations, by authorised, eligible people, before being signed by a doctor. While not routine practice in all UK hospitals, final-year medical students may undertake this process locally for example, by re-writing of medication charts or discharge prescriptions with the supervising doctor then signing the prescription to make it legal for dispensing or administration.

Hospital pharmacy technicians often work on wards to support clinical pharmacists, and their roles

in the UK have expanded with the final accuracy checking of dispensed prescriptions, and completion and documentation of medication histories,⁶ where their accuracy in completing medication histories has been reported as effective as pharmacists and other healthcare professionals.^{7,8}

Optimising pharmacy technician roles could allow doctors and pharmacists to focus on other patient-facing duties,⁶ while advancing roles have been reported to reduce adverse events and healthcare professional stress elsewhere.⁹ A recent study reported that pharmacy technicians' support of medicines administration was acceptable and feasible although they did not reduce rates of omitted medicines.¹⁰ Expanding pharmacy technician roles to draw on their technical proficiency could include the transcribing of inpatient medications for patient discharge. This could reduce transcribing errors from technical and skill-based errors such as slips and lapses,^{11,12} for example from omission of medications, or selection of incorrect doses or frequencies.

While the incidence of pharmacist discharge transcribing error rates have been reported,^{13,14} there are no known studies describing the impact of pharmacy technicians in undertaking this role and their impact on discharge transcribing error rates, severity of error or error type.

Aim of the project

To compare the transcribing error rates of discharge prescriptions between pharmacy technicians and doctors in an acute hospital setting.

Ethics approval

As this was an audit of current practice, ethical approval was deemed as unnecessary. The project was registered with the hospital audit department.

Overview of pharmacy technician discharge transcribing service

The pharmacy technician service had been established for over 12 months prior to the audit where it had been implemented to support the discharge process on selected high turnover wards, chosen in collaboration between pharmacy and clinical services departments.

Ward-based pharmacy technicians employed by the hospital were trained in the transcribing of medications. This included scenarios for the selection of correct drug, dose, frequency and duration, and clarification of eligibility for discharge of when required medications, for example. Training was delivered by a clinical pharmacist as part of a 1-hour workshop. Band 5 agenda for change pharmacy

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technicians were used as this grade were accredited medication accuracy checkers in the hospital. Medications were transcribed from an inpatient paper-based chart onto an electronic discharge system including documentation of any allergy status, and if an item was new, amended or had been stopped during admission. Pharmacy technicians could not enter any other clinical details, as these were completed by a doctor.

The process also involved identifying patients ready for discharge each weekday with the ward team. Pharmacy technicians were also trained to communicate completion of any TTO with ward doctors for signing and submission, and clarification of medication issues and eligibility for transcription, with the pharmacist and doctor prior to completing the TTO. This included clarification of course length if unclear, or appropriateness of medications on discharge, for example injections or as required medication that were being refused by the patient. Where a clinical decision was required, pharmacy technicians would refer to the doctor and inform them if a controlled drug prescription was required, for example. Additionally, pharmacy technicians would also check with the patient which medication was required for discharge. Doctors did not receive this training although they are taught on prescribing as part of their undergraduate education which includes having to pass a national prescribing examination. They are also taught on prescribing again as part of an induction programme to the hospital.

Access rights were limited so that technicians could only input medications, they could not submit or authorise the discharge prescription. Submission of the prescription could only occur by a doctor once they had reviewed the transcribed medications. Doctors also completed relevant details of the admission for communication to the general practitioner. Once completed, the ward pharmacist authorised the TTO for dispensing. Technicians were not allowed to amend a TTO once completed. The local medicines policy was updated to include statements on this practice. Additionally, all ward staff were informed of the new pharmacy technician role at departmental meetings, with nurses advised to communicate the need for a TTO with the pharmacy technician and doctors informed of the need to check any transcribed medication.

Pharmacy technicians undertaking these roles could move between other wards depending on service demands. No other roles (for example, documentation of medication histories) were undertaken while on the intervention wards.

