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Bedside Medication Management: Pharmacy Technicians Managing Patient Medication Supply to Improve Nursing Productivity and Patient Safety

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Abstract

Audits of medication charts conducted by Royal Hobart Hospital (RHH) Pharmacy revealed that dose omission was the most common medication error experienced by patients. Investigation of these errors also found that nurses spend significant time organising medication for inpatients. To address the issues contributing to these problems, an alternative model of medication management was implemented and tested. This model of bedside medication management (BMM) involves medication supply managed by ward pharmacy technicians (WPTs) where WPTs review charts daily for changes to medicines, and obtain medicines needed for each patient. Outcomes on two intervention wards showed that the BMM model combined with WPT involvement in controlled medicines stock management resulted in 29.78 hours of nursing time released to patient care per 20-bed ward per week, for an investment of 22.28 hours of WPT time; a 75% reduction in delayed doses; a 44% reduction in missed doses, and an average decrease of two hours in the turnaround time for supply of inpatient medication. Introducing BMM and controlled medicines stock management activities can release 1.34 hours of nursing time to patient care for every hour of WPT time (at lower hourly salary cost), decrease dose delays and omissions, and improve patient safety.

Keywords: medication; technicians; safety; productivity; nurse

1. Introduction

Medication administration omissions are a substantial problem that affect many hospital patients. A UK study which included 5,708 patients from 320 wards in 37 hospitals found that excluding valid clinical reasons, 30% of patients experienced medication administration omissions (although approximately half of these patients with omissions had refused medicines). Patients prescribed more than 20 medications were approximately five times more likely to have had omissions than patients prescribed one to four medications [1].

Another UK study examined medication safety incidents in the NHS and reported that 18% of medication incidents that cause death or serious harm are caused by dose omission [2].

An Australian study found that although the imprest (ward stock) system is a low-cost method for medicine distribution in hospitals, it is a high-risk system, leading to errors in 20% of medication administrations, the majority of which are dose omissions [3].

In addition, ward stock systems impose significant workload burden on nursing staff, who need to determine which medications are held 'on imprest' and which need to be ordered for individual patients, often at the time that dose administration is meant to occur. This needs to be considered in

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the context of Health Workforce Australia's prediction that there will be a shortage of more than 100,000 nurses by 2025.

Studies involving Ward Pharmacy Technicians (WPT) and individual patient storage found this model reduced administration errors by 75% [4], reduced medication costs by 5%, and significantly reduced dose omissions [5].

Statewide Hospital Pharmacy (SHP) is the unit within the Tasmanian Health Service (THS) that provides all medication management and pharmacy functions. SHP uses the imprest system for inpatient medication supply in hospital wards, augmented by dispensing of non-imprest items as needed.

Annual audits of medication charts conducted by SHP had revealed that medication omission was the most common medication error experienced by patients of the THS. SHP's investigation of these errors also found that nurses spend significant time undertaking tasks associated with organising medication supply for inpatients at the expense of direct patient care activities.

This is particularly noteworthy in the context of significant workforce nursing shortages (both across Australia, and within the State of Tasmania); and in this context, opportunities to streamline nursing tasks need to be considered. The role of pharmacy technicians in substituting or augmenting pharmacist roles is established practice [6]; but the impact on nursing 'time to care' has not been as widely studied.

The main aim of this study was to identify if an alternative model of medication distribution could reduce dose omissions, and the time that nurses spend undertaking tasks associated with organising medication for inpatients at the expense of direct patient care activities.

2. Materials and Methods

To address the issues contributing to medication omission, delayed dosing, and time spent by nurses organising inpatient medication supply, SHP considered a number of options to improve the system of inpatient medication supply in its acute hospitals. The options included automation, unit dose dispensing, and the bedside medication management (BMM) model which was already well-established in a small number of hospital wards of the THS. BMM was selected as the option which provided the greatest opportunity to achieve the desired outcomes more broadly.

