Medication Errors

Complaints closed by the Health and Disability Commissioner: 2009–2016

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

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Commissioner's Foreword

Much can be learned from the trends and patterns that emerge across complaints. The analysis of complaints data about a selected adverse event (such as medication error) can be particularly valuable for providing insights into the common contributing factors to that event. I am committed to ensuring that such analysis occurs and is reported back to the sector and general public in a way that supports quality improvement. With this in mind, I am pleased to present this analysis of complaints to HDC where it was found that a medication error had occurred.

Medication is the most common intervention in health care, and it is important to note that most of the time, the care that is provided is very good. Most New Zealanders who are prescribed, dispensed, and administered medication will receive safe and effective care. However, when medication errors do occur they have the potential to cause significant harm. It is therefore vital that the contributing factors are analysed, and that lessons are learned, preventative action taken, and systems strengthened to ensure that such errors do not occur again.

The process by which medication is delivered to a patient is a journey that involves multiple steps, multiple providers, and multiple healthcare settings. This can make the process vulnerable to error, but also ensures that there are multiple checks in the process that can prevent any errors from reaching the patient. It is imperative that every provider in the process ensures that the right person is receiving the right drug for the right reasons in the right dose at the right time.

This analysis highlights an issue I often see in complaints — a failure to do the basics well; that is, a failure to read the notes, talk to the patient, ask the questions, and undertake the necessary checking procedures. It is incumbent on prescribers, dispensers, and those administering medication to think critically each time they deliver a medication — considering the drug, the patient, and the context in which the medication is being delivered — to ensure that the medication is being delivered safely. Providers must also undertake the necessary checks to ensure they are undertaking their role safely. These basics can often be overlooked in the context of distraction and busy workloads, but they are vital to ensuring patient safety.

I was struck by the number of errors in which a failure to follow policies and procedures was a contributing factor. Individual providers are accountable for ensuring that they are following appropriate policies/procedures. Deliberate deviations from policies and procedures can seriously compromise patient safety and result in consumers not receiving an appropriate standard of care. However, one of the strengths of HDC is our ability to put individual behaviour in its systemic context. A failure by multiple staff to follow policies and procedures can point to a system that has allowed a culture of tolerance to emerge — where the suboptimal has become normal, and not following policies and procedures has become everyday practice. Such tolerance is not acceptable. Organisational leaders must be alert to such issues, and ensure that staff are supported to do what is required of them, and that a culture is fostered where adherence to policies/procedures is "the way we do things around here".

I encourage all providers, when reading this report, to consider, "Could this happen at my place?" and, if so, what changes could be made to prevent it. My thanks to all those who have shared their experiences and, in doing so, have made this report and the learning contained within it possible.

Anthony Hill
Health and Disability Commissioner

Executive Summary

This report presents an analysis of complaints closed by the Health and Disability Commissioner between 2009 and 2016 where a medication error was found to have occurred. Complaints to HDC often involve more than one provider, and multiple medication errors are sometimes involved in a single complaint. A separate analysis was undertaken for each medication error complained about. Therefore, although there were 310 complaints about medication errors, **338** medication errors were analysed (the complaints data). Each error was coded for the stage of the medication process at which the error occurred (prescribing, dispensing, or administration); the setting of the error; the class of medication involved in the error; the type of error that occurred; and the factors identified by HDC's expert advisor or the provider in their incident analysis as having contributed to the error.

The aim of this report is to provide an analysis of the HDC complaints data in order to shed light on some possible patterns regarding contributing factors that lead to medication error. The report also collates the lessons from our findings and from the case examples detailed in the report, in order to assist providers and organisations to recognise and address factors that contribute to medication errors.

It should be noted that although analysis of complaints data can be valuable for looking at the contributing factors to selected types of adverse events (such as medication errors), complaints data is not a proxy for quality of care. Generalisations cannot be made based on complaints data, and there are a number of factors that limit the conclusions that can be drawn.

The majority of medication errors in the complaints data were due to a complex interplay of human and organisational factors. Many medication errors were slips/lapses, whereby providers made inadvertent errors often due to error-producing conditions or latent factors in the organisational environment.

No one stage of the medication process (prescribing, dispensing, or administration) was disproportionately responsible for the majority of errors in the complaints data, with each stage being responsible for around a third of the errors complained about. Types of errors and contributing factors differed by the stage of the medication process involved.

The most common prescribing error was the prescribing of an inappropriate medication (prescribing a contraindicated medication or a medication to which the consumer was allergic or had had a previous adverse reaction). The other common type of prescribing error was prescribing the wrong dose of medication. The most common factors identified as contributing to prescribing errors were a failure to obtain necessary information; a failure to communicate effectively with the consumer; a failure to act on information; inadequate communication between providers; an inadequate software system; and inadequate/incorrect documentation.

The most common dispensing error was dispensing the wrong medication, followed closely by dispensing the wrong dose/strength of medication. The most common factors identified as contributing to dispensing errors were a failure to follow policies/procedures; inadequate policies/procedures; busyness; physical space layout issues; medications with similar names; failure to communicate effectively with the consumer; distractions/interruptions; and medications with similar packaging.

The most common type of administration error was administration of the wrong dose, followed by a failure to administer, and administration to the wrong patient. The most common factors identified

as contributing to administration errors were a failure to follow policies/procedures; inadequate communication between providers; busyness; inadequate policies/procedures; a failure to communicate effectively with the consumer; inadequate/incorrect documentation; and provider competence issues.

The lessons from these findings have been collated below

Reducing Medication Error

Medication errors are somewhat inevitable owing to the fact that human error is inevitable; however, it is vital that organisations have a series of defences built into their systems to prevent such errors from reaching the patient.

The trends and themes that emerge from this analysis suggest that additional focus could be given to the following:

Electronic medication management

Electronic medicine management systems with clinical decision support tools that are fit for purpose, fully integrated across the care continuum at a national level, and take into account the complexity of the process and the multiple providers involved, would mitigate against a number of the contributing factors to errors seen in this report.

In order to reduce error it is important that these systems are well planned, well designed, and subject to close scrutiny, and that providers are trained appropriately on the use of these tools to ensure that they make the best use of the safety features.

The Ministry of Health has signalled that smart use of digital systems, e.g., electronic prescribing and administration, is desirable. Roll-out at DHB level and across the health sector is incomplete. Lack of progress in this area is concerning, and it is recommended that this be prioritised.

The design and adoption of an electronic health record and use of digital systems would allow consumers' medication information to follow them on their journey through the healthcare system. This would facilitate the seamless sharing of information and would assist in the prevention of a number of medication errors that occur during transfers of care. The Ministry of Health has developed an indicative business case for the development of a national health information platform. It is recommended that this work be prioritised.

Following policies/procedures

A failure by providers to follow medication policies and procedures contributed to a number of the errors seen in this report. Non-adherence to policies and procedures is concerning, and seriously compromises patient safety. While individuals must be held accountable for reckless behaviour and deliberate deviations from policies/procedures, often these issues reflect a culture of tolerance within an organisation — where not following policies/procedures has become normalised. It is vital that organisational leaders are alert to such issues, and ensure that staff are supported to do what is required of them, and that they have in place a culture and system that ensures compliance with policies/procedures.