METHODS

Completed TTOs were audited by ward pharmacists Monday to Friday between 9am and 5pm for both pharmacy technicians and doctors. This allowed comparison of the pharmacy technician service on four wards to be compared with existing practice with doctors on four wards.

All wards were 32-bed, mixed gender medical wards. The pharmacy technician service had already been established on four wards. Control wards were matched in agreement with the pharmacy department for patient turnover (approximately 40 per week), number of doctors and a similar ward pharmacist service.

Pharmacists would visit the wards Monday to Friday to perform medicines reconciliation, counsel patients, supply non-stock medications and provide medicines information to the clinical team.

The control wards had no pharmacy technician service either before or during the audit period. The technician service had been established on the intervention wards for over 12 months.

Population and setting

This project was undertaken in a large acute hospital setting in the north-west of England. Pharmacy technicians and any doctor who transcribed a TTO during the audit period were included. Inpatient charts were handwritten and discharge prescriptions transcribed onto an electronic system at discharge. Participants were eligible for inclusion in the audit if they completed a TTO during the audit period.

Data collection

Ward pharmacists collected data prospectively over a 5-day period (Monday to Friday) in September 2017 where they identified transcribing errors by comparing the transcribed TTO to the inpatient medication chart for each doctor and pharmacy technician individually. All medication items, including as required medications, that were eligible to go on the TTO were audited. Where an error was identified, the pharmacists would resolve the error with the accountable doctor as per standard practice.

There were typically two pharmacists per ward. Pharmacists are commonly used to collect prescribing error data,¹ and in this project, had been previously trained to audit prescribing errors using case examples as part of routine audits undertaken in the hospital. The data collection tool included both the error type and potential severity to inform coding of transcribing errors. An established definition of a prescribing error was used: 'A clinically meaningful prescribing error occurs when, as a result of a prescribing decision or prescription writing process, there is an unintentional significant: (1) reduction in the probability of treatment being timely and effective or (2) increase in the risk of harm when compared with generally accepted practice.'¹⁵ This included any TTO requiring pharmacist intervention, including both clinical and non-clinical errors such as omission or commission errors, or lack of additional information such as course duration.

Error classification

Transcribing errors were classified according to type and severity based on published definitions.³ Pharmacists had been trained in these classifications previously and used them in regular prescribing audits. Ten error types were used:

1. Dosing errors
2. Writing errors
3. Allergy status errors
4. Duration of treatment wrong/not specified
5. Drug interactions
6. Omission of medication
7. Excessive/unnecessary prescribing
8. Clinical safety errors
9. Lack of clear directions for administration
10. Miscellaneous.

Potential error severity was defined as either minor, significant, serious or potentially lethal.³

A multidisciplinary panel including the author, two medical educationalists and a senior pharmacist reviewed transcribing errors for appropriateness, type and severity using the agreed definitions, with any differences resolved for consensus.

Data analysis

Transcribing error rate was determined per item by dividing the total number of errors by the total number of items transcribed. Descriptive statistics, two-tailed χ^2 tests and Fishers' exact tests were used to compare error frequencies. Data were analysed using SPSS v.24.

Table 1 Doctor and pharmacy technician data

Participant number	Grade*	Number of transcribed TTOs	Items transcribed	Number of errors	Transcribing error rate (%)
1	FY1	11	104	20	19.2
2	CT1	8	56	14	25.0
3	FY1	5	63	6	9.5
4	FY1	5	42	4	9.5
5	CT1	11	101	12	11.9
6	FY1	5	57	13	22.8
7	FY1	2	29	8	27.6
8	CT1	2	17	2	11.8
9	CT1	7	68	17	25.0
10	FY1	7	38	7	18.4
11	FY1	3	34	8	23.5
12	CT2	11	69	16	23.2
Total		77	678	127	Overall %: 18.7
13	Band 5	25	206	5	2.4
14	Band 5	5	53	3	5.7
15	Band 5	2	18	0	0
16	Band 5	7	73	3	4.1
17	Band 5	8	93	5	5.4
18	Band 5	4	44	3	6.8
19	Band 5	6	88	3	3.4
20	Band 5	6	79	3	3.8
Total		63	654	25	Overall %: 3.9