BMM involves holding patient-specific medications as close to the patient as possible (e.g., in bedside lockers, or patient-specific locations in medication trolleys), with Pharmacy taking responsibility for ensuring sufficient supplies are available for each patient. BMM involves ward pharmacy technicians (WPT) working weekdays and being responsible for:

- checking the paper-based medication charts daily (Monday to Friday) for all patients on the ward
- manually ordering medications requiring dispensing from Pharmacy
- placing inpatient medication in designated 'near bedside' patient-specific locations (whether sourced from Pharmacy, ward imprest, or the patient's own supply)
- annotating charts with the storage location of medicines (e.g., 'fridge')
- organising medication held in medication trolleys/lockers/rooms
- restocking trolleys and imprest storage as required
- managing urgent imprest orders outside scheduled replenishment, and
- anticipating requirements and ensuring sufficient supplies over weekends.

SHP had previously conducted a six-week pilot evaluation of BMM in one medical and one surgical ward at the Royal Hobart Hospital (RHH). The analysis of the outcomes of the pilot found the BMM model to warrant further adoption across the THS, with results including a 25% reduction in turnaround time for inpatient medication supply from the Pharmacy.

In light of these positive results, SHP proposed an Expanded Pilot of BMM which was approved by the THS Executive and conducted from late 2018 to early 2019.

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A specialist independent consulting company was engaged by the THS to work with the SHP on assessing the benefits of the Expanded Pilot of a BMM model utilising WPTs ('the study').

As the BMM model was already well-established in the service, the work to evaluate its benefits was undertaken as a quality improvement (QI) project and local policies at the time did not require Ethics Committee approval for QI projects such as this. As such, the work was exempted by the Tasmanian Department of Health from Ethics Committee review.

An additional component to the study was an assessment of the potential nursing productivity gain which could be achieved by extending WPT responsibilities to include providing assistance with controlled medicines i.e., schedule 8 (S8) and schedule 4D (S4D) medicine management activities, both of which have special requirements regarding their supply, storage and records of transactions.

Under the Expanded Pilot, the BMM model was implemented in the Assessment & Planning Unit (APU) and the Cardiology Unit (2D) of the RHH. Each unit has 20 beds, and involved the allocation of one WPT per ward, each working 0.5 FTE from 8.30 a.m. to 12.30 p.m. Monday to Friday (in total, equivalent to 1.0 FTE WPT working a 38-hour week).

The study methodology included developing and testing an audit approach which included using a time and motion audit tool to record time spent by nursing staff on dose administration to patients and activities related to medication supply. The objectives of the Expanded Pilot were to evaluate the impacts of an expanded BMM model at the RHH on nursing productivity, patient safety and quality use of medicines (QUM).

Two independent consultants made assessments in regard to:

a) nursing productivity, by:

i. observing, measuring and documenting activities and time involved in medication administration for a three-day period before the BMM implementation, and again for a three-day period approximately five weeks after implementation.

- A total of 160 occasions of patient dosing were observed, in which a total of 661 doses of medications were administered.
- The time taken for the nurse to undertake all necessary steps of dose administration was recorded (e.g., including the time spent retrieving the medication from its location on the ward and checking it prior to administration).
- Additionally, nursing time 'lost' to patient care during the dose administration process was recorded, which was defined as 'unproductive' time not essential to administering the charted medicine. This included any time a nurse was observed searching for medication potentially in various locations, ordering medicines, or putting away medicines following delivery by Pharmacy.

ii. recording the medication requirements of patients in the pilot wards by making copies of each medication chart

iii. measuring the time nurses spent managing S8 and S4D medicines requirements including performing the end of shift 'S8 count' and obtaining ad-hoc supplies of S8 and S4D medication, collecting these from Pharmacy and completing an entry in the S8 or S4D register with a second nurse

b) patient safety and QUM, by:

i. measuring the average turnaround time for the medication order delivery, defined as the time taken for a medication order to progress from the ward scanner to the dispensary, be dispensed by the Pharmacy team, and delivered to the ward

ii. documenting delayed doses observed (i.e., the number of occasions that a dose of medication was not available at the scheduled administration time)

iii. documenting missed doses (identified from a point prevalence audit of medication chart dose administration records), and

c) safety and security of medication storage areas, by observations and conducting spot checks during the site visits.

The limitations of the study include that:

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a) As the study was conducted in two medical wards, the results may not be transferrable to other hospital inpatient units and specialty areas.

b) The estimate of time released to patient care by having a WPT responsible for collection of ad hoc of S8/S4D orders was based on an assumption that a WPT could complete this activity in 15 minutes (compared with the average 25 minutes, observed to be required for a nurse).

c) Qualitative and quantitative methods were used to draw inferences from the data.

