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Perceptions, impact and scope of medication errors with opioids in Australian specialist palliative care inpatient services: A mixed methods study (the PERISCOPE project)

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Chapter 6: Palliative care clinicians’ perceptions of opioid error contributory factors in inpatient palliative care services

6.1 Chapter preamble

Chapter 5 explored reported opioid error contributory factors from clinical incident reports in two specialist palliative care inpatient services. This chapter reports the findings of a qualitative study undertaken with palliative care clinicians in the three NSW palliative care services that participated in Phase 1 of the PERISCOPE project.

6.2 Publication reference

This chapter was published in 2019 in *Palliative Medicine*, a peer reviewed scholarly journal targeting palliative care clinical practice, and contains an edited version of the published study exploring opioid error contributory factors from the perspective of palliative care clinicians (Appendix 1).

Heneka, N., Shaw, T., Rowett, D., Lapkin, S., & Phillips, J. L. (2018). Clinicians’ perceptions of opioid error contributing factors in inpatient palliative care services: A qualitative study. *Journal of Palliative Medicine*, 33(4) 430-444.

Palliative Medicine: Impact factor: 3.78; ISI JCR Ranking 2017: 15/94 (Health Care Sciences & Services), 24/154 (Medicine, General & Internal), 28/180 (Public, Environmental & Occupational Health).

6.3 Overview

Analysis of reported opioid errors in inpatient palliative care services suggests active failures are the major contributory factor to opioid errors in this service type (Heneka, Shaw, Rowett, Lapkin, & Phillips, 2018a; Heneka, Shaw, Rowett, Lapkin, & Phillips, 2018b). To fully understand the factors contributing to opioid errors in inpatient palliative care services and confirm or refute the findings from analysis of incident reports alone, it is essential to explore error contributory factors from the perspective of palliative care clinicians.

6.4 Objective

To explore palliative care clinicians' perceptions of the factors contributing to opioid errors in Australian specialist inpatient palliative care services.

6.5 Methods

Study methods have been described in Chapter 3.

Participants are reported using the following key (Study ID_Clinician Type_Classification_Age_Gender [M: Male; F: Female]), for example, ID01_Nurse_RN_35_F.

Clinician Classification key: CNC: Clinical Nurse Consultant; CNE: Clinical nurse educator; CNS: Clinical nurse specialist; CON: Consultant; EEN: Endorsed enrolled nurse; GM: Governance manager; INT: Intern; NUM: Nurse unit manager; REG: Registrar; RMO: Resident medical officer; RN: Registered nurse.

6.6 Findings

Qualitative data was collected from 58 clinicians who participated in one of eight focus groups, or a semi-structured interview (n=20), conducted between March 1 and November 30, 2017. The mean length of the focus groups was 41 (± 8) minutes and 34 (± 11) minutes for the semi-structured interviews. Participants comprised nurses (n=44), doctors (n=12), and pharmacists (n=2) (Table 6.1). The majority of participants were female (82%) and the mean age 42.3 (± 11.8) years. Almost two-thirds of participants (62%, n=36) had worked in the services' palliative care unit for three or more years, while half (50%, n=28) had worked in the palliative care specialty for six or more years. Six participants (medical n=2, nursing n=3, and pharmacy n=1) were unit medication safety working group members.

Table 6.1 Participant demographics (N=58)

Characteristic		N=58	(100%)
Gender	Female	50	(86.2)
	Male	8	(14.8)
Age (years)	Mean (SD)	42.3	(±11.8)
	Median (IQR)	41.0	(17)
Discipline	Nursing	44	(75.8)
	Medical	12	(20.8)
	Pharmacy	2	(3.4)
Classification	Endorsed enrolled nurse	3	(5.2)
	Registered nurse	29	(50.0)
	Clinical nurse educator	2	(3.4)
	Clinical nurse specialist	5	(8.6)
	Nurse unit manager	4	(6.9)
	Intern	1	(1.7)
	Senior resident medical officer	1	(1.7)
	Registrar – basic trainee	1	(1.7)
	Registrar – advanced trainee	1	(1.7)
	Consultant	8	(13.8)
	Pharmacist	2	(3.4)
	Governance manager	1	(1.7)
Years in discipline*	< 1 year	2	(3.4)
	1-2 years	6	(10.3)
	3-5 years	7	(12.1)
	6-10 years	9	(15.5)
	11-15 years	6	(10.3)
	16-20 years	10	(17.2)
	21 years or more	17	(29.3)
Years in palliative care*	< 1 year	10	(17.2)
	1-2 years	6	(10.3)
	3-5 years	12	(20.7)
	6-10 years	16	(27.6)
	11-15 years	6	(10.3)
	16-20 years	4	(6.9)
	21 years or more	3	(5.2)

Table 6.1 Participant demographics (N=58) (cont.)