Prescribing errors

Doing the basics well

Read the notes, ask the questions, talk to the patient. Often prescribing errors are contributed to by a failure to gather the appropriate information or to use that information effectively. Getting these basics right every time represents an important action that providers themselves can take to improve prescribing safety.

The importance of provision of information to consumers regarding their medication

The more information patients have about their medication, the better they are able to act as a defence against any medication errors. It is expected that prescribers will take the time to check the prescription with the patient, verbally check for any allergies, and educate the patient about his or her medication regimen.

Roll-out of electronic prescribing and clinical decision support tools and effective use of such systems

As noted above, the roll-out of electronic prescribing is incomplete at DHB level and across the health sector, and it is recommended that this be prioritised.

The importance of documentation of prescribing decisions

The quality of the information in the patient record has an influence on the safety and quality of subsequent prescribing decisions, and is vital to continuity of care. It is expected that individual prescribers share information about the prescribing with other providers involved in the patient's care, and keep a clear, accurate, and timely patient record. It is also expected that organisations have documentation policies and procedures that are consistent with relevant standards, and that they have in place systems to ensure that staff are complying with these policies.

Use of medication reconciliation processes

Medication reconciliation has been found to reduce medication errors caused by incomplete or insufficient documentation of medicine-related information at care transitions. Currently there is a national programme to roll out electronic medication reconciliation throughout New Zealand DHB hospitals. As noted above, roll-out at DHB level is incomplete, and it is recommended that this is prioritised.

The importance of robust policies around repeat prescribing in primary care

It is important that general practices have robust policies and procedures regarding patients on repeat prescriptions being reviewed at clinically appropriate intervals, and that they have in place systems to ensure that these policies are adhered to by practice staff.

Dispensing errors

The importance of ensuring that staff adhere to Standard Operating Procedures (SOPs)

It is expected that individual pharmacists practise in accordance with SOPs. It is just as important that organisations ensure an environment that allows pharmacists to maintain a safe dispensing procedure. Pharmacies must ensure that they have SOPs that are consistent with relevant standards, and that they have in place systems to ensure that staff are complying with their policies.

Avoiding self-checks where possible

Confirmation bias can make self-checking a poor method of error reduction, and should be avoided where possible. Where self-checking cannot be avoided, the pharmacist should ensure that a "fresh eyes" check is conducted. Additionally, if self-checks cannot be avoided in all cases, consideration could be given to using independent double checks for those high-alert medications that have the potential to cause greater harm, and those medications that are known to be more prone to error.

Use of strategies to reduce look-alike/sound-alike medication errors

A number of strategies can be employed by pharmacies to reduce the occurrence of errors associated with look-alike/sound-alike medications. These strategies are outlined on page 56.

Optimal staff mix, and effective use of technology

A number of innovations in pharmacy practice can reduce the risk of human error, including the use of barcode verification, dispensing robots, and pharmacy accuracy checking technicians. These innovations not only help to prevent errors, they can also decrease pharmacist workload and free up pharmacist time for patient counselling.

The importance of patient counselling

Counselling provides consumers with the opportunity to pick up on and clarify any potential discrepancies, and it acts as an additional accuracy check for the pharmacist. Information regarding the safe and proper use of medication is the particular expertise of pharmacists, and the provision of this information is an expected and fundamental part of their scope of practice.

Administration errors

Ensuring staff adherence to policies/procedures, particularly the Five Rights

Following the Five Rights of Medication Safety (the Five Rights)[1] is crucial to reducing medication administration errors. Administrators must ensure that the appropriate checks are carried out every time they administer medication — not doing so can seriously compromise patient safety. Facilities must ensure that they have policies and procedures that are consistent with relevant standards in regard to medication administration and use of the Five Rights, and that they have in place systems to ensure that staff are complying with these policies.

Effective use of electronic medication administration systems

As noted above, the roll-out of electronic prescribing and administration is incomplete at DHB level and across the health sector, and it is recommended that this be prioritised.

Improving communication between providers, and documentation of administration

Administrators need to ensure timely recording of the administration of medicines, and ensure that reasons for overdue, withheld, missed, or rescheduled medicines are documented. It is important that organisations ensure that the work environment enables providers to meet documentation requirements, and that a culture is encouraged that values the importance of documentation in patient safety and continuity of care.

Reducing unnecessary distractions/interruptions

It is important that organisations have strategies and processes in place to minimise distractions/interruptions, and that staff are provided with guidance about how to deal with distractions/ interruptions during times of high demand.

Provider training

Educational packages designed to increase administrators' working knowledge of pharmacology and safety principles have shown positive results for decreasing error prevalence. Educational packages can also assist to improve provider adherence to medication administration policies/procedures. It is important that organisations ensure that providers have access to up-to-date medication information and best practice guidelines.

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[1] See page 59.

The importance of provision of information to the consumer regarding the medication being administered

Providing the consumer with information about the medication he or she is being administered, including the type of medication, dose, route, and why the medication has been prescribed, provides an additional check for the provider, and empowers the patient to act as a safety net to reduce the chance of error.

Error reporting

For a small number of errors in the complaints data, incident reporting was inadequate or the consumer was not told of the error. The reporting, and analysis, of medication errors is fundamental to error prevention. Additionally, Right 6 of the Code of Health and Disability Services Consumers' Rights gives all consumers the right to be fully informed, including the right to be informed about any adverse event that occurred in their care.

Organisations must ensure that they have robust policies that outline expectations regarding open disclosure and incident reporting and reflect legal and professional standards, and that they have in place systems to ensure that staff are complying with these policies. Incident reports should be analysed, preventative actions put in place, and changes monitored to ensure that they have been implemented and are effective. Learnings from errors should also be reported throughout the organisation regularly.

Background

1. Medication errors

Definition and incidence of medication errors

There is no international consensus on the definition of "medication error". For the purposes of this report a medication error has been defined as:

> *Any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the healthcare professional or patient. Medication errors may be related to professional practice, drug products, procedures or systems, including prescribing, order communication, product labelling, packaging and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use.*[23]

This report focuses on medication errors made by healthcare professionals, and includes errors irrespective of whether or not the errors lead to adverse consequences.

The extent of medication errors made by healthcare professionals is difficult to quantify owing to variations in terminology,[4] methodology, and many errors going unnoticed, with only those errors resulting in patient harm being identified consistently.[5][6][7] This has resulted in substantial variation in the medication error rates reported across the international literature.

However, medication errors are among the most common errors that occur in healthcare settings, and are a leading cause of patient harm.[8][9][10][11] A systematic review of in-patient adverse events found that around 15% of adverse events in hospitals were medication related, with it being the second most common type of adverse event occurring in hospitals.[12] It has been estimated that, on average, a hospital patient in America is subject to at least one medication error per day.[13] A review of Australian studies suggested that around 2–3% of Australian hospital admissions are medication-

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[2] National Coordinating Council for Medication Error Reporting and Prevention. What is a medication error? New York: National Coordinating Council for Medication Error Reporting and Prevention; 2015.