Funding for the study was provided by the THS as a quality improvement activity.

3. Results

The analysis of results of the Expanded Pilot of the BMM model are presented in relation to the key research objectives.

3.1. Nursing Productivity i.e., Nursing Time Released to Patient Care

Table 1 provides a description of the quantitative analysis elements, measurement approach and key results.

Table 1. Quantitative analysis elements, measurement approach and key results.

Element description	Measured by:	Extrapolation	Pre-BMM (A)	Post-BMM (B)	Impact (across both pilot wards)
Nursing productivity					
1) Nurse time spent on dose administration	Direct observation, during time and motion (T&M) studies, measured as: a) Total time (mins) as observed b) Number of medications given (as observed) c) Average time (mins) per medication given (a/b)	[(Ac)-(Bc)] x (B3) = minutes gained per day	c) = 1.93 mins per medication given	c) = 1.48 mins per medication given	239.85 mins gained per day
2) Nurse time 'lost'[1] during dose administration			c) = 0.33 mins per medication given	c) = 0.05 mins per medication given	149.24 mins gained per day
3) Number of scheduled doses in 24 hours	Review of copies medication charts of all patients in pilot wards at time of T&M studies		531	533	
4) Nurse time spent scanning and sending scans of charts to Pharmacy	Direct observation, measured as: d) av. time per scan (mins)	[(Ad) x (A5)/14] minus [(Bd) x (B5)/14] = minutes gained per day	d) = 2.2 mins per scan	d) = 1.2 mins per scan	51.03 mins gained per day
5) Number of orders received by Pharmacy (from pilot wards)	Data from Pharmacy server over 14-day audit periods		520 (371 M-F, 149 S-S)	358 (250 M-F, 107 S-S)	
6) Nurse time spent on end of shift 'S8 check'	Direct observation, to derive:	WPT replaces second nurse for one check per	e) = 24.4 mins	e) = 24.4 mins	48.8 mins gained per weekday

[1] nursing time 'lost' to patient care during the dose administration process, defined as 'unproductive' time not essential to administering the charted medicine

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	e) av. time per check (mins) f) mins per day (2 nurses per check, 3 checks per day, x 2 wards)	day, Mon-Fri, on each ward	f) = 292.8 mins per day	f) = 244 mins per day	
7) Nurse time spent collecting ad hoc S8 orders from Pharmacy	g) Direct observation, to derive average time (mins) per occasion (estimated to occur once per day, for each ward)	WPT collects ad hoc orders (instead of nurse) once per weekday, per ward	g) = 25 mins per day per ward	g) nil nurse time	50 mins gained per weekday
8) WPT time required to collect S8 orders from Pharmacy	h) Not measured – estimated to be 15 minutes		n/a	h) = 15 mins	
Safety and quality					
9) Turnaround time i) order received by Pharmacy	For orders received over 14-day audit periods: i) time stamp from Pharmacy server of scanned chart	Average time interval from (i) to (m)	212 mins	97 mins	decrease of 115 mins (54%) in turnaround time
ii) order processed and dispensing label printed	j) time data from dispensing system (iPharmacy®)				
iii) labelled product checked by pharmacist and ready for collection	k) time recorded in log by Pharmacy staff				
iv) product collected from Pharmacy	l) time recorded in log by Pharmacy staff				
v) product delivered to ward	m) not measured – estimated to be 20 minutes from time of collection, based on data from the 2017 pilot study				
10) Delayed doses	Direct observation, during T&M studies, noting: n) occasions when dose was not available at scheduled time, and o) the total number of doses due to be given across all the dosing occasions observed	Number of delayed doses as % of doses due to be given	n) = 59 o) = 365 n)/o) = 16%	n) = 16 o) = 371 n)/o) = 4%	75% reduction in delayed doses
11) Missed doses	Point prevalence audit of medication charts for all patients in pilot wards at time of T&M studies, noting:	Number of missed doses as a % of doses due in 24 hours	p) = 42 q) = 531 p)/q) = 7.9%	p) = 24 q) = 533 p)/q) = 4.5%	43% reduction in missed doses

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	p) number of doses not given, and q) the number of regular doses scheduled in 24 hours for that patient [see (3)]

Reduction in time spent on dose administration: the average time spent by nurses on dose administration was reduced from 1.93 minutes per medication in the pre-intervention period, to 1.48 minutes per medication in the post-intervention period (due mostly to nurses only having to handle current medication), i.e., a reduction of 0.45 minutes per medication (see Table 2).