Characteristic	N=58	(100%)	
Years in unit*	< 1 year	13	(22.4)
	1-2 years	9	(15.5)
	3-5 years	12	(20.7)
	6-10 years	14	(24.1)
	11-15 years	6	(10.3)
	16-20 years	2	(3.4)
	21 years or more	1	(1.7)
Highest qualification attained (n=47) (excludes medical)	Certificate in nursing	1	(2.1)
	Certificate IV	1	(2.1)
	Diploma	2	(4.2)
	Advanced diploma	2	(4.2)
	Bachelor degree	18	(37.5)
	Graduate certificate	11	(22.9)
	Master's degree	7	(14.6)
	PhD	1	(2.1)
Role in opioid delivery process	Administration	39	(67.2)
	Prescribing	11	(19.0)
	Quality and safety	3	(5.2)
	Dispensing	1	(1.7)
	Prescribing, quality and safety	1	(1.7)
	Dispensing, quality and safety, surveillance	1	(1.7)
	Administration, quality and safety	1	(1.7)
	Resident medical officer supervision	1	(1.7)
Frequency of opioid delivery (prescribing/ dispensing/ administration)*	Frequently (daily)	47	(81.0)
	Occasionally (several times per week)	4	(6.9)
	Rarely (several times per month)	5	(8.6)
	Never**	1	(1.7)
Employment status*	Full-time	35	(60.3)
	Part-time	21	(36.2)
	Causal	1	(1.7)
Primary shifts worked*	Day	25	(43.1)
	Afternoon	3	(5.2)
	Night	2	(3.4)
	Combination	27	(46.6)

* Missing data (n=1)

Six primary contributory factor domains aligning with the Yorkshire Contributory Factors Framework (Lawton et al., 2012), and 13 descriptive sub-themes, were identified during thematic content analysis:

1. Active failures

- Human error is inevitable
- Active failures and opioid underdosing

2. Situational factors

- Task characteristics - opioid preparation and delivery
- Individual factors - clinician inexperience
- Patient factors - palliative patient complexity

3. Local working conditions

- Skill mix
- Staff workload
- Palliative care workforce

4. Latent organisational factors – Physical environment

- Physical environment - drug preparation areas

5. Latent organisational factors – Support from central functions

- Support from central functions - care transitions
- Support from central functions - absence of pharmacy input
- Support from central functions - paper-based medication charts

6. Communication systems

- Clinical communication: written and verbal

Error contributory factors were identified by participants in every phase of opioid delivery. These contributory factors were perceived to create error producing conditions from the time of patient admission to the palliative care service (Figure 6.1).