[3] Health Quality and Safety Commission New Zealand. Medication Safety Programme: Alerts. Available from www.hqsc.govt.nz; 2017.

[4] Lisby M, Nielson LP, Brock, B, Mainz J. How are medication errors defined? A systematic review of definitions and characteristics. Int J Qual Health Care. 2010; 22(6), 507–18.

[5] Sanghera IS, Franklin BD, Dhillon S. The attitudes and beliefs of health care professionals on the causes and reporting of medication errors in a UK intensive care unit. Anaesthesia. 2006; 62(1), 53–61.

[6] Kohn L, Corrigan J, Donaldson M. To Err is Human: Building a Safer Health System. Washington: National Academic Press; 2000.

[7] Wakefield BJ, Uden-Holman T, Wakefield DS. Development and validation of the medication administration error reporting survey. 2005.

[8] Leape LL, Brennan TA, Laird N, et al. The nature of adverse events in hospitalized patients. Results of the Harvard Medical Practice Study II. N Engl J Med. 1991; 324, 377–84.

[9] Garfield S, Barber N, Walley P, et al. Quality of medication use in primary care — mapping the problem, working to a solution: a systematic review of the literature. BMC Medicine. 2009; 7, 50–58.

[10] Roughead EE, Semple SJ. Medication safety in acute care in Australia: Where are we now? Part I: A review of the extent and causes of medication problems 2002–2008. Aust New Zealand Health Policy. 2009; 6(18).

[11] Glavin RJ. Drug errors: Consequences, mechanisms and avoidance. Br J Anaesth. 2010; 105(1), 76–82.

[12] de Vries EN, Ramrattan MA, Smorenburg SM, et al. The incidence and nature of in-hospital adverse events: A systematic review. Qual Saf Health Care. 2008; 17(3), 216–223.

[13] Institute of Medicine. Preventing Medication Errors: Quality Chasm Series. Washington DC: National Academy Press; 2007.

related, with around half of these being preventable. Incidents associated with medication is the second most common type of incident in Australian hospitals.[14] Medication errors can not only cause or prolong patient hospitalisation and increase morbidity and mortality, they also represent a significant burden on healthcare resources.[15 16 17 18]

The above definition of medication error is broad, and emphasises that errors can occur at any stage in the medication process — during prescribing, dispensing, or administration of the medication. There is large variation in the rates of error reported across studies for each stage of the medication process. Some studies that have looked at all stages of the process have found that prescribing errors account for the highest proportion of medication errors.[19 20 21] However, dispensing errors vary greatly depending on the study setting (hospital or community pharmacy), with incidence rates varying from 0.5% to 24% of medications dispensed.[22]

The majority of studies investigating medication error incidence rates have focused on secondary care; however, some studies have also found high rates of medication error in primary care,[23 24 25 26] community pharmacies,[27 28] and residential aged care settings.[29 30]

[14] Roughead EE, Semple SJ. Medication safety in acute care in Australia: Where are we now? Part I: A review of the extent and causes of medication problems 2002–2008. Aust New Zealand Health Policy. 2009; 6(18).

[15] Bates DW, Spell NJ, Cullen DJ, et al. The costs of adverse drug events in hospitalised patients. Adverse Drug Events Study Group. JAMA. 1997; 277(4), 307–11.

[16] Institute of Medicine. Preventing Medication Errors: Quality Chasm Series. Washington DC: National Academy Press; 2007.

[17] Roughead EE, Semple SJ. Medication safety in acute care in Australia: Where are we now? Part I: A review of the extent and causes of medication problems 2002–2008. Aust New Zealand Health Policy. 2009; 6(18).

[18] Department of Health. Pharmacy in England: Building on strengths — delivering the future. London: The Stationary Office; 2008.

[19] Lisby M, Nielson LP, Brock, B, Mainz J. How are medication errors defined? A systematic review of definitions and characteristics. Int J Qual Health Care. 2010; 22(6), 507–18.

[20] Kunac DL, Tatley MV. Detecting medication errors in the New Zealand Pharmacovigilance database: A retrospective analysis. Drug Saf. 2011; 34(1), 59–71.

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[23] Garfield S, Barber N, Walley, P et al. Quality of medication use in primary care — mapping the problem, working to a solution: A systematic review of the literature. BMC Medicine. 2009; 7, 50–58.

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[26] Avery AJ, Ghaleb M, Barber N, et al. The prevalence and nature of prescribing and monitoring errors in English general practice: a retrospective case note review. Br J Gen Pract. 2013; 63(613), e543–53.

[27] James KL, Barlow D, McArtney R, et al. Incidence, type and causes of dispensing errors: A review of the literature. Int J Pharm Pract. 2009; 17: 9–30.

[28] Ashcroft DM, Quinlan P, Blenkinsopp A. Prospective study of the incidence, nature and causes of dispensing errors in community pharmacies. Phamacoepidemiol Drug Saf. 2005; 14(5), 327–32.

[29] Barber ND, Alldred DP, Raynor DK. Care homes' use of medicine study: Prevalence, causes and potential harm of medication errors in care homes for older people. Qual Saf Health Care. 2009; 18(5), 341–46.

[30] Szczepura A, Wild D, Nelson S. Medication administration errors for older people in long-term residential care. BMC Geriatrics. 2011; 11(82).

Medication error in New Zealand

Medication-related harm is a significant form of patient harm in New Zealand's healthcare system.[31] A recent study found that 28% of public hospital inpatients at six District Health Boards in New Zealand suffered some form of medication-related harm, with nearly 30% of this harm originating in primary care. However, it is not known what proportion of this harm was caused by error.[32] A study of adverse events in New Zealand public hospitals found that around 12% of all adverse events causing permanent disability or death were medication related, of which 44% were preventable.[33] Additionally, 8% of New Zealanders who responded to a patient experience survey reported being given the wrong type or dose of medication in the primary care setting.[34]

Little research has been conducted on the types and causes of medication errors in New Zealand. However, an analysis of preventable adverse drug events in the New Zealand Pharmacovigilance database found that errors occurred at each stage of the medication process, but the majority were related to the prescribing stage, followed by the administration stage. The most common types of medication errors were wrong dose, failures to detect significant drug interactions or allergies, and lack of necessary clinical monitoring. Around 66% of the medication errors studied resulted in patient harm, and the majority of harmful errors occurred in patients aged 65 years and over.[35]

Substantial work is currently underway in New Zealand to mitigate harm from medication. This work includes the introduction of electronic prescribing, administration and medication reconciliation systems, investigation of a national electronic health record, increasing the partnerships of clinical pharmacists with clinical teams, and specific programmes around high-risk medications.[36]

2.   Using complaints data to investigate medication error

Complaints to the Health and Disability Commissioner

HDC is an independent Crown entity established under the Health and Disability Commissioner Act 1994 to promote and protect the rights of health and disability services consumers. The rights of consumers are set out in the Code of Health and Disability Services Consumers' Rights (the Code). The Code places corresponding obligations on all providers of health and disability services, including organisational and individual providers.