Table 2. Dose administration: time taken and time lost.

Measure		Pre-intervention			Post-intervention			Difference		
		All	APU	2D	All	APU	2D	All	APU	2D
Number of patient dosing occasions observed (DOO)	Total	80	53	27	67	24	43	-13	-29	+16
Number of medications given (all occasions observed)	Total	306	199	107	302	126	176	-4	-73	+69
Time taken										
Time taken (minutes) for patient dosing (all occasions observed)	Total	592	430	162	446	240	206	-146	-190	+44
Time taken (minutes) per patient dosing occasion observed:	Range	2-24	3-24	2-12	1-20	2-20	1-10			
	Average	7.4	8.1	6.0	6.65	10.0	4.78	-0.75	+1.9	-1.22
Time taken (minutes) per medication given	Average	1.93	2.16	1.51	1.48	1.90	1.17	-0.45	-0.26	-0.34
Time 'lost'										
Number of dosing occasions where time 'lost' was observed	Total	48	32	16	13	6	7	-35	-26	-9
	% of DOO	60%	60%	59%	19%	25%	16%	-41%	-35%	-43%
Total time 'lost' (across all occasions observed) (minutes)	Total	101.8	68.5	33.3	15.8	4.5	11.3	-86	-64	-22
Time 'lost' per patient dosing occasion (as observed) (minutes)	Range	0.4-10	0.4-10	0.5-9.9	0.5-3.1	0.5-1	0.5-3.1			
Average excluding nil (i.e., if time was lost, the average time lost)	Average	2.3	2.3	2.1	1.21	0.75	1.61	-1.2	-1.6	-0.6
Average including nil (i.e., average time lost across all dosing occasions)	Average	1.30	1.30	1.20	0.24	0.18	0.26	-1.06	-1.12	-0.94
Time 'lost' (minutes) per medication given	Average	0.33	0.34	0.31	0.05	0.04	0.06	-0.28	-0.36	-0.25

Application of this time saving to the number of scheduled, regular doses in 24 hours across the two pilot wards (see Table 3) yields a productivity gain of 239.85 minutes (3.99 hours) per day over both wards, or 119.92 minutes (1.99 hours) per day per 20-bed ward.

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Table 3. Profile of pilot wards patient medication dosing needs.

Measure		Pre-intervention			Post intervention			Difference		
		All	APU	2D	All	APU	2D	All	APU	2D
Data captured at 10am on day/date			Thur.	Wed.		Mon.	Tue.			
Number of patients on ward at time of data capture	Total	36	24	12	41	27	14[2]	+5	+3	+2
Number of medications (regular) charted	Total	337	236	101	355	244	111	+18	+8	+10
	Range		2-19	3-19		1-24	1-18			
	Av. per pt	9.4	9.8	8.4	8.7	9	8	-0.7	-0.8	-0.4
Patients with 'above average' number of medications charted	Total	15	11	4	16	11	5		Nil	+1
Number of regular doses scheduled to be given over 24 hours	Total	531	366	165	533	353	180	+2	-13	+15
	Range	3-30	3-30	3-28		1-28	1-38			
	Av. per pt	14.75	15.25	13.75	13	13	12.85	-1.75	-2.25	-0.9
Patients with 'above average' number of doses over 24 hours	Total	16	12	4	15	11	4	-1	-1	Nil
Number of patient dosing occasions in 24 hours	Total	156	100	56	166	113	53	+10	+13	-3
Number of patient dosing occasions (in 24 hrs) involving the administration of:	1-2 meds	89	56	33	99	66	33	+10	+10	Nil
	3-5 meds	35	22	13	36	25	11	+1	+3	-2
	6-9 meds	19	11	8	20	15	5	+1	+4	-3
	≥ 10 meds	13	11	2	10	6	4	-3	-5	+2
Number of medicines due per patient dosing occasion	Range		1 to 15	1 to 13		1 to 16	1 to 17			
	Average	3.4	3.7	2.9	3.2	3.2	3.4	-0.2	-0.5	+0.5

Reduction in time 'lost':

