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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 8: Conclusion and recommendations

8.1 Introduction

Chapter 1 described how the PERISCOPE project was driven by palliative care clinicians' perceptions that opioid errors in their services were contributing to iatrogenic patient harm, and reducing these errors was a quality improvement priority (Heneka, Shaw, Azzi, & Phillips, 2018a). As outlined in Chapter 2, empirical research into opioid errors in inpatient palliative care services is sparse, with only three studies having examined this phenomenon since 2010 (Heneka, Shaw, Rowett, & Phillips, 2015). Given the paucity of this research a thorough exploration of opioid error scope, patient impact, contributing and mitigating factors in specialist palliative care inpatient services was warranted. Chapters 4 to 7 presented the results of four studies undertaken to explore and understand this knowledge gap, and better understand the nature of opioid error occurrence in specialist palliative care inpatient services.

This final chapter integrates the mixed methods data from the PERISCOPE project's five studies to answer the research questions posed in Chapter 3. Meta-inference of the entire project's data answers the final research question, and allows for a series of recommendations to support safe opioid delivery in specialist palliative care inpatient services to be generated. Joint displays for each research question, as described in Chapter 3 are included as appendices.

8.2 Research Question 1: What is the prevalence, patient impact, and characteristics of opioid errors reported in specialist palliative care inpatient services?

The NSW state-wide (Study 2) and local (Study 3) retrospective review data were member checked during the semi-structured interviews and focus groups (Study 5) as medication errors are known to be widely under-reported (Westbrook et al., 2015) Data were then integrated to answer research Question 1: *What is the prevalence, patient impact, and characteristics of opioid errors reported in specialist palliative care inpatient services*? (refer Appendix 11 for joint display).

8.2.1 Opioid error prevalence

In the PERISCOPE project opioid errors accounted for one-third of all reported medication errors in the three specialist palliative care inpatient services, and occurred at a mean rate of 0.9 (±1.5) opioid errors per 1000 occupied bed days (Heneka, Shaw, Rowett, Lapkin, & Phillips, 2018d). This reported opioid error prevalence rate is almost three-fold greater than what is reported in other inpatient specialities (Carson, Jacob, & McQuillan, 2009; Desai et al., 2013; Mc Donnell, 2011; Prairie Research Association, 2014). Palliative care clinicians perceived this error prevalence rate was largely due to the high frequency of opioid delivery in their service. This perception was confirmed during the PERISCOPE project which found the frequency of opioid delivery in specialist palliative care inpatient services is substantial, with each patient receiving approximately 12 opioid administrations per day. This equates to an opioid being delivered approximately every 6 minutes in the specialist palliative care inpatient service.

8.2.2 Patient impact of opioid errors

Despite the high frequency of opioid prescribing and administration, serious patient harm from opioid errors was exceedingly rare in the PERISCOPE project. The vast majority of opioid errors reported at the state-wide and local level caused minor harm (SAC 3) or no harm at all (SAC 4) (Heneka, Shaw, Rowett, Lapkin, & Phillips, 2018b; Heneka et al., 2018d). Clinicians in the PERISCOPE project confirmed this finding and suggested that serious opioid errors were a rare occurrence in specialist palliative care inpatient services. However, approximately half of all opioid errors that reached the palliative inpatient in the PERISCOPE project necessitated clinical intervention to preclude or manage actual or potential harm(s).

In the PERISCOPE project palliative inpatients across NSW were significantly more likely to experience an opioid under-dose due to opioid error than inpatients in NSW cancer services (Heneka et al., 2018b), despite cancer pain management being core business for both clinical specialties (Australian Adult Cancer Pain Management Guideline Working Party, 2014; Australian Institute of Health and Welfare, 2018b). Approximately 60% of palliative inpatients received an opioid under-dose due to error, with almost half experiencing an exacerbation of their previously well managed pain (Heneka et al., 2018b; Heneka et al., 2018d).

The rate of opioid under-dosing due to error identified in the PERISCOPE project is also much higher than that reported in the acute care setting, where opioid overdose following an opioid error is far more common (Dy, Shore, Hicks, & Morlock, 2007). In the acute care setting, less than a quarter of reported opioid errors result in an opioid under-dose (Dy et al., 2007).

For palliative inpatients the predominant harms from opioid errors are attributable to opioid under-dosing. Iatrogenic harm due to opioid errors increases palliative patients burden of pain and adversely impacts previously well-managed symptoms in this vulnerable patient population.

8.2.3 Opioid error characteristics

Opioids involved

The PERISCOPE project found that NSW palliative care services were significantly more likely to report hydromorphone and morphine errors compared to all other NSW Health services combined (Heneka et al., 2018b). In both NSW acute care services and acute care internationally, errors with oxycodone, morphine and fentanyl are the most commonly reported opioid errors (Clinical Excellence Commission NSW Health, 2018; Desai et al., 2013; Dy et al., 2007; Mc Donnell, 2011). These differing patterns of opioid errors reflect the frequency with which these opioids are used in this specialist setting. In the seven-day snapshot audit undertaken in the PERISCOPE project, hydromorphone administrations accounted for almost half (48%) of all opioid administrations in specialist palliative care inpatient services. The higher usage of hydromorphone in the specialist palliative care inpatient services is not surprising, given that these services provide care to palliative patients with the most complex symptom management needs, including complex and/or refractory pain (Palliative Care Australia, 2018; Therapeutic Guidelines Limited, 2016).

Problem and error type

Opioid administration errors accounted for three-quarters of all reported opioid errors in the PERISCOPE project, and prescribing errors for one-fifth of opioid errors (Heneka et al., 2018b; Heneka et al., 2018d). Opioid administration errors were perceived to be relatively accurately reported by clinicians in the PERISCOPE

project, particularly when compared to errors with non-high-risk medications, due to mandated 24-hourly checks for narcotic discrepancies in the opioid drug registers. (Heneka, Shaw, Rowett, Lapkin, & Phillips, 2019). Conversely, palliative care clinicians acknowledged that opioid prescribing errors, particularly opioid conversion errors, occurred more frequently than reflected in incident reports, contradicting the results from the state-wide and local retrospective reviews (Studies 2 and 3). Clinicians acknowledged prescribing errors were more likely to be rectified when they were first identified, and subsequently not reported, if the error was readily fixable (Heneka et al., 2019).

Problem types seen in other healthcare settings are very similar to those reported in the PERISCOPE project (Carson et al., 2009; Desai et al., 2013; Dy et al., 2007; Mc Donnell, 2011). However, opioid administration error types identified in the PERISCOPE project showed markedly differing patterns compared to other healthcare settings.

Omitted dose errors resulting in opioid under-dosing, were the most frequently reported opioid error type, accounting for one-quarter of all reported opioid errors, and one-third of reported opioid administration errors in the PERISCOPE project (Heneka et al., 2018b; Heneka et al., 2018d). Omitted dose errors were reported at over double the rate in the PERISCOPE project compared to international acute care settings, where only 14% of reported opioid administration errors are due to omitted dose errors (Prairie Research Association, 2014). The rate of omitted dose errors reported by NSW palliative care services in the PERISCOPE project was also significantly greater when compared to NSW cancer services (Heneka et al., 2018b). These data suggest omitted opioid dose errors in palliative care services may be more prevalent than in other healthcare settings, even when opioid use is comparable (e.g., in the cancer care setting). The major contributor to opioid under-dosing due to error in the PERISCOPE project was the high proportion of omitted dose errors reported in palliative care services, which palliative care clinicians acknowledged substantially contributed to this error outcome (Heneka et al., 2019).