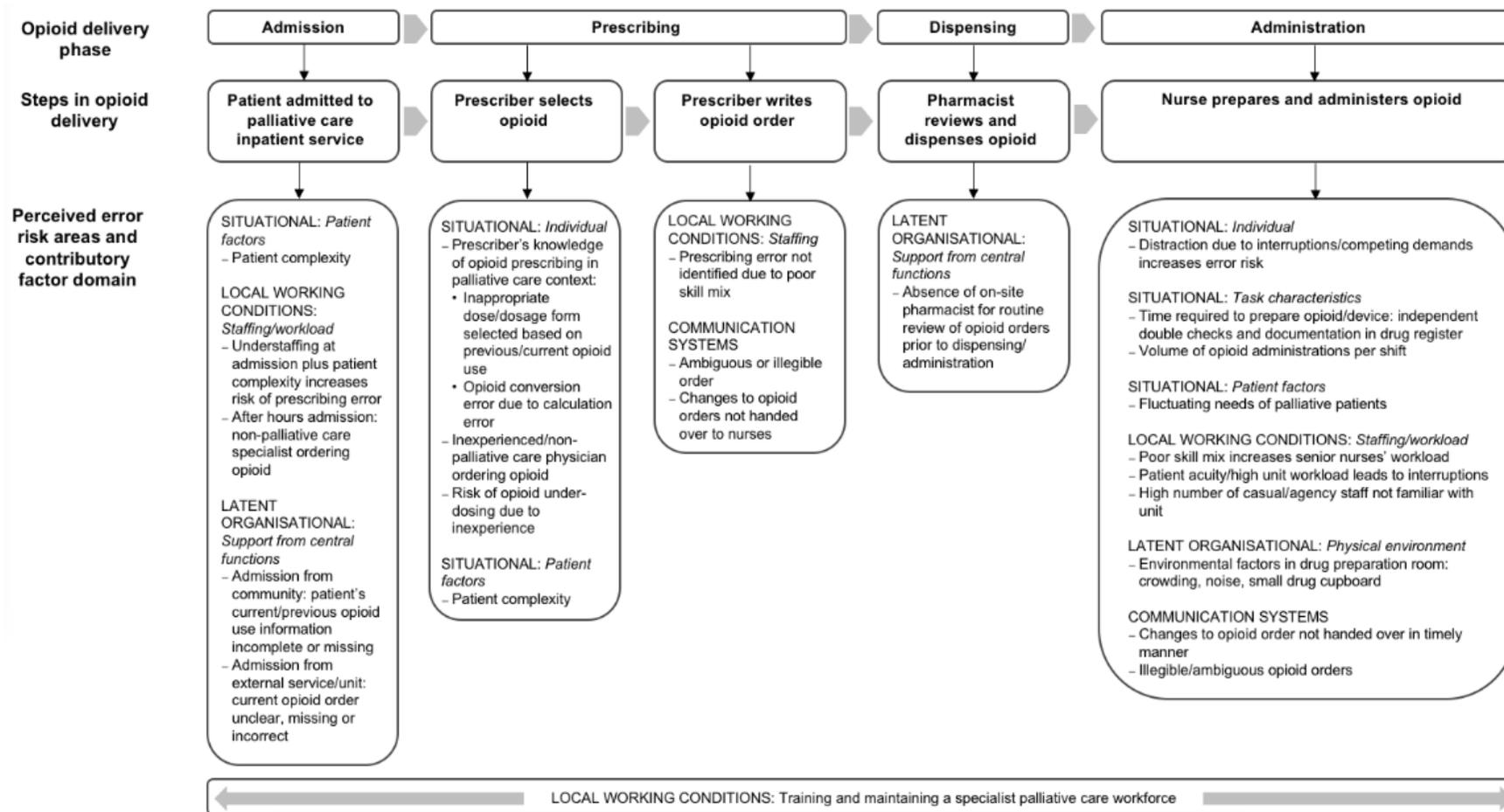


Figure 6.1 Perceived risk areas for opioid errors across the opioid delivery process in specialist palliative care inpatient services (adapted from Leape et al (1995), and corresponding contributory factor domain(s) (Lawton et al., 2012)

6.6.1 Active failures

Human error is inevitable

All participants had an in-depth awareness of the dangers associated with opioids, the potential for errors and harms, and a practical understanding of opioid management policies and practices:

Whenever I've tried to write up a protocol or a process about managing opioids...you recognise how many complex steps actually are involved...and decision making process, and...when you're doing it all the time, you just forget that actual high level of complexity (and) high risk clinical activity (ID22_Physician_CON_58_F).

However, participants readily acknowledged that active failures, such as slips, lapses and mistakes, were inevitable during opioid delivery:

We are aware that human error plays a part in medication administration, I don't think there's any way around that, completely; we can be as diligent as you want, but at times (errors will still happen) (ID47_Nurse_RN_22_F).

While serious opioid errors were perceived to be infrequent events, other opioid errors were perceived to occur more frequently:

I think serious opioid errors are uncommon. Minor issues of all descriptions are relatively common, and I think that that is partially related to the volume of opioid use here in the specialist inpatient unit (ID09_Physician_CON_56_F).

Considering the volume of opioid administrations in inpatient palliative care services; however, participants perceived that the incidence of opioid errors was comparatively low:

We roughly calculated an average of over 3000 opioid administrations in one month (in the unit), and there was one error... I'm not minimising the seriousness of a drug error,

any error is dangerous, and needs to be treated extremely seriously, but given the volume of (opioid) administrations in this unit (this is actually low) (ID23_Nurse_CNE_50_F).

Participants reflected on opioid error types they had observed in the palliative care unit, acknowledging that errors occurred across the medication delivery process:

The largest proportion probably come down to either a prescriber error at the time or an administration error (ID32_Physician_CON_48_M).

Participants suggested omitted opioid doses were potentially the most commonly occurring error:

...the missed dose is quite frequent...there is no doubt there's an element of human error that we haven't been able to eliminate entirely (ID32_Physician_CON_48_M).

Mistakes with opioid conversions, were also perceived to be common:

...opioid conversions are the huge danger area...and that happens many times when you're trying to stabilise pain, we're changing routes and we're changing drugs (ID22_Physician_CON_58_F).

Active failures and opioid underdosing

Participants acknowledged that arriving at the correct opioid dose was challenging, particularly with opioid conversions. While there was a perception that overdosing due to conversion error is problematic:

...you hear about the very dramatic (errors), I automatically think of hydromorphone/morphine and patients being overdosed (ID17_Nurse_RN_63_F);

Underdosing due to error was equally concerning:

They don't always choose too large (a dose), sometimes I think the dose is dangerously small...we had one case

recently where sub-cut morphine was changed to sub-cut hydromorphone, but in my estimation they gave about a 1/3 of the dose needed (ID55_Physician_REG_34_F).

It was suggested that under prescribing was not limited to mistakes with opioid conversions, but rather opioid underdosing due to error was perceived to be more widespread:

So we worry about the overdose, obviously, because that's a life threatening problem, but, patients underdosed is also a major problem (ID22_Physician_CON_58_F).

Despite the acknowledged frequency of active failures, participants involved in quality and safety oversight were highly cognisant of the differences between active failures and systems factors that contributed to opioid errors. It was evident all services actively sought to identify and address these systems factors:

I really do believe in improving systems rather than looking so much at people, because if systems are improved then people also improve automatically; so having very good governance systems, policies and procedures, leadership that provides that clinical supervision at the point of care, reporting errors as they happen and learning from those errors after a thorough investigation, without blaming people...that's the only way really that we can improve patient safety, and reduce the number of opioid errors (ID31_Nurse_GM_38_M).