HDC promotes and protects the rights of consumers of health and disability services by:

- resolving complaints;
- improving quality and safety within the sector; and
- holding providers to account appropriately.

As such, HDC fulfils the critical role of independent watchdog for consumer rights within the sector.

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[31] Health Quality & Safety Commission. A window on the quality of New Zealand's health care 2018. Wellington: Health Quality & Safety Commission; 2018.

[32] Robb G, Loe E, Maharaj A, et al. Medication-related patient harm in New Zealand hospitals. N Z Med J. 2017; 130(1460).

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[35] Kunac DL, Tatley MV. Detecting medication errors in the New Zealand Pharmacovigilance database: A retrospective analysis. Drug Saf. 2011; 34(1), 59–71.

[36] Robb G, Loe E, Maharaj A, et al. Medication-related patient harm in New Zealand hospitals. N Z Med J. 2017; 130(1460).

Rights under the Code

1. The right to be treated with respect.
2. The right to freedom from discrimination, coercion, harassment, and exploitation.
3. The right to dignity and independence.
4. The right to services of an appropriate standard.
5. The right to effective communication.
6. The right to be fully informed.
7. The right to make an informed choice and give informed consent.
8. The right to support.
9. Rights in respect of teaching or research.
10. The right to complain.

Anyone may make a complaint to HDC about a health or disability service that has been provided to a consumer. The Commissioner may also commence an investigation on his own initiative, even without having received a complaint, if he considers it appropriate to do so. The steps involved in assessing a complaint vary depending on the circumstances, but usually involve HDC:

- seeking a response to the complaint from the provider(s);
- gathering additional information related to the complaint, for example, HDC may ask the provider for a copy of the consumer's medical records; and
- seeking independent expert advice on the clinical aspects of the care received.

The value of complaints for quality improvement

Every individual complaint represents an opportunity for learning. Both local and sector-wide changes result from the assessment and/or investigation of what went wrong in a particular case, and an analysis of how such events can be prevented in future.

Considered together, complaints can become an even more powerful tool for widespread quality improvement. Understanding trends and patterns in the complaints received, and what occurred in the clinical interactions, allows for the identification of common issues and possible solutions.

Using complaints to investigate medication error

The study of medication error can be challenging. Many medication errors go unreported, particularly when they do not result in patient harm. However, much can be learnt from those "near-miss" errors that are identified before harm occurs.

Complaints data represents a potentially rich source of data to study medication error. This data set offers two main advantages for such analysis.

First, medication errors can often be caught by patients before harm occurs, meaning that complaints data may contain information on near-miss events that can go unreported by more

traditional forms of error reporting. Medication errors are a common adverse event identified by consumers,[37] and studies have found high rates of patient-reported medication error. [38] [39]

Second, the information collected when a complaint is assessed means that relatively thorough documentation is available regarding what happened. Complaints data can, therefore, be particularly valuable in analysing common contributory factors within selected types of adverse events (such as medication errors). In the HDC context, this information usually includes:

- a complaint letter alleging what happened;
- medical records pertaining to the event;
- the provider's response to the complaint;
- expert clinical advice on whether a medication error occurred and what may have contributed to or caused that error;
- the Commissioner's decision report, which synthesises the above information to provide an analysis of what occurred, and whether or not the care provided in relation to the medication error was appropriate; and
- any recommendations made by the Commissioner based on the above analysis to improve the quality of services

It must be noted, however, that complaints data has many limitations. Complaints data is not a proxy for quality of care. Generalisations cannot be made based on complaints data, and there are a number of factors that limit the conclusions that can be drawn. Not all patients who experience an error will make a complaint to HDC, and there are a number of factors that influence what consumers complain about, such as the potential for harm, how visible the error is to the consumer, and the manner of communication with the consumer in the context of the error. Complaints data, therefore, should not be used as a measure for the incidence or prevalence of types of error, but instead can be used to provide insights into some contributing factors to selected types of adverse events (such as medication error).

3. The data used in this report

The data analysed in this report comes from HDC's current complaints database. We extracted, from that database, all complaints closed between 1 January 2009 and 31 December 2016 that were coded as being about a medication error. From that dataset, only complaints in which it was found, on HDC's assessment of the complaint, that a medication error had occurred were extracted. Only those complaints where enough information was available to ascertain the contributing factors to the medication error were then included in the analysis. We identified **310** such complaints.

Complaints to HDC often involve more than one provider, and multiple medication errors are sometimes involved in a single complaint. A separate analysis was undertaken for each medication error complained about. Therefore, although there were 310 complaints about medication errors, **338** medication errors were analysed (the complaints data).

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[37] Harrison R, Walton M, Manias E, et al. The missing evidence: A systematic review or patients' experiences of adverse events in health care. Int J Qual Health Care. 2015; 27(6), 424–42.

[38] Schoen C, Obsborn R, Doty MM, et al. Toward higher-performing health systems: Adults' health care experiences in seven countries. Health Aff (Millwood). 2007; 26(6), w717–34.

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Each error was coded for the stage of the medication process in which the error occurred (prescribing, dispensing, or administering); the setting of the error; the class of medication involved in the error; the type of error that occurred; and the factors that HDC's expert advisor or the provider in their incident analysis identified as contributing to the error. Each error was coded for up to seven contributing factors. The coding taxonomy for "type of error" and "contributing factors" is detailed further in the section entitled "Types of errors and contributing factors".

4. Objectives of this report

As noted above, complaints data can provide valuable insights into contributing factors within selected types of adverse events, and may be a rich source of data to investigate medication error. Accordingly, this report provides an analysis of the HDC complaints data in order to shed light on some possible patterns regarding contributing factors that lead to medication error. Specifically, this report details an analysis of complaints closed by HDC over an eight-year period where a medication error was found to have occurred.

Our primary objectives in analysing this data and reporting on these findings were as follows:

- To identify the characteristics of complaints about medication error, in terms of the types of medications involved, the setting of the error, and the stage of the medication process at which the error occurred.
- To investigate the types of errors that occur during prescribing, dispensing, and administering medication, and the factors that contributed to these errors.
- To compare our findings against the existing literature.
- To bring together the recommendations made in the cases with a view to improving quality of care.

Characteristics of Medication Errors

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Summary of results

- No one stage of the medication process (prescribing, dispensing, or administration) was disproportionately responsible for the majority of errors in the complaints data.
- The most common settings for medication errors in the complaints data were community pharmacies, general practices, and public hospitals.
- Psychotropic medications were the most common medication class involved in errors, followed by antibiotics, opioids, cardiovascular agents, and analgesics.

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1. Stage of medication process in which error occurred

Introduction

This section looks at the stage in the medication process in which the error occurred. The types of errors that occurred in each stage and their contributing factors are analysed in depth in the next section.

The medication process has three stages — prescribing, dispensing, and administration. It is important to note that this analysis looks at only those errors made by healthcare professionals; therefore, this cannot be seen as a single process, as a number of medications will be administered by the patients themselves after the medication has been prescribed and dispensed by a healthcare professional.