Another major difference in reported opioid administration error types in the specialist palliative care inpatient services, compared to other inpatient settings, was the substantially lower number of wrong drug and wrong dose errors. In the

PERISCOPE project, these error types were reported at one-fifth (wrong drug) to one-third (wrong dose) the rate reported in acute care (Desai et al., 2013; Dy et al., 2007; Prairie Research Association, 2014). The factors that may account for this lower proportion of wrong drug and wrong dose errors in specialist palliative care inpatient services are explored in greater detail in Section 8.4.1.

There are some notable differences in opioid error prevalence, patient impact and characteristics in specialist palliative care inpatient services compared to other acute care and/or inpatient settings. These are likely attributable to the frequency of opioid delivery in specialist palliative care inpatient services, and the volume of specific opioids used to manage palliative patients complex pain and other symptoms.

8.3 Research Question 2: What are the individual and systems factors that contribute to opioid errors in specialist palliative care inpatient services?

Studies 2, 4 and 5 data were integrated to answer research Question 2: *What are the individual and systems factors that contribute to opioid errors in specialist palliative care inpatient services*? (refer Appendix 12 for joint display). These studies examined the incident narrative of clinical incident reports, at a state-wide (Study 2) and local level (Study 3), to provide a preliminary understanding of reported opioid error contributing factors in the palliative care delivery context. Semi-structured interviews and focus groups (Study 5) explored opioid errors contributing factors from the perspective of palliative care clinicians and service managers.

8.3.1 Individual factors

The state-wide and local data in the PERISCOPE project found active failures (i.e., human error on the part of the clinician) (Lawton et al., 2012) contributed to approximately two-thirds of opioid errors in the palliative care setting (Heneka et al., 2018b; Heneka, Shaw, Rowett, Lapkin, & Phillips, 2018c). Palliative care clinicians in the PERISCOPE project openly acknowledged human error is an inevitable aspect of opioid errors, and medication errors generally, which cannot be entirely eliminated, despite every effort to mitigate it (Heneka et al., 2019).

By far the most prominent individual factor contributing to opioid error in the PERISCOPE project was perceived to be clinician inexperience. This finding reflects

the international literature which suggests that, regardless of the clinical setting or specialty, clinician inexperience is a known medication error risk factor (Brady, Malone, & Fleming, 2009; Coombes, Stowasser, Coombes, & Mitchell, 2008; Keers, Williams, Cooke, & Ashcroft, 2013). The higher frequency of opioids administered on a daily basis in specialist palliative care inpatient services compared to other care settings, combined with substantially higher opioid doses and diverse opioid combinations, was perceived to increase the risk of errors with opioids for inexperienced palliative care clinicians (Heneka et al., 2019). Additionally, the inherent complexity of palliative patient management and rapid fluctuation of palliative inpatients symptom management needs posed additional challenges for inexperienced palliative care clinicians (Heneka et al., 2019). In the PERISCOPE project, junior doctors, and nurses new to palliative care, all acknowledged the steep learning curve associated with opioid delivery in the specialist palliative care context, compared to other acute care settings, and the resultant heightened risk of opioid error for inexperienced clinicians (Heneka et al., 2019).

While palliative care clinicians in the PERISCOPE project acknowledged the role of human error and clinician inexperience as opioid error contributing factors, clinicians also stressed it was essential to consider the systems factors that may be contributing to human error and causing opioid errors to occur (Heneka et al., 2019).

8.3.2 Systems factors

The systems factors contributing to opioid errors identified in the retrospective reviews of clinical incident narratives involving opioids (Studies 2 and 4) were limited to staff workload and clinical communication factors (Heneka et al., 2018b; Heneka et al., 2018c). This is not a wholly unexpected finding as incident reporting is often skewed towards active failures and individual factors, and rarely considers the broader systems factors that may have contributed to the error (Lawton et al., 2012; Mahajan, 2010). While clinicians in the PERISCOPE project confirmed the results from the retrospective reviews, they identified multiple additional systems factors they perceived directly contributed to opioid errors in the specialist palliative care inpatient setting. The confirmatory and enhanced findings from the quantitative and qualitative data relating to opioid error contributing factors in the PERISCOPE project, are illustrated in Figure 8.1.

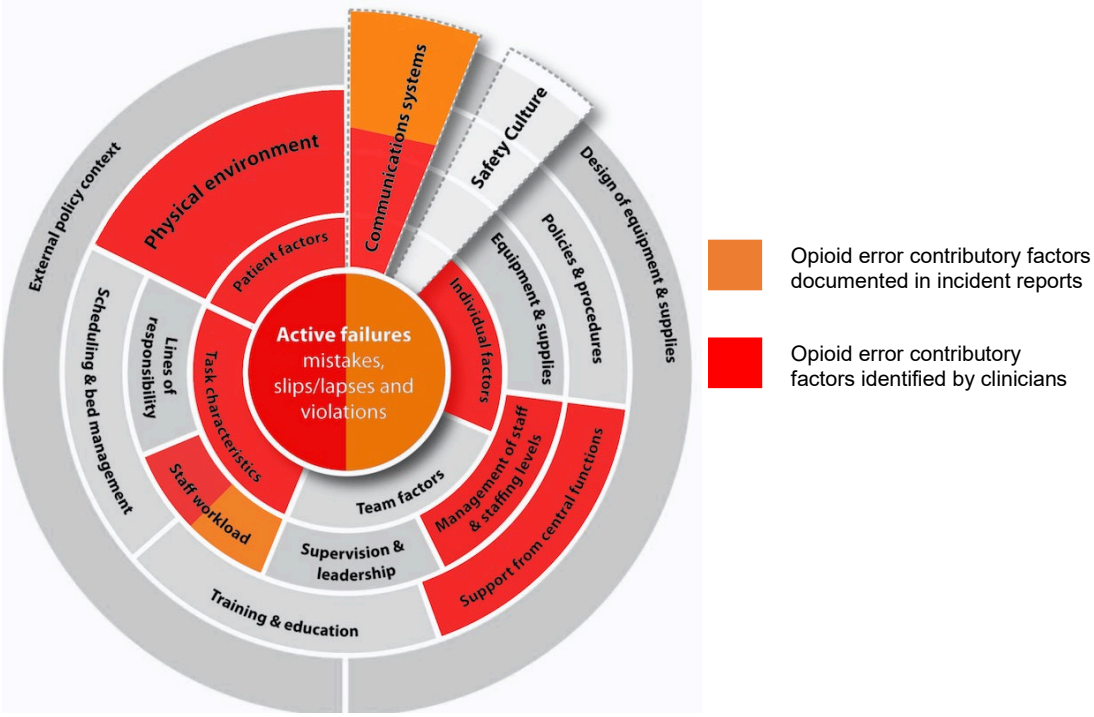

Figure 8.1 Opioid error contributory factors reported in clinical incident reports (orange) and identified by palliative care clinicians (red) in the PERISCOPE project, categorised per the Yorkshire Contributory Factors Framework (Lawton et al., 2012)

Adapted from: Development of an evidence-based framework of factors contributing to patient safety incidents in hospital settings: a systematic review, Lawton R, McEachan RR, Giles SJ, Sirriyeh R, Watt IS and Wright J. 21:369-80 ©2012 with permission from BMJ Publishing Group Ltd. (Appendix 3)

The systems factors contributing to opioid errors in the PERISCOPE project encompassed: i) suboptimal management of skill mix and registered nurse ratios; ii) the nature of opioid administration in specialist palliative care inpatient services; iii) absence of a pharmacist in the multi-disciplinary team; and iv) clinical communication factors. These factors are discussed in detail below.