*Prefix FY=Foundation Year trainee, CT=core medical training doctor, ST=specialist trainee, suffix 1–7=year of training programme, with foundation trainee doctors the most junior, followed by CT, then ST and then consultants. Pharmacy technicians are banded according to agenda for change, a national pay system for NHS staff except doctors and dentists. Junior pharmacy technicians are typically band 4, progressing to band 5 once they are an accredited accuracy checker. More senior management positions are typically band 6 (team leaders) or 7 (chief technician).

RESULTS

Twelve doctors and eight pharmacy technicians completed TTOs during the audit period and were included in the evaluation. Doctor and pharmacy technician details are presented in [table 1](#) below.

Doctors transcribed 77 TTOs and 678 items, with 127 errors recorded (18.7% error rate). Pharmacy technicians transcribed 63 TTOs and 654 items with 25 errors recorded (3.8% error rate). One doctor (participant 8) and technician (participant 15) transcribed a smaller number of items, while two doctors (participants 1 and 5) and one technician (participant 13) transcribed a larger number of items within their group.

Transcribing error frequency was significantly different between groups ($\chi^2(1)=58.6$, $p<0.005$) with a 14.9% absolute difference reported.

Table 2 Example transcribing errors for doctors and pharmacy technicians

Doctor or pharmacy technician	Description of error	Error type	Potential severity
Doctor	No maximum frequency specified for ibuprofen gel	Clinical safety	Minor
Doctor	Fexofenadine 18 mg dose transcribed instead of 180 mg	Writing error	Minor
Doctor	Bisoprolol omitted from TTO	Omissions	Significant
Doctor	Esomeprazole transcribed instead of omeprazole	Writing error	Significant
Doctor	Incorrect device specified for salbutamol inhaler	Writing error	Significant
Doctor	Chlorpromazine transcribed onto TTO but clinical notes say to stop as prolonged QTc interval	Clinical safety	Serious
Pharmacy technician	Adcal D3 chosen instead of Evacal D3	Writing error	Minor
Pharmacy technician	Aspirin transcribed at night instead of in the morning	Writing error	Minor
Pharmacy technician	No maximum dose specified for paracetamol	Clinical safety	Minor
Pharmacy technician	Tiotropium handihaler frequency transcribed twice-daily instead of once-daily	Dosing error	Significant
Pharmacy technician	Vagifem route transcribed orally instead of per vagina	Writing error	Significant
Pharmacy technician	Aspirin omitted from TTO	Omissions	Significant

ERROR CLASSIFICATION

No transcribing errors were excluded from analysis by the multi-disciplinary panel. Error type was regraded for 11 errors in the doctor group. Error severity was regraded for 19 errors in the doctor group with seven errors downgraded. No amendments were considered necessary in the pharmacy technician group. Example errors for both doctors and pharmacy technicians are provided in [table 2](#).

Error severity

The frequency of all error severities was lower for pharmacy technicians (see [table 3](#)). Error frequencies were significantly ($p<0.05$) lower in the pharmacy technician group for both minor and significant error types, with non-significant differences in serious errors reported.

Error type

The frequency of all error types was lower for pharmacy technicians (see [table 4](#)) except for lack of clear directions (a non-significant 0.2% increase). Error frequencies were significantly

Table 3 Frequency of transcribing errors by severity for doctors and pharmacy technicians

Error severity	Error frequency (% error rate)		Percentage difference between doctor and technician groups (%)	χ^2 and p value
	Doctor	Pharmacy technician		
Minor	64/678 (9.4%)	9/654 (1.4%)	–8%	$\chi^2(1)=37.5$, $p<0.05$
Significant	62/678 (9.1%)	16/654 (2.4%)	–6.7%	$\chi^2(1)=25.6$, $p<0.05$
Serious	1/678 (0.1%)	0/654 (0%)	–0.1%	Fishers' exact test, $p=1.0$ (ns)
Potentially lethal	0/678 (0%)	0/654 (0%)	0	NA
Total	127/678 (18.7%)	25/654 (3.8%)	–14.9%	$\chi^2(1)=58.6$, $p<0.05$