6.6.2 Situational factors

Task characteristics – opioid preparation and delivery

Participants described a number of notable differences in opioid delivery in palliative care, compared to other care settings. They acknowledged the volume of opioid administrations is significantly higher in palliative care, compared to other inpatient settings, primarily due to the needs of the inpatient population:

I've probably given 15-20 (opioid administrations) today, that's one shift, one ward, no PRN, you can have shifts where you've given 30 (opioid administrations), you have one unstable patient who you've given six (opioid administrations) and you feel like you're constantly in front of the drug cupboard (ID49_Nurse_RN_30_F).

Participants also perceived the amount of time spent preparing and administering opioids each shift, compared to other units, was much greater. Preparing opioids for administration was seen to be time consuming, due to mandated double checking and documentation requirements. Additionally, the sheer volume of opioid administration in palliative care impacted on the time available to perform other duties:

We just said to each other the other day, 'How's your day?', she said, 'I didn't get out of the (drug) cupboard the whole shift' and I said, my shift was the same. And you'd hear it all the time ... because...you can literally be standing in that (drug) room and not leave. Yesterday, we did five (infusion pumps) in a row...and then the time doing the drug check, and all the breakthroughs...it's hours, hours, hours (ID38_Nurse_RN_41_F).

In addition to the time spent delivering opioids, participants also felt that substantially higher opioid doses are used in palliative care, compared to other care settings:

It's different, totally different, in another hospital you wouldn't use this dosage (of opioids) (ID01_Nurse_NUM_48_F).

For participants new to palliative care, a combination of the high frequency of opioid use and the high doses administered was a marked difference to their previous experience:

I've only been nursing for three months, and over in the medical ward they're really reluctant to give some opioids, and here, because it's a lot to do with pain management, I

don't think the nurses are as hesitant; the biggest thing I've noticed, was ... not just the frequency, but how much more (opioids) we use here, they're big, scary drugs, and here it's just like, 'no, give it' (ID44_Nurse_RN_25_F).

Similarly, for doctors, opioid prescribing in palliative care was perceived to differ from other specialties:

...previously I didn't really put people on morphine so much because there was no real indication to do so, and if people were already on morphine...they were generally under a pain team so I just let them manage the medication, and here, there's just a lot of experience (prescribing opioids) with most people on opioids (ID54_Physician_REG_27_F).

Hence, the time burden of opioid delivery methods and the complexity of specific routine tasks, such as opioid conversion, were perceived to directly contribute to opioid errors:

...when they're doing complicated dose conversions, not only are they converting from one variety of opioid to another, but they're converting the route or the formulation, so oral to subcutaneous, or long-acting to fourth hourly, or subcut morphine to hydromorphone, methadone rotations; the more the complexity of the dosing, the more chance there is for error, if there's multiple steps, is my experience (ID09_Physician_CON_56_F).

Compounding the risk of error during opioid preparation were frequent interruptions:

I think a point that's critical is when you're there at the drug cupboard and you're drawing something up and people are talking to you and everything is busy...you know you're trying to do your drug calculations, draw up the right dose, and it can be a really busy hub in that drug room...it's not even your nurses interrupting, it's the

doctors saying, I'm sorry, I can see you're doing your drugs but...but...or there's a patient being taken for a scan and the wardsman needs something...and it only takes that really quick thing for you to pick the wrong thing, for something to happen (ID02_Nurse_RN_35_F).

However, participants were generally pragmatic about interruptions and acknowledged that was part of the nature of the palliative care unit:

Things happen and they can't just wait half an hour for us to finish the drug round, we get interrupted all the time and we just have to deal with it, that's what I think anyway, the reality of it (ID17_Nurse_RN_63_F).

Individual factors – clinician inexperience

Clinician inexperience was perceived to be a key contributing factor to opioid errors. During opioid selection and prescribing there was a perception that opioid errors occur edmore frequently when junior doctors were responsible for prescribing, especially if more experienced clinicians are not available to guide them:

When we have to make after hours calls...(the doctors) often they're going by what we (nurses) see...if it's a more junior doctor, or a doctor from (another service), there could be so much room for an error there (ID20_Nurse_RN_28_F).

The risk of a wrong dose error was thought to be compounded when prescribers are: *'unfamiliar with opioid dosing and with opioid conversions between types of opioids'* (ID32_Physician), as many non-palliative care doctors or junior doctors are:

I think we've got to realise that we have a lot of new and young registrars that haven't seen, you know, someone on fentanyl and hydromorphone and methadone, and then being converted to a syringe driver... (ID11_Nurse_RN_62_F).

During opioid administration, participants reflected that working with less experienced palliative care nurses, particularly casual or agency staff, was perceived to amplify the error risk:

I think...when we have casual (staff)...or people who aren't familiar (with opioids)...there just seem to be a number of errors if we use inexperienced staff
(ID48_Nurse_RN_44_F).

Nurses new to the specialty noted the considerable learning curve with opioids in the palliative care context, particularly with dosage forms: 'when I just started, I didn't know the long acting and the short acting thing' (ID7_Nurse), and similar sounding drug names:

The OxyNorm's, the oxycodone's, the Endone's...and MS Contin's...and they're all similar dosages, and I try to be very, very careful and triple check, quadruple check exactly what we're giving (ID12_Nurse_RN_62_M).