Suboptimal management of skill mix and registered nurse ratios

The most pervasive opioid error contributing factor in the PERISCOPE project related to sub-optimal skill mix and registered nurse ratios. These factors, in turn, underpinned almost all the other error contributory factor domains identified by clinicians. Poor skill mix, from a nursing perspective, was seen to increase the number of patients and volume of opioid administrations that senior nurses had to manage, increasing their workload and the subsequent risk of error (Heneka et al.,

2019). In the current era of cost containment, medication errors have been noted to increase as the proportion of registered nurses on a unit decreases, and the number of less qualified nursing staff (i.e., Enrolled Nurses, Assistants in Nursing) and/or agency staff, increases (Breckenridge-Sproat, Johantgen, & Patrician, 2012; Frith, Anderson, Tseng, & Fong, 2012; Picone et al., 2008). From an interdisciplinary perspective, experienced palliative care nurses were pivotal in the identification of opioid prescribing errors, particularly when junior doctors, or non-palliative care specialists were initiating opioid orders. Subsequently, when inexperienced nurses and doctors were rostered together, the risk of opioid error was perceived to be much greater (Heneka et al., 2019).

The need for optimal interdisciplinary skill mix is heightened in specialist palliative care inpatient services as the palliative inpatient population has very complex symptom management needs (Australian Institute of Health and Welfare, 2018b; Palliative Care Australia, 2018). As such, palliative care clinicians require increasingly complex, specialised, knowledge and skills to provide comprehensive patient care, and continuity of care, with no single clinician likely able to meet all the complex needs of the palliative patient (Hall & Weaver, 2001; Nancarrow et al., 2013).

The PERISCOPE project identified that the error risks due to workforce skill mix was amplified when the specialist palliative registered nurse to inpatient ratio was insufficient (Heneka et al., 2019). There has been compelling evidence for over two decades that a lower proportion of registered nurses to patients is associated with significantly higher rates of medication errors (Frith et al., 2012; McGillis Hall, Doran, & Pink, 2004; Patrician et al., 2011), including in specialist units, such as intensive care, intermediate care, and medical-surgical units (Whitman, Kim, Davidson, Wolf, & Wang, 2002). Lower registered nurse ratios, have also been shown to decrease nurse surveillance of medication errors, resulting in poorer patient outcomes following an error (Flynn, Liang, Dickson, Xie, & Suh, 2012).

The continuously rotating nature of less experienced doctors, into and out of the specialist palliative care inpatient service (e.g., junior medical officers, out of hours non-specialist prescribers), also substantially increases the risk of opioid prescribing

errors if experienced clinicians are absent, and prescribing errors are not intercepted (Heneka et al., 2019).

Nature of opioid administration in specialist palliative care inpatient services

The process of opioid administration itself in the specialist palliative care inpatient context was identified as an error contributory factor in the PERISCOPE project. Palliative care clinicians highlighted the considerable differences in opioid administration in specialist palliative care inpatient services, compared to other inpatient settings (Heneka et al., 2019). Both the frequency of opioid administration and high opioid doses routinely delivered in specialist palliative care inpatient services, posed a substantial opioid error risk for palliative patients. The high frequency of opioid administration resulted in palliative care nurses spending a large part of each shift preparing and administering opioids (Heneka et al., 2019). The independent double checking process mandated for opioid delivery, while highly effective in reducing errors with these high-risk medicines, (Institute for Safe Medication Practices, 2013) is a time consuming process. Additionally, the fluctuating pain management needs of the palliative inpatient population means that opioid administration is not restricted to defined medication rounds, and palliative care nurses can spend several hours each shift administering PRN opioids to meet clinical need, and recording to meet regulatory requirements (Heneka et al., 2019).

Opioid preparation and administration is also a complex task that requires considerable concentration. However, interruptions during the opioid administration process were common in the PERISCOPE project, and palliative care nurses acknowledged these interruptions increased their risk of making an error (Heneka et al., 2019). Although all local participating services strove to create a ‘quiet’ space in the drug room to minimise interruptions and allow nurses to focus on opioid preparation, in reality, drug rooms were busy hubs which were often cramped and noisy.

Additionally, all local services had also trialed a ‘do not interrupt’ approach to medication rounds which has been widely adopted across the globe (Australian Commission on Safety and Quality in Health Care, 2013; Freeman, McKee, Lee-Lehner, & Pesenecker, 2013; Relihan, O'brien, O'hara, & Silke, 2010). However, this formalised process was not perceived to have meaningfully reduced the number of

interruptions during opioid preparation. These findings are reflected in the literature which confirms the challenges of significantly reducing interruptions during medication administration, and identifying the complex relationship between interruptions and medication error (Raban & Westbrook, 2014; Westbrook et al., 2017). Palliative care nurses in the PERISCOPE project acknowledged that, ultimately, interruptions were inevitable in their day-to-day clinical practice, and were one of many competing priorities that they actively endeavoured to manage (Heneka et al., 2019).

Absence of a pharmacist in the multi-disciplinary team

One of the most notable differences in the error prevalence rates between specialist palliative care inpatient services was attributed to the absence of a dedicated clinical pharmacist in the palliative care unit. The single specialist palliative care inpatient service in the PERISCOPE project that did not employ a palliative care pharmacist, reported all bar one prescribing error in the local retrospective review (Heneka et al., 2018d). Clinicians in this service suggested that the lack of opioid order review by a clinical pharmacist directly contributed to opioid prescribing errors, in the palliative care unit (Heneka et al., 2019). This finding is reflected in the international literature, where the median prescribing error rate (all drug types) is almost three times higher in medications administered in the inpatient setting prior to pharmacist review compared to orders screened by pharmacists prior to administration (9.9% versus 2.7%) (Lewis et al., 2009).

In relation to palliative care service delivery, pharmacists have long been accepted as an integral part of the interdisciplinary palliative care team (Lee & McPherson, 2006; Lucas, Glare, & Sykes, 1997; Wilson, Wahler, Brown, Doloresco, & Monte, 2011). In Australia, palliative care pharmacists are actively involved in medication review (Gilbar & Stefaniuk, 2002) Palliative care pharmacists' recommendations regarding medications are well accepted by palliative care physicians and nurses, particularly for pain management (Wilson et al., 2011), and the proportion of palliative patients who achieve the desired therapeutic outcome following pharmacist input is high (Lee & McPherson, 2006). Hence, without a clinical pharmacist in the interdisciplinary palliative care team, the risk of opioid error, and resultant palliative patient harm, is considerably higher.