Table 4 Frequency of transcribing error type for doctors and pharmacy technicians

Error type	Error frequency (% error rate)		Percentage difference between doctor and technician groups (%)	χ^2 and p value
	Doctor	Technician		
1. Dosing errors	18/678 (2.7%)	2/654 (0.3%)	-2.4%	$\chi^2(1)=12.1$, $p<0.05$
2. Writing errors	40/678 (5.9%)	13/654 (2.0%)	-3.9%	$\chi^2(1)=12.3$, $p<0.05$
3. Allergy status	0/678 (0%)	0/654 (0%)	0	NA
4. Duration of treatment	5/678 (0.7%)	0/654 (0%)	-0.7%	Fishers' exact test, $p=0.62$ (ns)
5. Drug interactions	0/678 (0%)	0/654 (0%)	0	NA
6. Omissions	27/678 (4.0%)	4/654 (0.6%)	-3.4%	$\chi^2(1)=15.8$, $p<0.05$
7. Excessive/unnecessary prescribing	9/678 (1.3%)	0/654 (0%)	-1.3%	Fishers' exact test, $p=0.004$
8. Clinical safety	26/678 (3.8%)	5/654 (0.8%)	-3%	$\chi^2(1)=13.2$, $p<0.05$
9. Lack of clear directions	0/678 (0%)	1/654 (0.2%)	+0.2%	Fishers' exact test, $p=1.0$ (ns)
10. Miscellaneous	2/678 (0.3%)	0/654 (0%)	-0.3%	Fishers' exact test, $p=0.5$ (ns)
Total	127/678 (18.7%)	25/654 (3.8%)	-14.9%	$\chi^2(1)=58.6$, $p<0.05$

($p<0.05$) lower in the pharmacy technician group for dosing, writing, omissions and clinical safety errors with lower but non-significant frequencies for duration, excessive prescribing, lack of clear directions and miscellaneous errors.

DISCUSSION

This evaluation has reported significantly lower discharge transcribing error rates with pharmacy technicians when compared with doctors, consistent with lower error rates reported for non-medical prescribers elsewhere.¹³

Transcribing error rates by doctors were higher than in one large UK study and may reflect differences in prescribing error definitions or training of pharmacists in data collection for example.¹ However, the technician TTO error rate was lower than doctors both in this audit, and average discharge error rates reported elsewhere (6.4%).¹ Similarly, the reported error rate for pharmacy technicians was higher than that (0.2%) reported for transcribed TTOs by pharmacists in a recent study.¹³ Such differences possibly reflect heterogeneity in prescribing error definitions with further research required to assess any difference that could inform future service design.

Prescribing is an integrated set of complex skills with knowledge, skills and attitudes interacting with the environment.¹⁶ Similarly, error causation is complex with multiple factors reported including a lack of knowledge, distractions, poor communication, complex patients and a large number of prescribed items.¹⁷ However, where a transcription is copied from one source to another and the original source has been verified as safe and correct, it would be reasonable to assume that knowledge is less of a contributing factor unless a clinical decision is required, for example.

It has been suggested that prescribing is a lower priority task for doctors¹ where they may rely on pharmacists to intercept errors for them although there is no substantial evidence that explores this. Prescribing is one of many tasks expected of a doctor while in this project, the TTO transcription may be given greater prioritisation by technicians as a dedicated, focused task. Such task-prioritisation is a non-technical skill with such skills recognised as increasingly important for an accurate prescribing outcome.^{18,19} Equally, pharmacy technicians had been trained to communicate and clarify any transcribing queries with the ward pharmacist and doctor. This may have influenced their decision making, communication and team-working skills, all of which are non-technical skills^{19,20} that could have influenced the transcribing outcome. Understanding why pharmacy technicians have lower error rates than doctors could help to guide future prescribing training of junior doctors, offering avenues for

further qualitative research enquiry to explore error causation, and attitudes towards transcribing of TTOs.