Less experienced nurses also reflected that they were not yet confident identifying prescribing errors and were concerned this could result in errors that reached the patient:

But for someone like me (new graduate), that's scary, because I have seen it getting picked up, and for someone that's less experienced, I find that very scary that, that there's a potential for an error there through my lack of knowledge (ID20_Nurse_RN_28_F).

Patient factors

Increasingly, palliative patients were presenting with complex conditions and medication regimens, and, when this was coupled with inexperienced clinicians, opioid errors were perceived to be more likely to occur:

...the patient that is being looked after in palliative care, is very complex with a lot of co-morbidities...and

polypharmacy...it leaves the more junior staff in a very difficult situation because they have to provide care, and when they do that, often times this is where errors tend to happen (ID42_Nurse_RN_55_F).

The fluctuating needs of palliative patients were also noted to add to error risk because of the resultant increased workload:

I think sometimes when the ward is very busy, so you've got 17 to 20 patients, and there's a lot of unstable patients, or deteriorating patients that need a lot of breakthroughs, the doctors are changing orders frequently, you have anxious families, that all adds up...and you could really do with extra staff numbers then (ID11_Nurse_RN_62_F).

6.6.3 Local working conditions

Skill mix

Clinician skill mix, (i.e., the balance in staffing levels based on qualifications, levels of competence, abilities, knowledge and experience (Cahill, 1995)), was one of the most frequently reported factors perceived to contribute to opioid errors:

If an inexperienced doctor charts a wrong dose, an inexperienced nurse is far less likely to pick that up, and sometimes the safeguard is having experienced nurses, so if there's a combination of inexperienced junior doctors and inexperienced nursing staff, I think that is where the potential for error is high (ID53R_Physician_RMO_27).

Poor nursing skill mix was perceived to increase the number of patients and volume of opioid administrations that senior nurses had to manage. This in turn was thought to increase the risk of error, primarily because of the extra time pressure and workload put on senior nurses:

For me, when you have a good skill mix, nothing is going to go wrong, even though it's chaotic, even though it's really busy, you've got the good staff on, you can handle it. If you

are the only senior (nurse), you have to make the decisions. You have to help the new staff, the new grad, you have to guide them, help them to even (administer). You have to check not only twice, you have to check five times to make sure they're all on the right track. That is time consuming, and takes away your energy as well, that's how errors can come easily (ID60_Nurse_RN_60_F).

Staff workload

During the admissions process, clinician workload was raised as a risk factor for prescribing error, due to the impact of understaffing on the time required to undertake a comprehensive patient assessment:

I think most of the prescribing errors happen at admission - they're (palliative care medical team) understaffed for admissions and the complexity of our patients has increased, the constant turnover means complex patients are being admitted daily and their (clinicians) proportional workload to manage those admissions I think is too high (ID21_Physician_CON_41_F).

Unit workload generally was identified as a major factor contributing to error:

...of course, it's workload that could be contributing to errors, time is a big contribution to errors (ID61_Nurse_RN_35_F).

In addition to the amount of time spent preparing and administering opioids and attending to patient care, participants noted the non-clinical tasks that comprised their workload each shift, and the impact that had on error risk:

What's expected of our nurses on a day to day basis, in addition to what they're doing for the patients, (is) they really do have to have that shifting focus and then complete concentration on a regular level, I think we need to help them more to be able to do that work safely, I think they're

inundated now with paperwork and tasks that sometimes takes the focus off the care of the patient, and the concentration required with some of the medications (opioids) (ID41_Pharmacist_42_F).

Management of staff and staffing levels

A lack of permanent fulltime palliative care nursing workforce was a perceived error risk, with service managers highlighting the challenge of training and maintaining an adequately specialised and experienced palliative care workforce:

It's hard to keep a (palliative care) workforce that is very agile, that is very specialised; so you might find there are two nurses who are specialised per shift and the workloads are such that those two nurses are caring a lot in terms of supporting the junior staff as well as supporting the patients... often times this is where errors tend to happen...it's probably really around skilling (in) this space; it's hard with the changing population and with the (palliative) patient that is very, very complex...the doctors, they come, they make errors, and then you see how they develop, after two, three months they are so good you don't hear (about) any errors and then they go, and then it starts again, it's sort of like a rollercoaster (ID31_Nurse_GM_38_M).

6.6.4 Latent organisational factors

Physical environment

The risk of error during opioid preparation was perceived to be compounded by environmental aspects of the drug room, such as the size of the drug room, which participants reported added to interruptions and/or distraction:

In our treatment room it gets super busy and super noisy, so when you're trying to draw up a complicated (subcutaneous infusion pump), or even you're just trying to move because

someone's got to get into the cupboard, you can (make an error) (ID45_Nurse_RN_29_F).

Support from central functions – care transitions

Multiple factors were perceived to increase the risk of opioid error when a patient was first admitted to the inpatient palliative care service, particularly when transitioning from the community into the inpatient setting:

I think (there's a risk) in the transition from community to inpatient, because there may be more than one prescriber of the opioid and what the actual patient has been taking may be different from what's being prescribed...and that there's not a uniform medication list between GP, the community team, and the inpatient team necessarily (ID48_Nurse_RN_44_F).