Clinical communication factors

Communication systems: The PERISCOPE project identified a lack of standardised electronic medical record systems that allows the patients' medical information to be seamlessly transferred between the inpatient unit, the community/outreach service, primary care and non-palliative care specialists. The lack of an integrated electronic medical record system heightened the risk of error when patients were first admitted to the inpatient unit, as opioids were often ordered without the prescriber being able to access all of the relevant information in a timely manner (Heneka et al., 2019).

Care transitions are a known medication error risk issue (National Health and Hospitals Reform Commission, 2009), with a recent Australian study suggesting that two medication errors occur for every three patients at the time of their inpatient admission (Roughead, Semple, & Rosenfeld, 2016). A recent USA nursing home study found that the risk of opioid prescribing errors for patients transitioning into nursing homes was significantly higher than for non-opioid medications (11.3% vs. 8.1%, p=.001) (Desai et al., 2013). Although the nursing home population differs in many respects from the inpatient palliative care population, there are some notable similarities. Palliative patients, like nursing home residents, are typically elderly, frail, have multiple co-morbidities, and experience persistent pain (Australian Institute of Health and Welfare, 2018a; Hunnicutt, Ulbricht, Tjia, & Lapane, 2017; Kasper J & O'Malley M, 2007). While a third (32%) of nursing home residents have an opioid prescription for pain management (Hunnicutt et al., 2017), nearly all (98%) of patients in the PERISCOPE project had at least one opioid order following admission to the palliative care unit. Hence, it is highly likely that the combination of patient characteristics, the aforementioned deficits in integrated electronic medical record systems, and the proportionally higher frequency of opioid orders, contributes to opioid prescribing errors in inpatient palliative care services.

Interpersonal communication: Poor written or verbal clinical communication was a contributory factor to opioid error in the PERISCOPE project (Heneka et al., 2018b; Heneka et al., 2018c, 2019). In healthcare settings generally, clinical communication deficits have been well documented as factors contributing to medication errors (Manojlovich & DeCicco, 2007; Parry, Barriball, & While, 2015; Redley, Botti, Wood, & Bucknall, 2017). In palliative care settings specifically, deficits in

interdisciplinary communication and unclear medication documentation are also reported as common causes of errors (Dietz et al., 2013; Dietz, Plog, Jox, & Schulz, 2014). As written communication deficits were generally quickly resolved in the PERISCOPE project (Heneka et al., 2019), the most problematic communication deficit was the lack of consistent contemporaneous handover of changes to opioid orders, from the ordering physician to the palliative care nurse. From the palliative care nurses' perspective, these deficits contributed to the already high rate of omitted opioid doses. Further exploration of clinical handover practices in inpatient palliative care services is needed to fully understand the barriers and facilitators to timely handover of medication order changes.

There are multiple systems level factors that contribute to opioid errors in specialist palliative care inpatient services. While some contributory factors are intrinsic to the process of opioid delivery itself, other factors reflect gaps in staffing and resource management.

8.4 Research Question 3: What are the opioid error mitigating factors in specialist palliative care inpatient services?

Study 5 (semi-structured interviews and focus groups) explored the specific strategies specialist palliative care inpatient services in the PERISCOPE project had implemented to mitigate opioid errors. Data from this study were integrated with the Study 3 (local retrospective review) and Study 4 (retrospective review of error contributing factors) to answer research Question 3: *What are the opioid error mitigating factors in specialist palliative care inpatient services?* (Refer Appendix 13 for joint display).

Many of the strategies to mitigate opioid errors in the PERISCOPE project were developed in direct response to specific errors, or patterns of errors, the service had identified following internal review of reported opioid errors. Underpinning these strategies was evidence of a positive opioid safety culture in all participating specialist palliative care inpatient services, which has been detailed in Chapter 7. In addition to an over-arching positive safety culture in specialist palliative care inpatient services, five opioid error mitigating factors were consistently evident in the PERISCOPE project: i) palliative care nurses' ability to identify and intercept opioid errors; ii) palliative care pharmacists in the interdisciplinary team iii) targeted

and ongoing opioid education; iv) strong interdisciplinary collaboration; and v) use of an electronic medication management system. These factors are reported in detail below.

8.4.1 Opioid error mitigating factors

Applying the Yorkshire Contributory Factors Framework (Lawton et al., 2012) (refer Chapter 3) to the PERISCOPE project data revealed that the majority of opioid error mitigating factors in specialist palliative care inpatient services aligned with systems factors related to supervision and leadership, management of staff/staffing levels, training and education, and support from central functions (refer Figure 8.2).

Most notably, the PERISCOPE project identified two opioid error mitigating factors which, if not present, were considered to be error contributory factors. Poor skill-mix (management of staff/staffing levels) and the absence of pharmacy input (support from central functions) directly contributed to opioid errors in the PERISCOPE project (Heneka et al., 2019), however, optimal skill-mix (nursing and interdisciplinary) and a full-time clinical pharmacist in the palliative care unit, appeared to directly reduce opioid errors in specialist palliative care inpatient services (Heneka et al., 2018c, 2018d, 2019).

Palliative care nurses' ability to identify and intercept opioid errors

Checking opioid orders was a routine part of palliative care nurses' opioid administration practices in the PERISCOPE project. As medication administrators, nurses are well positioned to safeguard against medication errors, and are thought to intercept up to 86% of prescribing or dispensing errors (Leape et al., 1995). In the PERISCOPE project palliative care nurses were pivotal in intercepting prescribing errors, as evidenced in incident reports (Heneka et al., 2018c) and from the perspective of palliative care clinicians (Heneka et al., 2019). This may account for the discrepancy between clinicians' perceptions that prescribing errors are relatively common, and the comparatively low prevalence (approximately 20%) of reported prescribing errors in specialist palliative care inpatient services (Heneka et al., 2018d, 2019).