Some studies suggest that the majority of errors occur during the prescribing stage,[40] [41] [42] although dispensing error rates vary greatly depending on the study setting.

What does the HDC complaints data show?

As can be seen from Table 1 and Figure 1 below, no one stage of the process was disproportionately responsible for the majority of errors in the complaints data. The majority of errors occurred in the dispensing stage (39%), and the least number of errors occurred in the administration stage (28%), with prescribing accounting for 33% of errors.

Table 1. Stage of medication process in which error occurred

	Number of errors	Proportion of errors
Prescribing	111	33%
Dispensing	131	39%
Administration	96	28%

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[40] Lisby M, Nielson LP, Brock, B, Mainz J. How are medication errors defined? A systematic review of definitions and characteristics. Int J Qual Health Care. 2010; 22(6), 507–18.

[41] Kunac DL, Tatley MV. Detecting medication errors in the New Zealand Pharmacovigilance database: A retrospective analysis. Drug Saf. 2011; 34(1), 59–71.

[42] Bates DW, Cullen DJ, Laird N, et al. Incidence of adverse drug events and potential adverse drug events. Implications for Prevention. ADE Prevention Study Group. JAMA. 1995; 274, 29–34.

Figure 1. Stage of medication process in which error occurred
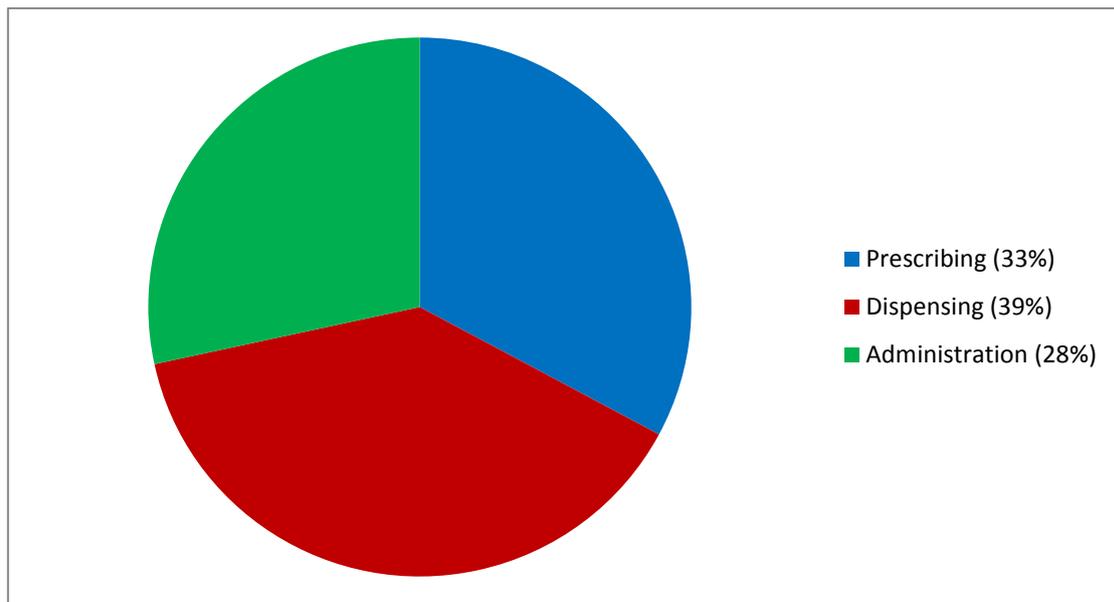
2. Setting of medication errors

Introduction

This section details the healthcare setting in which the medication errors in the complaints data occurred.

Medication errors occur in all healthcare settings, and the prevalence and type of error is often associated with the setting in which the error occurred.

Common settings for medication errors have been identified as hospitals — both inpatient and outpatient settings; community pharmacies; general practices; and residential aged care facilities. However, research into medication errors has tended to focus on errors that occur during inpatient hospital care, with less attention being paid to errors in community healthcare settings.

What does the HDC complaints data show?

Table 2 details the healthcare settings involved in the medication errors.

Table 2. Setting of medication error

Healthcare setting	Number of errors	Proportion of errors
Community pharmacy	129	38%
General practice/medical centre	83	25%
Public hospital	75	22%
Residential aged care facility	29	9%
Other residential facility	7	2%
Prison	7	2%
Private hospital/clinic	4	1%
Other setting	4	1%
TOTAL	338	

The most common setting for medication errors in the complaints data was community pharmacies, with 38% of errors occurring in this setting. Other common settings included general practices (25%), public hospitals (22%), and residential aged care facilities (9%).

Table 3 details the stage of the medication process in which the error occurred, for the five most common settings. Unsurprisingly, all errors in community pharmacies were dispensing errors. Errors that occurred in general practice settings were predominantly prescribing errors, and errors that occurred in residential aged care facilities were predominantly administration errors. This data will be explored further in the next section.

Table 3. Stage of medication process in which error occurred, by healthcare setting

	Number of errors	**Proportion of errors in setting**
Community pharmacy	*129*	
Dispensing	129	100%
General practice/medical centre	*83*	
Prescribing	61	73%
Dispensing	1	1%
Administration	21	25%
Public hospital	*75*	
Prescribing	41	55%
Dispensing	1	1%
Administration	33	44%
Residential aged care facility	*29*	
Prescribing	3	10%
Administration	26	90%

What does this tell us?

The majority of errors in the complaints data originated in the community setting, with community pharmacies and general practices being the most common settings for medication errors. This is consistent with the small number of studies conducted on medication error in New Zealand, which have found that a number of adverse drug events originate in the community setting.[43 44 45 46]

Community pharmacies were the most common setting for medication errors in the complaints data. This is probably due to the fact that almost all dispensing errors complained about occurred in community pharmacies, and indicates that complaints data may be a potentially rich dataset for analysing contributing factors to errors that occur in this setting.

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[43] Robb G, Loe E, Maharaj A, et al. Medication-related patient harm in New Zealand hospitals. N Z Med J. 2017; 130(1460).

[44] Kunac DL, Tatley MV, Seddon ME. A new web-based Medication Error reporting Programme (MERP) to supplement pharmacovigilance in New Zealand — findings from a pilot study in primary care. N Z Med J. 2014; 127(1401), 69–81.

[45] Kunac DL, Tatley MV. Detecting medication errors in the New Zealand Pharmacovigilance database: A retrospective analysis. Drug Saf. 2011; 34(1), 59–71.

[46] Health Quality & Safety Commission. A window on the quality of New Zealand's health care 2017. Wellington: Health Quality & Safety Commission; 2017.

General practices were the setting for a quarter of the medication errors in the complaints data. International research has identified primary care as a common setting for medication error.[47] Studies investigating medication errors in primary care have tended to focus on prescribing errors made by GPs; however, 25% of errors complained about in this setting related to the administration of medications.