- the incidence of time being 'lost' during dose administration fell from 60% of dosing occasions observed in the pre-intervention period, to 19% of dosing occasions observed in the post-intervention period).
- There was a corresponding reduction in the amount of time 'lost' of 0.28 minutes per medication given (from 0.33 to 0.05 minutes) see Table 2.
- Applying this to the total number of regular doses due in 24 hours across the two pilot wards yields a time saving of 149.24 minutes (2.48 hours) per day over both wards, or 74.62 minutes (1.24 hours) per day, per 20-bed ward

Reduction in time spent scanning and sending charts to Pharmacy:

- the introduction of the BMM model led to a reduction in the time spent by nurses sending scanned orders to Pharmacy of 63.2% (from 81.71 minutes to 30.63 minutes) on weekdays and 59.2% on weekends, despite the WPT working only on weekdays (see Table 1). This equates to

[2] There were 16 patients on ward including two aged <18 yrs – data were not captured for these patients.

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a productivity gain of 51.03 minutes (0.85 hours) per day across both wards, or 25.51 minutes (0.43 hours) per day, per 20-bed ward

WPT assistance with S8/S4D management:

- When a WPT replaced the second nurse in counting S8 and S4D medications during one shift on weekdays, the average amount of nurses' time that was released to patient care was 24.4 minutes per weekday, per ward (see Table 4).
- The average time spent by nurses collecting ad hoc orders for S8 and S4D medications from Pharmacy was 25 minutes per occasion (ranging from 21 minutes to 29 minutes). If this task was performed by a WPT once each weekday, the WPT could release approx. 25 minutes per weekday per 20-bed ward.
- The combined productivity gain from having a WPT support these two activities was estimated to be 49.4 minutes (0.82 hours) per weekday, per 20-bed ward, for an investment of 39.4 minutes (0.66 hours) of WPT time per day.

Table 4. Time taken by nurses conducting S8 and S4D counts at end of shifts.

Measure		Cardiology			APU			All data		
		AM	PM	Evening	AM	PM	Evening	AM	PM	Evening
Number of 'end of shift S4D and S8 counts' by nurses observed	Total	1	3	1	1	2	1	2	5	2
Time taken (minutes)										
Total time	Total	32	61	27	26	45	29	58	106	56
Range of time taken	Range	32	16-27	27	26	20-25	29	26-32	16-29	27-29
Average time taken	Average	32	20.33	27	26	22.5	29	29	21.2	28
		Cardiology – all shifts			APU – all shifts			All shifts		
Average time taken to complete 'end of shift S4D and S8 counts'		25 minutes			24 minutes			24.4 minutes		

Table 5 presents a summary of the productivity gains identified by the quantitative analysis, which shows that WPTs operating a BMM model and supporting S8/S4D management can release 29.78 hours of nursing time to patient care, per week (7 days), per 20 bed ward. This release of nursing time can be achieved for an investment of 22.28 hours of WPT time per week (Monday to Friday), which equates to 1.34 hours of nursing time released to patient care for each hour of WPT time.

Table 5. Extrapolation and summary of time released to patient care.

Description of productivity gain	Estimated time (hours) released to patient care, per day (for a 20-bed ward)	Estimated time (hours) released to patient care, per 7-day week (for a 20-bed ward)	WPT time (hours) invested per 7-day week, to release nursing time to patient care
Reduction in nursing time:			19.00#
• spent on dose administration	1.99	13.99	
• 'lost' during dose administration	1.24	8.70	
• spent scanning and sending scans of charts to Pharmacy	0.43	2.98	

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• spent conducting end-of-shift S8 checks (if WPT acts as second person for afternoon shift check, M-F)	0.41*	2.03*	2.03*
• spent collecting ad-hoc S8 orders from Pharmacy (assuming WPT does this once per day each weekday)	0.42*	2.08*	1.25*
Total * time released (and invested) Mon-Fri only # 0.5 FTE working 38-hour week, Mon-Fri	**4.49 (M-F)** **3.66 (S-S)**	**29.78**	**22.28**

3.2. Patient Safety and QUM

In regard to delayed doses: the time-and-motion observations found a reduction in medication doses which were not available for administration at the scheduled dosing time, dropping from 16% (59 of 365 medication doses due) pre-intervention, to 4% (16 of 371) post-intervention period i.e., a 75% reduction in delayed doses (as a proportion of the medication doses due to be administered).