As ready access to information on patients' previous and current opioid intake was not always available, participants reflected on how these missing details adversely impacted on the team admission assessment of the patient:

There's an area of restraint of not being able to necessarily have all of the information that you need to make that assessment (ID32_Physician_CON_48_M).

Similarly, information for patients being admitted from another health service may be missing or incorrect:

There might be a transcription error on documents the patient brings with them or the patient might not know the dose that they've been on...I think errors can happen that way as well (ID56_Physician_INT_28_M).

In addition, participants observed opioid doses for patients coming from other, non-palliative care services were often incorrect:

It's quite often that somebody gets admitted and the (opioid) dose that they're on is definitely not the correct dose (ID58_Nurse_CNS_29_F).

Support from central functions – absence of pharmacy input

Pharmacist participants acknowledged that palliative patients were increasingly presenting with less common opioid combinations, which made error identification challenging, even for experienced clinicians:

I think we're seeing more people with unusual combinations (of opioids on admission)...we're seeing people who might have MS Contin or Dilaudid...it's quite common now for people to be on a fentanyl patch and Dilaudid and that's a real error prone combination I think because, depending on experience, some nurses will recognise whether a breakthrough is in the right ball park for the medication, but there's very few that would recognise whether the fentanyl and the Dilaudid strength are right... (ID41_Pharmacist_42_F).

Participants in services without access to a dedicated palliative care pharmacist perceived that the lack of routine pharmacist review, especially at admission, contributed to error:

They used to have a process whereby all admissions (orders) were checked and that is now an ad hoc process...so that, I think, is a big safety gap (ID21_Physician_CON_41_F).

Also, a lack of routine pharmacy review of orders on the ward prior to dispensing was perceived to contribute to error:

We don't have enough clinical pharmacists on the ward so they don't come to review the charts frequently, that is a concern...I would like to see them review charts at least twice a week, they can review the charting, route, the generic name...you know if the medication route is wrong but no-one checks, or the doctor charted for bd but only put down one time in the chart (ID01_Nurse_NUM_48_F).

Support from central functions – paper-based medication charts

Participants who had worked with both paper-based medication charts and electronic medication management systems, perceived paper-based charts directly contributed to omitted dose errors:

I worked in (other palliative care service) and the main issue there was we missed lots of drug. And that was because of the paper chart. Since I came here (electronic medication chart), I can't think of going back to a paper chart...because it (the electronic chart) alerts us all the time. We can't miss it. (ID60_Nurse_RN_60_F)

6.6.5 General factors: Communication systems, and safety culture

Effective clinical communication was considered an essential foundation of patient safety:

Communication between doctors and nurses, and the way that happens, is incredibly important, to set up the relationship that's going to be safe for the patients, it's critical (ID22_Physician_CON_58_F).

However, poor inter-professional communication, especially when patients' opioid orders were changed, contributed to delayed or omitted opioid doses:

So if anything for a patient changes, as a nurse, our job is to then let the doctor know that this has just changed, the patient's in more pain, or whatever. It'd be really nice if that was reciprocated, in terms of, they've charted a new drug for a patient, especially an opioid, can you let us know that that has been charted? Just a quick tap on the shoulder and say "Hey, we've just charted this" (ID13_Nurse_RN_45_F).

Poor written communication, particularly doctors' opioid orders, was another factor perceived to contribute to error. While 'prescribing in illegible writing'

(ID41_Nurse) was relatively commonly identified, nurses reported they were confident asking for clarification before administering the opioid:

We're generally pretty good in going and saying: 'Can you rewrite this again? We can't read it!'

(ID44_Nurse_RN_29_F).

More problematic were orders that had not been correctly re-charted or clearly ceased:

(Right now) there's one (chart)...that has everything on that page ceased, and not a nice, neat, it's, you know, scribble-scribble-scribble...at first glance at that chart, you go, 'that's all ceased'...and right in the middle of it, there's an oxycontin. That doesn't give us much of a chance, does it?

(ID45_Nurse_RN_29_F).

Of note, safety culture was not identified as an error contributory factor, with participants overwhelmingly reporting the existence of a strong, non-punitive opioid safety culture:

I think it's supportive, which is really good, because you can get quite anxious when you've (made an error) and you feel terrible. I think all the nurses support each other and certainly management supports us as all, obviously. Things have to be reported, that's just the way it's got to be. There has to be some accountability and some monitoring, officially. That's how it is (ID43_Nurse_RN_48_F).

6.7 Discussion

This study has identified a range of systems factors that contribute to opioid errors from the perspective of palliative care clinicians across multiple disciplines, which have not been previously reported. While factors contributing to medication errors in acute care are well understood (Brady, Malone, & Fleming, 2009; Lawton et al., 2012; McBride-Henry & Foureur, 2006), error contributory factors in the specialist

palliative care inpatient services are an emerging area of research (Heneka et al., 2018b).