Twenty-two percent of errors occurred in the public hospital setting, with general medicine, surgical, and emergency department services being the most common public hospital service types involved. International research has also identified these services as common settings for medication error.[48] [49] [50]

Residential aged care facilities were the setting for 9% of the errors in the complaints data. International research has cited these facilities as potentially error prone, as residents are often prescribed multiple medications by multiple providers, and age-related changes make them particularly susceptible to adverse reactions.[51]

3. Types of medications involved in errors

Introduction

This section presents the types of medication that were involved in the errors in the complaints data.

A number of factors can affect which medications are involved in medication errors, including the frequency with which medications are prescribed; medications that have similar names or packaging; commonly used medications to which patients may be allergic; their potential for drug–drug interactions; and medications that require testing to ensure that therapeutic levels are maintained.[52]

The medications identified by research as being commonly associated with medication errors include analgesics, nonsteroidal anti-inflammatories, antibiotics, cardiovascular drugs, gastrointestinal drugs, and psychotropic medications.[53] [54] [55] [56] Some medications have been labelled as "high-alert" medications. These are medications that are not necessarily more prone to error, but

[47] The PRACtICe Study (PRevalence And Causes of prescribing errors in general practiCe). A report for the General Medical Council. 2012.

[48] Pham JC, Story JL, Hicks RW, et al. National study on the frequency, types, causes and consequences of voluntarily reported emergency department medication errors. J Emerg Med. 2011; 40(5), 485–92.

[49] Davis P, Lay-Yee R, Briant R, et al. Adverse events in New Zealand public hospitals II: Preventability and clinical context. N Z Med J. 2003; 116(1183).

[50] Franklin BD, Reynolds M, Shebel NA, et al. Prescribing errors in hospital inpatients: A three-centre study of their prevalence, types and causes. Postgrad M J. 2011; 87(1033) 739–45.

[51] Barber ND, Alldred DP, Raynor DK, et al. Care homes' use of medicines study: Prevalence, causes and potential harm of medication errors in care homes for older people. BMJ Qual Saf. 2009; 18, 341–46.

[52] Hughes RG, Blegen MA. Medication administration safety. In Hughes RG (ed). Patient safety and quality: An evidence-based handbook for nurses. Rockville: Agency for Healthcare Research and Quality; 2008.

[53] Hughes RG, Ortiz, E. Medication errors: Why they happen and how they can be prevented. Am J Nurs. 2005; 105(3 Suppl), 14–24.

[54] Kunac DL, Tatley MV. Detecting medication errors in the New Zealand Pharmacovigilance database: A retrospective analysis. Drug Saf. 2011; 34(1), 59–71.

[55] Keers RN, Williams SD, Cooke J, Ashcroft DM. Prevalence and nature of medication administration errors in health care settings: A systematic review of direct observational evidence. Ann Pharmacother. 2013; 47(2), 237–56.

[56] Glavin RJ. Drug errors: consequences, mechanisms and avoidance. Br J Anaesth. 2010; 105(1), 76–82.

that may require additional safeguards because they are likely to cause significant harm to patients when used in error. These medications include insulin, opioids, anticoagulants, and sedatives.[57]

What does the HDC complaints data show?

Table 4 details the most common classes of medications involved in errors in the complaints data.

Table 4. Most common classes of medications involved in errors

Medication class	Number of errors	Proportion of errors
Psychotropic medications	67	20%
Antibiotics	46	14%
Opioids	40	12%
Cardiovascular medications	34	10%
Analgesics (simple)	32	9%
Steroids	12	4%
Vaccines	12	4%
Anticonvulsants	10	3%
Diabetic medications	10	3%
Anticoagulants	9	3%

Psychotropic medications (20%) were the most common medication class involved in errors, followed by antibiotics (14%), opioids (12%), cardiovascular agents (10%), and analgesics (9%).

Psychotropic medications were most often antidepressants (7% of all errors), followed by anti-psychotics (6%) and anti-anxiety medications (4%). Cardiovascular medications were most often statins (4% of all errors) and beta-blockers (2%). Analgesics were paracetamol (5% of all errors) and non-steroidal anti-inflammatory drugs (4%). Common types of opioids involved in errors were morphine (3% of all errors), tramadol (3%), and methadone (2%).

Table 5 below details the stage of the medication process in which the error occurred for the five most commonly complained about medication classes.

The majority of medication errors involving antibiotics occurred during the prescribing stage, and the majority of errors involving cardiovascular medications occurred in the dispensing stage. This data will be explored further in the next section.

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[57] Available from: www.ismp.org

Table 5. Stage of medication process in which error occurred, by class of medication involved in error

	Number of errors	**Proportion of errors about medication class**
Psychotropic medications	*67*	
Prescribing	21	31%
Dispensing	26	39%
Administration	20	30%
Antibiotics	*46*	
Prescribing	26	57%
Dispensing	14	30%
Administration	6	13%
Opioids	*40*	
Prescribing	15	38%
Dispensing	11	28%
Administration	14	35%
Cardiovascular medications	*34*	
Prescribing	8	24%
Dispensing	17	50%
Administration	9	26%
Analgesics (simple)	*32*	
Prescribing	11	34%
Dispensing	13	41%
Administration	8	25%

What does this tell us?

The common classes of medications involved in errors in the complaints data is consistent with findings in the international literature, which lists analgesics, antibiotics, cardiovascular agents, and psychotropic drugs as being medications commonly associated with medication errors.

Many of the medications commonly involved in errors in the complaints data were "high-alert" medications — medications that are more likely to cause harm to patients when used in error, including opioids, insulin, and sedatives. This finding is likely due to the nature of complaints data. Consumers may be more likely to complain about errors involving these types of medications owing to the high likelihood for harm.

Psychotropic medications were the most common type of medications involved in errors in the complaints data, with 20% of errors involving these types of medications. Psychotropic drugs have commonly been implicated in studies investigating inappropriate prescribing.[58] There are many factors associated with psychotropic drug use that may affect the potential for error, including that they are a commonly prescribed treatment; their use in polypharmacy; their potential for drug–drug interactions; fragmented care provision in mental health; that some psychotropic medications are look-alike/sound-alike medications; monitoring requirements associated with the prescribing of psychotropic medication; and the use of off-label prescribing.[59 60 61 62]

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[58] Roughead L, Semple S, Rosenfeld E. Literature Review: Medication Safety in Australia. Sydney: Australian Commission on Safety and Quality in Health Care; 2013.

[59] Maidment ID, Lelliott P, Paton C. Medication errors in mental healthcare: A systematic review. Qual Saf Health Care. 2006; 15, 409–13.

Opioids were involved in 12% of errors in the complaints data. This class of medication has a high potential for harm when used in error. The factors that may contribute to error with the use of these medications include patient allergies; that some opioids are look-alike/sound-alike medications; their routes of administration; monitoring requirements associated with the prescribing of opioids; the potential for dosing errors; and their potential for drug–drug interactions.[63] [64]

Similar to what has been reported in the literature, antibiotics and analgesics were also commonly involved in errors. These medications are frequently prescribed, have allergies associated with them, can have complex dosing regimens, and have a number of possible contraindications, making them prone to error.