The process of pharmacy technician transcribing in this project required an additional sign-off step in comparison to the traditional doctor transcription and pharmacist check. This could be considered an inefficient process, but equally, where time is saved for pharmacists and doctors from the correction of avoidable errors, it could be a more effective and efficient process with further investigation required to explore this.

This project involved transcribing from a paper-based inpatient, to electronic discharge prescription. Full electronic prescribing provides considerable promise to improve prescribing errors although benefits are not consistent²¹ and omission or commission errors can still occur on discharge for example. While the role of pharmacy technicians in TTO transcribing with full electronic systems is unknown, and is likely to vary or become redundant depending on the system used, a recent study reported low error rates from pharmacists transcribing discharge medications using full electronic systems.¹³ This demonstrates appetite, at least with some electronic systems, for non-medical transcribing of TTOs and provides possible future research avenues to compare error rates and the cost effectiveness of different staff groups undertaking this role.

It has been suggested²² that hospital pharmacy technicians should spend more time on clinical pharmacy services. This echoes the evolving roles of pharmacy technicians⁶ and where pharmacy technicians are utilised to transcribe TTOs, there is potential for doctors to focus on other clinical duties. Equally, any reduction in error rates has the potential to optimise workflow and, most importantly, reduce the risk of harm.

Further work is necessary to explore the potential benefits of the service on the flow of TTOs, cost effectiveness, patient satisfaction, and doctor and pharmacist workload and stress, for example, through the use of mixed methods including observational and qualitative studies.

Strengths and limitations

This is a pilot evaluation with small numbers of participants and transcribed items. However, to our knowledge this is the first project to report and compare TTO transcribing error rates between pharmacy technicians and doctors.

There were variations in the number of items transcribed by participants in both the doctor and technician groups. One technician (participant 13) transcribed almost three times as many items as any other. These results could therefore be potentially misleading, although error rates were comparable within each group, and the

difference could be related to variances in patient turnover or cover of different wards, depending on service provision.

Doctors did not receive any specific training in the transcribing of TTOs and it is possible that this influenced the lower error rates in the pharmacy technician group. However, doctors receive training in prescribing at both undergraduate and post-graduate level to prepare and support them for practice, and are required to pass a national prescribing safety assessment prior to practice in the UK.

The impact of patient gender, ward characteristics, number of prescribed items, type of medication transcribed or ward patient turnover on transcribing error rates has not been assessed. However, this was not the aim of the evaluation but equally offers potential for further research.

It is unknown if all TTOs were included over the audit period as data collection was reliant on ward pharmacists. However, wards were matched for turnover and similar number of TTOs were audited for both doctors and pharmacy technicians.

Finally, the impact of the service on participants is unknown and further enquiry would be needed to assess any positive or negative impact on doctors, technicians, pharmacists or nurses.

CONCLUSION

This audit has demonstrated a significantly lower discharge transcribing error rate for pharmacy technicians compared with doctors with the potential to improve patient safety and minimise inefficiencies from correcting errors with this service. Further work is needed to explore the sustainability of service, views and opinions of service users of the intervention, and why technician transcribing error rates are significantly lower than doctors.

What this paper adds

What is already known on this subject

- Discharge prescribing errors are common in hospital settings in the UK and can delay discharge, waste resources and compromise patient care.
- Transcribing of inpatient medications for discharge has been undertaken by hospital pharmacists with low error rates reported.
- The role of pharmacy technicians has evolved in the UK to include accuracy checking of medications and completion of medication histories with the potential to expand this role to include transcribing of medications for discharge from hospital.

What this study adds

- Pharmacy technicians have lower discharge transcribing error rates compared with hospital doctors.
- Understanding why transcribing error rates are lower for pharmacy technicians could inform future prescribing education and requires further investigation.

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