6.7.1 Active failures

Active failures were acknowledged as contributing to opioid errors in inpatient palliative care, due predominantly to lapses resulting in omitted dose errors, and mistakes in opioid conversion and selection. Interestingly, participants reported that active failures were more likely to result in opioid underdose than overdose. The concept of opioid underdosing, as a result of omitted dose errors, and other opioid error types, has been recently highlighted as a potential area of concern in specialist palliative care inpatient services (Heneka et al., 2018a; Heneka, Shaw, Rowett, Lapkin, & Phillips, 2018c). While it is estimated over half (52%) of patients in acute care will experience an opioid overdose as a result of opioid error (Dy, Shore, Hicks, & Morlock, 2007), a recent retrospective review study found that 57% of palliative inpatients received an opioid underdose as a direct result of opioid error (Heneka et al., 2018c), confirming the perceptions of clinicians in this study.

6.7.2 Situational factors

Most palliative care inpatients have at least one, if not multiple, opioid orders, including regular and PRN opioid orders (Australian Institute of Health and Welfare, 2018). The opioid delivery process is complex and time consuming, with mandated double checking and strict documentation requirements for each opioid administration (Ministry of Health NSW, 2013, 2015). There are multiple opportunities for errors at each step of the process; hence, it is unsurprising that the process of opioid delivery itself was identified as a major error contributory factor.

Opioid delivery in the inpatient palliative care setting differs from other health care settings in that large volumes of opioids are administered each day, often at considerably higher doses, and, increasingly, in combination with other opioids rarely seen in other settings. The high volume of opioid use may explain why opioid errors in palliative care services are reported at almost triple the rate of opioid errors in other health care settings (Carson, Jacob, & McQuillan, 2009; Desai et al., 2013; Heneka et al., 2018c).

Opioid delivery also routinely requires clinicians to undertake complex calculations when converting between opioids, including between long and short acting formulations and routes of administration, all of which are prone to error (Webster & Fine, 2012). Hence, clinician inexperience was identified as an error contributory factor in this study. In the acute care setting, factors such as workload, skill mix/supervision and clinician knowledge have been identified as critical factors contributing to prescribing errors by junior doctors (Coombes, Stowasser, Coombes, & Mitchell, 2008). Similarly, in this study the risk of opioid prescribing errors by junior doctors was considered heightened if more experienced clinicians were not available to review the opioid order.

Irrespective of care setting or drug type, medication administration places complex, and often competing, demands on the administering nurse (Jennings, Sandelowski, & Mark, 2011; Pirinen et al., 2015). Nurses are required to: adhere to multiple medication administration policies (Baker, 1997; Jennings et al., 2011), effectively manage the administration process and the medications themselves (Jennings et al., 2011; Pirinen et al., 2015), attend to patient care responsibilities (Barker, Flynn, Pepper, Bates, & Mikeal, 2002; Huynh et al., 2016; Jennings et al., 2011), navigate drug delivery devices, and the physical environment of the unit (e.g., size and location of the drug room) (Jennings et al., 2011). As such, medication administration is not a discreet process with a defined start and end point, rather, is inseparable from other tasks undertaken in the multifaceted nursing role (Jennings et al., 2011).

Clinicians in this study, especially nurses, confirmed this finding, acknowledging that the bulk of their shift is spent attending *primarily* to opioid administration. For palliative care nurses, managing interruptions and competing demands was seen as an inevitable but routine part of opioid preparation, determined by: the fluctuating needs of the patient population; the additional time burden of opioid preparation compared to other, less high-risk medicines; and increased workload due to issues with nursing staffing and/or skill mix ratios. Quantifying the time burden of opioid delivery in the palliative care inpatient context may help inform management of staffing levels, as time spent on medication administration is frequently underestimated (Jennings, Sandelowski, & Mark).

The phenomena of ‘interruptions’ during medication administration are thought to be inevitable, precisely because medication administration does not have a clearly delineated start and end-point (Jennings et al., 2011). As interruptions increase the risk of medication error (Westbrook, Woods, Rob, Dunsmuir, & Day, 2010), reducing them is a patient safety priority. However, as noted by the clinicians in this study, the feasibility of reducing interruptions in a palliative care unit is challenging, given the nature of the workflow, and will most likely require a strategy that considers the multiple systems factors at play, such as: the physical environment of the drug preparation area, workload, patient acuity, and skill mix (Jennings et al., 2011).

6.7.3 Local working conditions

The challenge of training and maintaining a specialist palliative care workforce was noted to affect both staff management and workload. Sub-optimal skill mix was perceived to directly increase workload, particularly for more experienced clinicians, and increase the risk of error. This was most evident for experienced palliative care nurses who, in addition to managing their own patient load, were often also ensuring new graduates, agency, or casual staff adhered to the mandated opioid checking processes. Multiple studies report associations between increased medication administration errors and: poor skill mix (McGillis Hall, Doran, & Pink, 2004), higher patient to nurse ratios (Aiken et al., 2011; Valentin et al., 2009), clinician workload (McBride-Henry & Foureur, 2006; Parry, Barriball, & While, 2015), and perceived adequacy of staffing (McKeon Christine, Fogarty Gerard, & Hegney Desley, 2008). Given these findings, clinician rostering should ensure that there is an optimal balance of experienced team members rostered on each shift to support and mentor less experienced palliative care clinicians (Flynn & McKeown, 2009).