Cardiovascular medications were also a common class of drug in the complaints data. Some of these medications have a heightened risk of causing significant harm when used in error. Cardiovascular medications may be implicated in higher numbers of errors owing to their monitoring requirements; the frequency with which these medications are prescribed; the potential for dosing errors; fragmentation of care for patients using these medications; the introduction of new therapies; their use in polypharmacy; and the potential for drug–drug interactions.

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[60] Maidment ID, Parmentier H. Medication error in mental health: Implications for primary care. Ment Health Fam Care. 2009; 6, 203–207.

[61] Hughes RG, Blegen MA. Medication administration safety. In Hughes RG (ed). Patient safety and quality: An evidence-based handbook for nurses. Rockville: Agency for Healthcare Research and Quality; 2008.

[62] Roughhead L, Procter N, Westaway K, et al. Medication Safety in Mental Health. Sydney: Australian Commission on Safety and Quality in Health Care; 2017.

[63] Hughes RG, Blegen MA. Medication administration safety. In Hughes RG (ed). Patient safety and quality: An evidence-based handbook for nurses. Rockville: Agency for Healthcare Research and Quality; 2008.

[64] Institute for Safe Medication Practices. High alert medication feature: Reducing patient harm from opiates. Available from www.ismp.org; 2007.

Types of Errors and Contributing Factors

1. Describing and categorising medication error

Introduction

Human error and systems issues are both significant contributors to medication error. Although essentially all medication errors are errors made by individual providers, properties of systems can both make providers more prone to error and rectify errors before they can cause harm. A systems approach is therefore often used to look at the causes of medication error.

Reason's accident causation model[65] can be used to look at the causes of medication errors. Using this model, there are broadly four types of medication error:

1. *Mistakes:* Selecting the wrong plan to achieve the desired goal. Mistakes can be knowledge-based errors (errors that occur through lack of knowledge) or rules-based errors (mistakes that occur through using a bad rule or misapplying a good rule)
2. *Slips:* Intending to do one thing, but doing another
3. *Lapses:* Forgetting to do something
4. *Violations:* Deliberate deviation from instruction or rules[66]

According to Reason's model, there are "latent" failures (organisational processes and management decisions) within systems and "error producing conditions" (environmental, team, technology, or task factors that affect performance) within the environment that make providers susceptible to error. However, "defences" in a system can identify an error and rectify it before it results in harm.

Most medication errors fall into the categories of mistakes, slips, and lapses.[67] [68] [69] [70] Common error-producing conditions identified in studies of medication errors include provider training; poor communication between providers; inadequate documentation; high workloads; time pressures; chaotic physical spaces; distractions and interruptions during the medication process; deficiencies in technology; individual knowledge and experience; and staff health issues. These error-producing conditions often arise owing to latent conditions such as the organisational culture (including the impact of hierarchy, relationships between clinicians and management, type of leadership, and tolerance of the sub-optimal — where sub-optimal practices became normalised); inadequate policy/procedures; staffing and resourcing issues; staff induction processes; and organisational feedback regarding errors.[71] [72] [73] [74] [75] [76] The below case study is an example of how conditions in the work environment can contribute to medication errors harming the patient.

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[65] Reason JT. Human error. New York: Cambridge University Press; 1990.

[66] Aronson JK. Medication errors: what they are, how they happen, and how to avoid them. Q J Med. 2009; 102, 513–21.

[67] Sanghera IS, Franklin BD, Dhillon S. The attitudes and beliefs of health care professionals on the causes and reporting of medication errors in a UK intensive care unit. Anaesthesia. 2006; 62(1), 53–61.

[68] Dean B, Schachter M, Vincent C, Barber N. Causes of prescribing errors in hospital inpatients: a prospective study. Lancet. 2002; 359, 1373–78.

[69] Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of medication administration errors in hospitals: A systematic review of the quantitative and qualitative evidence. 2013; 36, 1045–67.

[70] The PRACtICe Study (PRevalence And Causes of prescribing errors in general practiCe). A report for the General Medical Council. 2012.

[71] The PRACtICe Study (PRevalence And Causes of prescribing errors in general practiCe). A report for the General Medical Council. 2012.

[72] Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of medication administration errors in hospitals: A systematic review of the quantitative and qualitative evidence. 2013; 36, 1045–67.

Case study: Administration of medication to consumer with known allergy
(14HDC00157)

Mrs A, an 80-year-old woman who had previously experienced a severe adverse reaction to the antibiotic trimethoprim, was admitted to a public hospital for a period of supportive rehabilitation following surgery. Mrs A wore a MedicAlert bracelet that stated: "Allergy Co-Trimoxazole & Trimethoprim Angina."

The admitting house officer took a full medical history and recorded in the progress notes that Mrs A had multiple medication allergies. The house officer handwrote orange adverse reaction labels/stickers and stuck one to each page of Mrs A's drug chart. In particular, the orange sticker stated: "Trimethoprim/Co-trimoxazole — toxic epidermal necrolysis."

Two days later, a registrar, Dr E, reviewed Mrs A for a suspected urinary tract infection. Dr E prescribed trimethoprim 1 x 300mg tablet to be given to Mrs A at night for five days. Dr E did not check the orange adverse reaction stickers. Dr E, while accepting that she made a "grievous error", pointed to a number of systemic factors in the ward. In particular, she noted the workload, high patient turnover, and the requirement to support and supervise junior staff, which made her vulnerable to omitting her standard check of the orange alert sticker.

That night, registered nurse (RN) F administered Mrs A her first dose of trimethoprim. RN F stated that in her busyness she did not see the adverse reaction written on the adverse reaction sticker, and instead placed too much reliance on the fact that Mrs A would not be charted medications to which she was allergic.

The following morning, Mrs A was reviewed by another registrar, who identified that Mrs A had been given trimethoprim, to which she was allergic. Mrs A was admitted to intensive care with toxic epidermal necrolysis, a life-threatening skin condition resulting from the allergic reaction to the trimethoprim. Mrs A underwent surgery but, sadly, she died a few days later.

The Commissioner considered that both Dr E and RN F missed several opportunities to establish Mrs A's allergy status, including reading the notes, reviewing the drug chart, noting the MedicAlert bracelet, and asking Mrs A whether she had any allergies. The Commissioner acknowledged that the ward was busy, but stated that it was Dr E's responsibility to take the necessary steps to ensure that Mrs A was prescribed medication that was appropriate for her. By failing to do so, the Commissioner held that Dr E did not provide services to Mrs A with reasonable care and skill, in breach of Right 4(1) of the Code. While HDC's expert advisor noted that the clinical workload contributed to RN F's administration error, nevertheless the advisor considered the error to be a severe departure from accepted standards. The Commissioner was also concerned that RN F failed to think critically, and placed too much reliance on Mrs A not being charted medications to which she was allergic. The Commissioner held that RN F failed to provide services to Mrs A with reasonable care and skill, in breach of Right 4(1) of the Code. The Commissioner recommended that Dr E's and RN F's respective regulatory authorities consider whether a review of their competence was warranted.