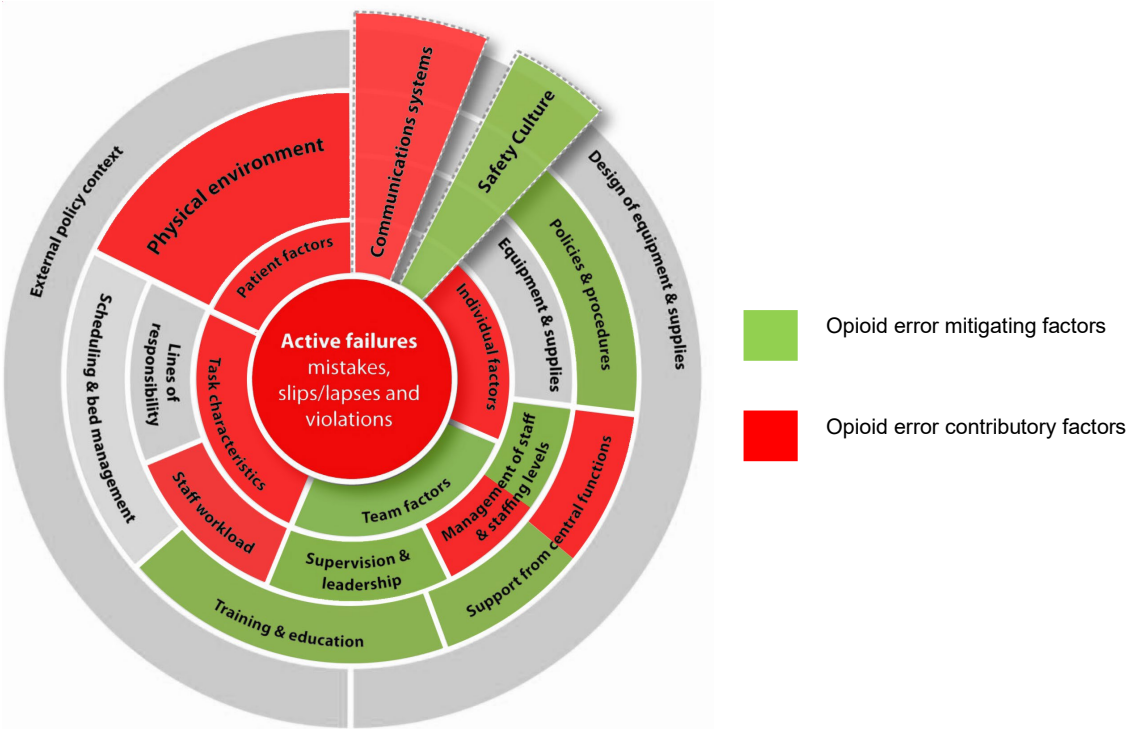

Figure 8.2 Comparison of opioid error mitigating (green) and contributory (red) factors identified in specialist inpatient palliative care services in the PERISCOPE project, categorised per the Yorkshire Contributory Factors Framework (Lawton et al., 2012)

Adapted from: Development of an evidence-based framework of factors contributing to patient safety incidents in hospital settings: a systematic review, Lawton R, McEachan RR, Giles SJ, Sirriyeh R, Watt IS and Wright J. 21:369-80 ©2012 with permission from BMJ Publishing Group Ltd. (Appendix 3)

The role of the nurse in intercepting errors before they reach the patient has been explored for over a decade (Balas, Scott, & Rogers, 2004; Flynn et al., 2012; Gaffney, Hatcher, & Milligan, 2016; Rothschild et al., 2006). A significant association between registered nurses' error interception practices and rates of medication error has been identified in medical-surgical units (Flynn et al., 2012). Critical care nurses have also been found to intercept two or more harmful medical errors per patient, per day, the majority (73%) of which are medication errors (Rothschild et al., 2006). While data in the palliative care context could not be identified, it is highly likely that nurses' interception practices in palliative care directly prevent prescribing, and other opioid errors, such as wrong drug and wrong dose errors, from reaching the patient.

Similar to studies in acute care (Cullen, Bates, & Leape; Hewitt & Chreim, 2015; McBride-Henry & Foureur, 2006), palliative care nurses in the PERISCOPE project

reported being confident asking for opioid orders to be changed if an error was identified, and acknowledged they prioritised timely administration of opioids to ensure effective pain management, over error reporting. Driving nurses' confidence to identify and challenge opioid errors in the PERISCOPE project was a safety culture where nurses felt empowered to speak up when an error was identified, felt confident and supported to adhere to opioid handling/management policies, and had ready access to opioid related training and education (Heneka et al., 2019).

Palliative care pharmacists in the interdisciplinary team

As previously mentioned, the two services in the PERISCOPE project whose interdisciplinary team included a palliative care pharmacist reported considerably fewer opioid prescribing errors than the service that did not, irrespective of the medication management system used (electronic versus paper-based) (Heneka et al., 2018d). In these two services pharmacists were highly valued members of the interdisciplinary team and palliative care physicians and nurses routinely sought advice from them. Additionally, pharmacists tailored opioid education to meet the needs of the unit, and pro-actively identified and conducted opioid safety related quality assurance activities.

The inclusion of a pharmacist in the interdisciplinary team in specialist palliative care inpatient services appears integral to mitigating opioid errors, driving the services' education and quality assurance activities to further support safe opioid delivery practices, and improving palliative patient outcomes (Gilbar, 2006; Herndon et al., 2016; Wilson et al., 2011).

Targeted and ongoing opioid education

Opioid related education was seen as pivotal to nurses' capacity to identify and intercept opioid errors in the PERISCOPE project. As reported in Chapter 7, each of the local palliative care services in the PERISCOPE project utilised a suite of opioid education options for all disciplines. Palliative care nurses reported feeling empowered to practice safely, largely driven by learning opportunities provided by the Clinical Nurse Educator, and the ongoing formal and informal education within the day-today operations of the unit.

Harnessing medication safety education to reduce medication errors and prevent error related harms has been a widely employed approach for over two decades (Australian Commission on Safety and Quality in Health Care, 2017; Institute for Safe Medication Practices, 2009; Leape, 1994). However, in isolation, education strategies are not a reliable approach to consistently mitigate medication errors. Rather, education is best employed in combination with strategies that are less reliant on human vigilance to be successful (e.g., forcing functions and constraints in electronic medication management systems, standardised protocols, and independent double check systems) (Institute for Safe Medication Practices, 2009).

Strong interdisciplinary collaboration

Palliative care clinicians in the PERISCOPE project acknowledged the existence of strong and collegial interdisciplinary relationships in their services. Collaboration with palliative care pharmacists was greatly valued by nursing and medical staff, and afforded additional checks of opioid orders and guidance with opioid management. Palliative care physicians reported routinely consulting with nurses to check opioid conversions, and were open to being questioned if they had made and error. Equally, palliative care nurses felt empowered to challenge opioid orders they perceived to be ambiguous, illegible or incorrect. Interdisciplinary collaboration extended to situational awareness of, and increased vigilance around, less experienced palliative care clinicians in the PERISCOPE project, particularly junior doctors, and non-palliative care specialists prescribing out of hours.

In a recent integrative review of 30 studies, interdisciplinary collaboration was shown to substantially contribute to the identification, interception and reduction of medication errors across a broad range of hospital settings (Manias, 2018). While none of the setting in this integrative review included palliative care services, qualitative data from the PERISCOPE project strongly suggests effective interdisciplinary collaboration is a key factor in mitigating opioid errors in specialist palliative care inpatient services.

Use of an electronic medication management system

An electronic medication management system was used in one palliative care service in the PERISCOPE project. A notable difference in opioid errors prevalence in this

service was the absence of reported omitted dose errors. Palliative care clinicians in this service perceived that electronic medication management systems directly reduced omitted dose errors by virtue of prompting clinicians to administer the missed dose, and preventing progression to the next due opioid administration. In contrast, omitted dose errors in the two palliative care services using paper based medication charts ranged from 29% to 69% of reported opioid administration errors (Heneka et al., 2018d).