The few studies that have explored the relationship between skill mix/workload and medication errors in the palliative care setting are limited to exploration of staff stressors and wellbeing (Ablett & Jones, 2007; Peters et al., 2012). These studies confirm that high workloads are commonplace in palliative care service delivery, and are a major contributor to clinician stress (Ablett & Jones, 2007; Peters et al., 2012). Better understanding of the impact of repetitive, high-risk opioid delivery and

resultant workload on palliative care clinicians' stress levels is important, particularly in terms of building a sustainable palliative care workforce.

6.7.4 Latent organisational factors

The absence of a standardised medication management system, between the inpatient and community service, and the patient's general practitioner and/or specialist(s), was seen as a barrier to undertaking an accurate medication history on admission, which increased the risk of prescribing error. Incomplete medication histories on admission account for up to two-thirds (67%) of prescribing errors in acute care (Tam et al., 2005); however, data in the palliative care service context could not be identified.

The absence of an on-site pharmacist was also perceived to increase the risk of prescribing errors, as, although nurses routinely check opioid orders for errors prior to administration, review by the on-site pharmacist was seen as an additional, high-risk medicine safety check. A review of clinical incident reports identified palliative care services without on-site clinical pharmacist reported a proportionally greater number of prescribing errors, compared to those with on-site pharmacy support (Heneka et al., 2018c). The palliative care pharmacist's role in reducing opioid errors includes anticipating patients' opioid needs during transitions of care, opioid order review and reconciliation, safe use of opioids in the management of pain, and clinician education (Herndon et al., 2016; Kuruvilla, Weeks, Eastman, & George, 2018). Clinical pharmacy support in palliative care has been shown to contribute favourably to patient outcomes (Lee & McPherson, 2006) and palliative care service delivery (Atayee, Best, & Daniels, 2008; Austwick, Brown, Goodyear, & Brooks, 2002). As such, consideration of a dedicated pharmacist role in specialist palliative care services is warranted to reduce opioid prescribing errors and support safe opioid delivery.

In the earlier study of opioid error characteristics in specialist palliative care inpatient services it was suggested the use of paper-based medication charts, versus electronic medication management systems, may be contributing to the substantial burden of omitted dose errors reported in this setting (Heneka et al., 2018c). Clinicians in this study confirmed this finding, highlighting the electronic medication management system alerts them to outstanding doses and prompts opioid administration. Indeed,

in the single specialist palliative care inpatient services using an electronic medication management system in the aforementioned study, there were nil reported omitted dose errors in a two year review period (Heneka et al., 2018c).

6.7.5 Communication systems

Communication system factors contributing to opioid error in this study were predominantly identified by nurses and related to clinical communication shortfalls on the part of the ordering physician. While poor written communication was generally promptly rectified, failure to hand over changes to patients' opioid orders in a timely manner was reported to directly lead to error. Written and oral clinical communication deficits have been well documented as factors contributing to medication errors in acute and aged care settings (Parry et al., 2015). A progressive shift to electronic medication management systems will go some way to alleviating written communication errors, as errors due to illegible or ambiguous orders are effectively eliminated compared to handwritten orders (Ammenwerth, Schnell-Inderst, Machan, & Siebert, 2008). Again, there is scant research on the relationship between clinical communication and medication errors in the palliative care context; however, palliative care clinicians have identified poor interdisciplinary communication and unclear medication documentation as relatively common causes of error in palliative care services (Dietz et al., 2013; Dietz, Plog, Jox, & Schulz, 2014).

6.7.6 Error protective factors

The presence of a strong, non-punitive service safety culture was evident in this study, and appears to be a protective, rather than error contributory factor in the participating specialist palliative care inpatient settings. Gaining a deeper understanding of the elements that contribute to the creation of a strong opioid/medication safety culture in palliative care warrants further exploration.

6.8 Strengths and limitations

A key strength of this study was the number of participants from multiple disciplines who were actively involved in opioid delivery and/or medication safety oversight, allowing data saturation to be reached. A limitation of this study is that the analysis was confined to the perceptions of factors contributing to opioid errors in specialist

inpatient palliative care services, and, as such, may not be generalisable to other palliative care settings, or other services routinely using opioids.

6.9 Summary

There are multiple systems factors, beyond active failures, that contribute to opioid errors in specialist inpatient palliative care services, which must be considered in any quality and safety initiatives targeting safe opioid delivery in this service type.

Adequate staffing and skill mix are critical to ensure clinicians can manage high workloads and safely navigate opioid delivery. Acknowledging that palliative care nurses spend a substantial amount of time engaged in opioid preparation, and are simultaneously managing multiple competing demands when handling high-risk opioids, is an essential medication safety consideration and a workforce issue.

Further exploration of opioid safety culture is also warranted to better understand the cultural factors supporting and promoting safe opioid delivery in specialist palliative care services.

6.11 References

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