In regard to missed doses: the point prevalence audit of patient charts found medication doses scheduled to be given in a 24-hour period which were missed, dropped by 44% i.e., from 8% (42 of 531) pre-intervention to 4.5% (24 of 533) in the post-intervention period.

In regard to turnaround time: the study found a reduction of 115 minutes in average turnaround time under the BMM model (3 hours 12 minutes pre-intervention to 1 hour 17 minutes post intervention) i.e., the required medications being available for administration to patients almost two hours earlier as a result of BMM.

3.3. Safety and Security of Medication Storage Areas and, Wastage

Medication storage security: improvements observed by the consultants in the post intervention period included medication trolleys being locked more frequently (i.e., increased security); smaller volumes of stock being stored on shelves in cupboards facilitating easier (and faster) access for nurses to locate the medications they required; and no expired or inappropriately stored medications were found in the medication storage areas.

Wastage: It was observed that the WPT model allowed greater predictive accuracy in the number of medications that a patient needed, reducing both overall waste as well as the time spent re-ordering medications that had been supplied in insufficient quantities.

4. Discussion

The combined productivity benefits of WPT involvement in BMM and S8/S4D stock management activities released to patient care a total of 29.78 hours of nursing time per 20-bed ward per week for an investment of 22.28 hours of WPT time per 20-bed ward per week. This translates to 1.34 hours of nursing time released to patient care for each 1.0 hour of WPT time.

Based on the findings from the BMM study and in light of the significant shortage of nurses, the Tasmanian Government approved the BMM model for implementation in all THS hospitals. The 35 technician positions which were created are expected to generate approx. 1,500 hours each week of productive nurse time (i.e., patient care time) across the State.

If the study was repeated, one change that would be considered would be including additional hospital inpatient units and specialty areas beyond medical wards.

The key facilitators to achieving a successful outcome included identifying and clearly describing the problems (including those beyond Pharmacy e.g., nurse shortages), designing and implementing a pilot study, using the results from the pilot to generate interest and support from

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key Hospital decision-makers for an expanded pilot, and driving a rigorous methodology and project planning through the involvement of external consultants.

5. Conclusions

This study provides novel evidence of the productivity benefit of a medication management system that has been shown to improve patient safety, improve timeliness of treatment, and can be leveraged to create cases for change in other hospitals.

Author Contributions: Conceptualization, Tom Simpson. and Duncan McKenzie; methodology, Tom Simpson, Duncan McKenzie Rosina Guastella and Michael Ryan; validation, Tom Simpson. and Duncan McKenzie; formal analysis, Tom Simpson. and Duncan McKenzie; investigation, Rosina Guastella and Michael Ryan; resources, Rosina Guastella and Michael Ryan; data curation, Tom Simpson, Rosina Guastella; writing -original draft preparation, Tom Simpson, Rosina Guastella and Michael Ryan; writing -review and editing, Tom Simpson, Duncan McKenzie, Rosina Guastella and Michael Ryan; supervision, Tom Simpson and Duncan McKenzie; project administration, Tom Simpson, Rosina Guastella and Michael Ryan; funding acquisition, Tom Simpson. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: Ethical review and approval were waived for this study due to the work being undertaken as a quality improvement (QI) project and local policies at the time did not require Ethics Committee approval for QI projects. such as this. As such, the work is exempt from Ethics Committee review (as per Deputy Chief Medical Officer, Tasmanian State Department of Health).

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author due to privacy reasons.

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Conflict of Interest Statement: The authors declare no conflict of interest. The Tasmanian Health Service employed authors #1 and #2 as salaried employees, and paid a consultancy fee to authors #3 and #4 for their involvement in the study

Abbreviations

The following abbreviations are used in this manuscript:

APU	Assessment & Planning Unit
BMM	Bedside medication management
DOO	Dosing occasions observed
FTE	Full Time Equivalent
QI	Quality improvement
QUM	Quality use of medicines
RHH	Royal Hobert Hospital
S8	Schedule 8 medicines are controlled drugs with a high potential for misuse, abuse, and dependence. These include opioid analgesics such as morphine and fentanyl
S4D	Schedule 4 Appendix D medicines are controlled drugs which include drugs which may be abused and/or are liable to cause dependence
SHP	Statewide Hospital Pharmacy
THS	Tasmanian Health Service (THS)
WPT	Ward pharmacy technician

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