Electronic medication management systems have been reported to significantly reduce the risk of medication errors in acute health care settings (13% to 99% relative risk reduction) (Ammenwerth, Schnell-Inderst, Machan, & Siebert, 2008; Redley & Botti, 2013). However, the impact of electronic medication management systems on omitted dose errors is varied. In one Australian study omitted dose errors occurred at less than half the rate in an acute care hospital using an electronic medication management system compared to a similar hospital service using paper-based medication charts (14% versus 33%) (Redley & Botti, 2013). Similar results were seen in a general surgery ward in the UK, with a 35% decrease in omitted dose errors following the introduction of an electronic medication management system (Franklin, O'Grady, Donyai, Jacklin, & Barber, 2007). However, a more recent Australian study found that, while the introduction of an electronic medication management system did not reduce the rate of omitted doses overall, it did lower the rate of non-therapeutic omissions from 26% to 4.4% of total omitted doses (Munzner, Welch, & Richardson, 2012). Given that omitted dose errors are the most frequently reported error type in specialist palliative care inpatient services, transitioning to electronic medication management systems for inpatient palliative care services currently using paper-based medication charts is an important consideration.

8.5 Research Question 4: What is required to support and strengthen safe opioid delivery practices in specialist palliative care inpatient services?

This final research question is answered through meta-inference of the collective PERISCOPE project data. The meta-inference process applied in the PERISCOPE project has been reported in detail in Chapter 3.

8.5.1 Understanding opioid delivery in specialist palliative care inpatient services

In order to support and strengthen safe opioid delivery practices in specialist palliative care inpatient services, it is essential to first understand that opioid delivery in this setting is complex and time consuming. In specialist palliative care inpatient services opioids are frequently administered, using high doses and opioid combinations that differ substantially from opioid usage in other inpatient settings. Integral to palliative inpatients' symptom management is palliative care clinicians' capacity to undertake opioid conversions, which, in itself, is a complex and error prone task. Preparing and administering a single opioid dose for a palliative inpatient is time consuming as safe opioid administration requires adherence to independent double checking and documentation, in accordance with high-risk medicine management policies (Ministry of Health NSW, 2013, 2015). Hence, the complexity and fluctuating symptom management needs of the palliative care inpatient means palliative care clinicians, particularly nurses, spend a large proportion of their shift primarily attending to administering regular and PRN opioids.

There are over 30 steps in the opioid delivery process in specialist palliative care inpatient services and each step is prone to human error (Heneka et al., 2018c; Leape, 2006). Having multiple processes in place to pro-actively identify and intercept opioid errors across the opioid delivery process, and before the error reaches the patient, is a critical starting point in supporting and strengthening safe opioid delivery in this setting. The PERISCOPE projects' meta-inferences of the data has revealed that arriving at this point is contingent on the following four elements:

i) embedding a positive opioid safety culture;
ii) enabling optimal skill mix and staffing;
iii) providing comprehensive opioid related education; and
iv) empowering clinicians to identify, intercept and report opioid errors.

Each element is described in the next section and the conceptual framework illustrating the relationships between the elements is depicted in Figure 8.3.

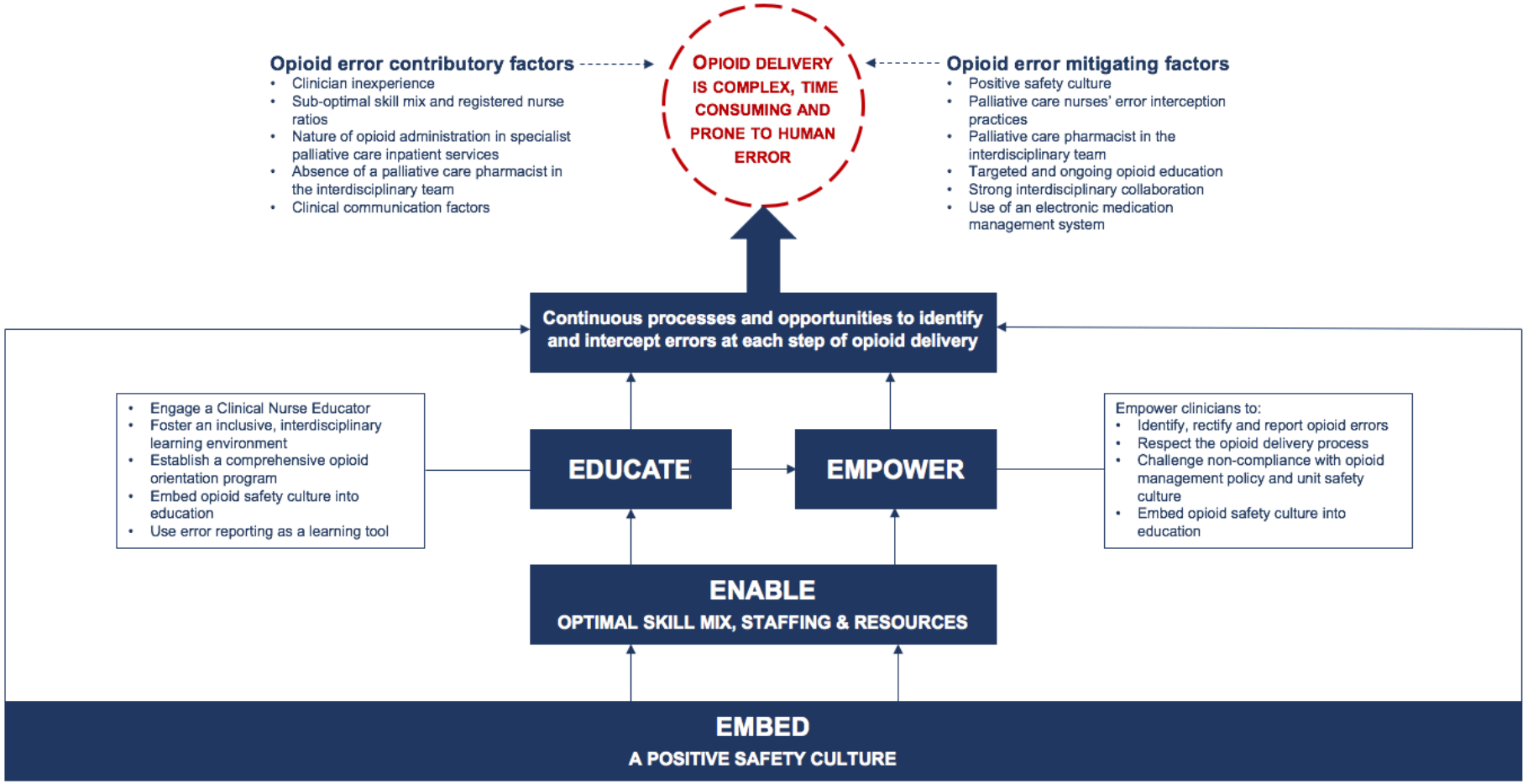

Figure 8.3 Conceptual framework of factors to support and strengthen safe opioid delivery in specialist palliative care inpatient services

8.5.2 EMBED a positive opioid safety culture

An organisation's safety culture has long been considered the most fundamental predictor of safety performance (Clarke, 1999; Scott, Mannion, Marshall, & Davies, 2003; Wakefield, McLaws, Whitby, & Patton, 2010). Highly evident in the PERISCOPE project was a strong commitment to creating, and sustaining, a positive safety culture, which included:

- **Leadership commitment to opioid safety**: acknowledgement of opioid delivery as a high-risk, time-intensive activity; opioid safety is a key organisational priority; strong leadership drives opioid safety culture (Flin, Burns, Mearns, Yule, & Robertson, 2006);
- **Awareness of opioid error potential**: acknowledgement at all staff levels that opioid errors can and will occur; awareness of individual and systems causes of opioid error (Sammer, Lykens, Singh, Mains, & Lackan, 2010);
- **Awareness and perceptions of opioid safety**: managerial expectations of opioid safety/opioid handling are consistent and clearly communicated; actions/behaviors that promote opioid safety (e.g., strict adherence to two-person check); perceptions of behavioral norms related to opioid safety (e.g., querying opioid orders perceived to be incorrect, challenging non-compliance with opioid delivery policy and/or unit safety culture) (Grissinger, 2014; Wakefield et al., 2010; Weaver et al., 2013);
- **A non-punitive response to error**: a 'no blame' response when opioid errors occur and/or are reported; a systems approach to error investigation and resolution (Sammer et al., 2010);
- **Opioid error recognition, reporting, feedback and communication**: clinicians empowered to identify and challenge opioid errors; encouraging error reporting; individual and organisational learning from opioid error; errors are followed up by management and used to inform quality improvement strategies (Hodgen, Ellis, Churruca, & Bierbaum, 2017);
- **Organisational support for opioid safety**: comprehensive opioid education at orientation to unit; ongoing formal and informal clinician education, including group learning and one-on-one learning opportunities; dedicated Clinical Nurse Educator role in unit; palliative care pharmacist as essential

member of interdisciplinary team; positive safety culture integrated into unit education activities (Flin et al., 2006; Sammer et al., 2010);

- **Team work within and across units**: high level interdisciplinary collaboration (nurses, doctors, pharmacists); interdisciplinary awareness of clinician inexperience; proactive provision of opioid related education and quality assurance activities by pharmacist (Flin et al., 2006); and
- **Job satisfaction**: adequate unit staffing and skill mix (Hodgen et al., 2017; Sammer et al., 2010).

Creating a systems wide approach that supports palliative care clinicians to safely navigate the complexities of opioid delivery in the specialist palliative care inpatient services delivery context, and promotes a non-punitive approach to error occurrence and reporting, is essential to minimising opioid errors. Embedding and sustaining a positive safety culture must be at the core of any initiatives to support and strengthen safe opioid delivery in specialist palliative care inpatient services. Hence this element lies at the foundation of the conceptual framework developed from the PERISCOPE project data. A positive safety culture shapes clinicians' opioid safety behaviours, values and attitudes, and drives the palliative care services' commitment to opioid safety management (Wakefield et al., 2010).

RECOMMENDATION 1: That palliative care inpatient services strive to establish and embed a positive opioid safety culture within their services that is: driven by leadership, promotes a non-punitive approach to error, provides strong organisational support for opioid safety, and fosters strong interdisciplinary collaboration.

8.5.3 ENABLE optimal skill mix, staffing and resources

Skill mix and staffing

From an organisational perspective, it is essential to acknowledge that opioid delivery in the palliative care inpatient setting is a high-risk clinical activity which consumes a large amount of time each shift, and differs substantially to delivery in other inpatient settings. The fluctuating needs of palliative care patients, and the task characteristics of opioid delivery place considerable time and workload burdens on palliative care clinicians. Appropriate ratios of registered nurses to palliative patients,

and optimal interdisciplinary skill mix, are fundamental to supporting safe opioid delivery in specialist palliative care inpatient services. As opioid delivery comprises a large proportion of the palliative care nurses' shift, budgetary consideration for the provision of supportive staff to alleviate palliative care nurses' non-clinical workload are also worth considering.

In the PERISCOPE project, the challenge of training and sustaining an agile palliative care workforce was noted as a direct contributor to sub-optimal staffing and skill mix, which, in turn, were the most pervasive opioid error contributing factors. The Australian palliative care workforce is ageing rapidly with approximately 70% of the total palliative care workforce over 40 years of age, and one-third over 50 years (Senate Community Affairs References Committee, 2012). It is likely that over the next decade, the number of palliative care clinicians retiring will lead to an inadequate workforce to meet the demands of an ageing, and growing, Australian population (Australian Institute of Health and Welfare, 2018b; Victorian Healthcare Association, 2011). Workforce planning needs have been acknowledged in the recently released 3rd national palliative care strategy and need to be driven at a national level (Australian Government Department of Health, 2018).

The absence of a palliative care pharmacist in the specialist palliative care inpatient services interdisciplinary is detrimental to opioid safety. Palliative care pharmacists' review of opioid orders is an important error safeguard for these high-risk medicines. Palliative care pharmacists also play an integral role in opioid education and quality assurance activities in the specialist palliative care inpatient service.

RECOMMENDATION 2: That palliative care inpatient services ensure optimal medical and nursing ratios and interdisciplinary skill mix, appropriate to palliative patients' acuity, each shift.

RECOMMENDATION 3: That a minimum ratio of palliative care pharmacist hours be mandated for all specialist palliative care inpatient services.

Resources

The complexity of opioid delivery in specialist palliative care inpatient services demands clinicians have ready access to resources that support clinical decision

making and help mitigate opioid errors. Omitted does errors were, by far, the most frequently reported opioid error type, and substantially contributed to opioid under-dosing and iatrogenic patient harm. Electronic medication management systems appear to considerably reduce omitted does errors in specialist palliative care inpatient services, and their implementation should be a key consideration for palliative care services using paper-based medication charts.

RECOMMENDATION 4: Prioritise the transition to electronic medication management systems from paper-based charts to reduce omitted opioid dose errors.

8.5.4 EDUCATE

Education was the foundation for safe opioid delivery practices in the PERISCOPE project. Given the substantial differences in opioid delivery in palliative care, compared to other acute care services, a comprehensive orientation to opioid delivery in the palliative care context is essential for all clinicians first starting in palliative care. Education was seen one of the key drivers that empowered clinicians to recognise and challenge opioid errors. This was achieved through fostering an inclusive and safe learning environment that supported interdisciplinary learning, and ongoing formal and informal learning opportunities. Clinicians from all disciplines valued one-to-one education with the Clinical Nurse Educator, and the palliative care pharmacist. For palliative care nurses, the Clinical Nurse Educator was seen as pivotal to instilling and maintaining safe opioid delivery practices in the nursing team. In keeping with the characteristics of a strong opioid safety culture, error reporting was used as a powerful learning tool, giving clinicians the opportunity to reflect on and better their clinical practice, and facilitating system-wide change. Incorporating the services' approach to safety culture within the education program was integral to embedding and sustaining a positive opioid safety culture throughout the palliative care service.

RECOMMENDATION 5: That palliative care inpatient services ensure that a dedicated Clinical Nurse Educator is employed in the specialist palliative care inpatient service to: consistently instill safe opioid delivery practices for new and existing palliative care clinicians, and drive a coordinated opioid education program across the palliative care service.

RECOMMENDATION 6: That palliative care inpatient services provide opportunities for one-on-one, tailored learning as required, in addition to regular group-based learning activities.

8.5.5 EMPOWER

It was evident the large majority of clinicians in the PERISCOPE project felt empowered to identify, challenge and report opioid errors. Given the perceived number of opioid prescribing errors that occur in specialist palliative care inpatient services, empowering clinicians to recognise and intercept these errors is a key opioid error mitigating factor. However, empowerment requires the requisite knowledge and skills to identify when an error occurs, and a safety culture where clinicians feel supported to query errors and/or ask their colleagues for assistance when needed. In the PERISCOPE project this was achieved through a combination of targeted opioid education, a non-punitive error reporting culture, and strong interdisciplinary collaboration, underpinned by a positive opioid safety culture where the risks inherent with the opioid delivery process were acknowledged and respected.

RECOMMENDATION 7: That palliative care inpatient services empower clinicians to identify challenge and report opioid errors by providing comprehensive opioid education and fostering a positive, non-punitive opioid safety culture.

8.6 Significance of the PERISCOPE project

The PERISCOPE project is the first body of work to comprehensively explore opioid errors in the specialist palliative care inpatient service delivery context. The project aligns with multiple national standards, strategies and polices targeting medication safety, quality use of medicines, and palliative care delivery standards (Australia, 2018; Australian Commission on Safety and Quality in Health Care, 2017; Australian Commission on Safety and Quality in Health Care and NSW Therapeutic Advisory Group Inc., 2014) (refer Appendix 10).

8.7 Strengths and Limitations

The PERISCOPE project has a number of strengths. Data were drawn from both a state-wide clinical incident reporting system and within local services, enabling

direct comparisons and benchmarking of opioid errors in specialist palliative care inpatient services. A large number of clinicians from multiple disciplines enabled data saturation to be reached in the qualitative component of the PERISCOPE project, and facilitated comprehensive member checking within and across participating specialist palliative care inpatient services.

Limitations

While the limitations of each of the PERISCOPE project studies have been described in the relevant chapters, there are several limitations that need to be highlighted in this section. The PERISCOPE project focused on specialist adult palliative care inpatient services in metropolitan NSW only. However, palliative care in Australia is delivered in multiple generalist and specialist settings, including outpatient care and community-based/home care and paediatric palliative care. Hence the findings from this project may not be generalisable to other palliative care settings or geographical locations (e.g., regional, rural and remote services).

Although two dedicated cancer inpatient services had initially expressed interest in participating in the PERISCOPE project, a change in management and competing research priorities, saw both services decline participation when recruitment for the project commenced. A key challenge in recruiting additional cancer services to the PERISCOPE project lay in the nature of cancer service delivery outside of the inpatient context. There are few dedicated cancer inpatient services in NSW, with cancer patients generally dispersed throughout multiple wards in a hospital, depending on their reason for admission (e.g., surgical ward) and cancer type (e.g., respiratory ward). Hence, only palliative care services were included in the PERISCOPE project.

The PERISCOPE project recruited palliative care clinicians from multiple disciplines, and achieved strong participant engagement at each site, however, participation in this project was voluntary and the characteristics of participants, versus non-participants may have biased the study findings.

It is well known that medication errors are widely under-reported in hospitals (Levinson, 2012; Munzner et al., 2012; Westbrook et al., 2015) and emerging research suggests the same is true of palliative care units (Boyer, McPherson,

Deshpande, & Smith, 2009; MacLeod, Fletcher, & Ogles, 2011; Taylor, Fisher, & Butler, 2010). Although the PERISCOPE project sought palliative care clinicians perceptions of opioid error reporting practices in their services to verify the clinical incident report data, it is highly likely these data do not accurately reflect the actual prevalence of opioid errors in specialist palliative care inpatient services.

Finally, research into patient safety and medication errors in palliative care is still an emerging area of research, with multiple gaps in published empirical data. Thus, one of the overarching challenges in the PERISCOPE project lay in the dearth of comparable literature in the palliative care context, which limited the conclusions that could be drawn.

8.8 Conclusion

Opioid errors in specialist palliative care inpatient services rarely have a single cause. Rather, opioid errors occur as a result of differing combinations of individual, team, environmental and organisational factors (Heneka et al., 2018b; Heneka et al., 2018c, 2018d). In order to support safe opioid delivery in specialist palliative care inpatient services, a systems approach to error management recognises that healthcare services themselves are subject to latent failures, which manifest as error promoting conditions in the workplace (Lawton et al., 2012). Hence, focusing solely on the actions of the palliative care clinician when opioid errors occur, will not prevent error recurrence, if, in fact, failings within the system itself are the issue (Lawton et al., 2012; McBride-Henry & Foureur, 2006). Importantly, a systems approach to opioid errors does not take away individual accountability for opioid safety, but expands accountability across the organisation to anyone who influences the medication use process (Cohen, 2007).

The PERISCOPE project identified opioid errors in specialist palliative care inpatient services differ in prevalence, characteristics and patient impact to other health care settings, and contribute to iatrogenic patient harm. Opioid error contributing factors in specialist palliative care inpatient services are multifactorial, encompassing a spectrum of factors from individual to latent systems factors. Accordingly, any strategies to reduce opioid errors must apply an integrated systems approach in order to be of impact.

Implications for practice

The PERISCOPE project has highlighted that opioid underdosing, not overdosing, was the most common patient outcome following an opioid error, and that omitted dose errors substantially contribute to this phenomenon in specialist palliative care inpatient services. It is important to recognise the dosing cascades that might follow from inadequate pain relief from such errors, the implications of worsening pain and distress for patients at the end of life, and their families/caregivers, and the additional nursing workload resulting from PRN analgesia administration.

A key finding of the PERISCOPE project was the evidence of a positive opioid safety culture in participating palliative care services which drove safe opioid delivery practices in specialist palliative care inpatient services. Assessing safety culture within the specialist palliative care inpatient service to identify areas of strength and areas for improvement, is an essential first step for any services considering strategies to support and improve this aspect of care. Pro-actively embedding and sustaining a culture of opioid safety is a critical practice component that empowers clinicians to safely deliver opioids in specialist palliative care inpatient services.

Implications for future research

Further exploration of safety culture in inpatient palliative care services is warranted to identify the similarities and differences in culture across a greater number of palliative care services, including services in differing geographical regions. In anticipation of the growth of palliative care delivery in the community/home setting, a systematic exploration of opioid errors by clinicians in these settings is also warranted. Given the unique features of paediatric palliative care it is worth extending this program of research into this setting to better understand how paediatric palliative care services manage opioid safety, and how opioid errors impact paediatric patients. With increasingly greater integration of palliative and cancer care services, understanding barriers and facilitators to opioid safety in the cancer care setting is equally important to ensuring these vulnerable patients are protected from iatrogenic harm due to opioid errors. Conducting rigorous studies in these multiple care settings will facilitate greater generalisability and applicability of study findings.

The absence of a standardised opioid error taxonomy may be a barrier to consistent reporting and effective benchmarking of opioid errors and patient impact within and across palliative care services. This will be explored in a future Delphi consensus process to develop and formalise the proposed taxonomy.

Finally, as the PERISCOPE project has established clinicians perceptions of opioid errors in specialist palliative care inpatient services, exploring the impact of opioid errors from the palliative patients' and family/caregiver perspective is a critical next step. Partnering and collaborating with consumers to develop this research will privilege their experiences and care needs following an opioid error, and better understand how to effectively facilitate their engagement in opioid safety throughout the patient and family/caregiver journey.

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