There were a number of systemic factors in the ward that made Dr E vulnerable to making an error, including a large workload, high patient turnover, the requirement to supervise house officers, the physical set-up and chaotic nature of the ward, medical staff being constantly interrupted, and a confrontational work environment. Additionally, staff on the ward raised concerns about the work environment, identifying that there was a culture in the ward of concerns raised not being acted on and staff feeling unable to communicate

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[73] Harvey J, Avery AJ, Ashcroft D, et al. Exploring safety systems for dispensing in community pharmacies: Focusing on how staff relate to organizational components. Res Social Adm Pharm. 2015; 11(2), 216–27.

[74] Ross S, Ryan C, Duncan EM, et al. Perceived causes of prescribing errors by junior doctors in hospital inpatients: A study from the PROTECT programme. BMJ Qual Saf. 2013; 22(2), 97–102.

[75] Kiekkas P, Karga M, Lemonidou C, et al. Medication errors in critically ill adults: A review of direct observation evidence. Am J Crit Care. 2011; 20(1): 36–44.

[76] Sanghera IS, Franklin BD, Dhillon S. The attitudes and beliefs of health care professionals on the causes and reporting of medication errors in a UK intensive care unit. Anaesthesia. 2006; 62(1), 53–61.

freely about issues regarding day-to-day operations on the ward. HDC's expert advisor commented: "It is in such environments that major errors occur".

The Commissioner considered that systemic failures at the DHB directly contributed to the errors made by Dr E and RN F. The Commissioner held that the DHB failed to provide services to Mrs A with reasonable care and skill, in breach of Right 4(1) of the Code.

The Commissioner made a number of recommendations to the DHB, including that it report on its involvement in the Health Quality & Safety Commission's National Medication Safety Programme; report back to HDC on the recommendations outlined in its root cause analysis, including its review of workloads at the hospital and its review of the working environment and clinical governance of the ward; develop a process by which all staff are empowered to raise concerns about issues related to patient safety, and the concerns are responded to and acted on; and develop a process to ensure that clinicians who are prescribing and administering medication are not interrupted or otherwise exposed to factors that increase errors.

These recommendations have been met.

The three stages of the medication process (prescribing, dispensing, and administration) are carried out by different provider groups, and each of these providers represents a line of defence against errors harming the patient. Each individual provider in the process must do their part to ensure patient safety. This includes thinking critically about whether the right medication is being given to the right patient, for the right reasons, at the right dose, and at the right time.

The first line of defence is the prescribing clinician, who should ensure that he or she has all the information required to make the best prescribing decision for each patient. The second line of defence is the provider (usually a pharmacist) dispensing the medication. This provider has an important role to play in reviewing the prescription and assessing its appropriateness. This provider also should ensure that the medication is dispensed in the right dose, the right form, and at the right frequency. The third line of defence is the provider administering the medication (most often a nurse). The administration stage provides a final check to ensure that the right patient is being given the right drug, at the right dose, at the right time, and through the right route. The last line of defence is patients themselves, who can question why they are receiving a medication, verify that it is the appropriate medication, and alert the clinician to any potential issues, such as allergies or past drug–drug interactions.[77] The below case study provides an example of how medication errors can reach the patient when healthcare providers do not act as a line of defence, and when the patient is not given the necessary information to act as a defence.

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[77] Hughes RG, Ortiz, E. Medication errors: Why they happen and how they can be prevented. Am J Nurs. 2005; 105(3 Suppl), 14–24.

Case study: Prescription of contraindicated medication
(13HDC01300)

Mrs B, an elderly rest home resident, developed a severe rash for which her GP (Dr C) prescribed ketoconazole. Ketoconazole has a high risk of causing liver injury and is contraindicated with simvastatin, which Mrs B was taking at the time.

The pharmacy that dispensed the ketoconazole had dispensing software that highlighted drug interactions. However, no one from the pharmacy contacted Dr C about the drug interaction between simvastatin and ketoconazole. Mrs B's rash occurred a second time, and again Dr C prescribed ketoconazole. No one from the pharmacy advised Dr C of the drug interaction. When Mrs B's rash occurred a third time, Dr C prescribed ketoconazole at double the previously prescribed dose and for double the length of time. Again, no one from the pharmacy advised Dr C of the drug interaction. Dr C did not monitor Mrs A's liver function on any of the occasions on which he prescribed ketoconazole.

Mrs B later had a fall and was taken to hospital. On arrival at the hospital, her medications were documented but ketoconazole was not included. Six days later, clinicians reviewed Mrs B's computerised pharmacy dispensing records and discovered for the first time that she had been prescribed ketoconazole. Mrs B suffered acute kidney failure and, sadly, died.

Dr C was aware of the interaction between ketoconazole and simvastatin, but he did not check the GP notes for Mrs B's existing medications, which included simvastatin, when he prescribed her ketoconazole. The Commissioner considered that Dr C should have ensured that Mrs B's medication records were readily accessible to him and reviewed prior to prescribing. The Commissioner noted that this highlighted the importance of taking a comprehensive history from the patient, reviewing the risk factors, and having a discussion with the patient about the medication before prescribing.

The Commissioner considered that by failing to establish Mrs B's medical history appropriately, by not monitoring her liver function adequately when prescribing ketoconazole, and by co-prescribing ketoconazole with simvastatin, Dr C did not provide services to Mrs A with reasonable care and skill, in breach of Right 4(1) of the Code. Additionally, the Commissioner considered that Dr C did not provide Mrs B with information regarding the potential risks and side-effects of ketoconazole, in breach of Right 6(1)(b) of the Code. It follows that without this information, Mrs B was not in a position to make an informed choice and give her informed consent to taking ketoconazole. Accordingly, Dr C was also found in breach of Right 7(1) of the Code. In response to a recommendation by the Commissioner, Dr C underwent further training on good prescribing practice. The Commissioner also recommended that the Medical Council of New Zealand consider whether a review of Dr C's competence was warranted.

HDC's expert advisor considered that assessing the suitability of a prescribed medication forms part of the fundamental responsibility of a pharmacist during the dispensing process. The Commissioner noted that the relevant part of the Pharmacy's Standard Operating Procedures (SOPs) in place to guide staff in dealing with alerts and contraindicated drugs was inadequate, as it did not require an alert to be documented, communicated, and investigated. In addition, on three occasions, staff at the pharmacy dispensed an inappropriate product, failed to evaluate the prescription for correctness, and failed to notify Dr C when the alert was prompted. Accordingly, the Commissioner considered that the pharmacy failed to comply with professional standards, in breach of Right 4(2) of the Code. In response to recommendations made by the Commissioner, the pharmacy obtained an independent review of its dispensing SOPs and provided training to its pharmacists on its dispensing SOPs.

Two documents listed ketoconazole as one of Mrs B's current medications. However, both documents appear to have been missed or overlooked by DHB staff when Mrs B was admitted to hospital. The DHB acknowledged that if medicines reconciliation had occurred on the day of admission, it is likely that the true nature of Mrs B's illness would have been identified at an earlier stage. The Commissioner was critical that Mrs B's notes were not reviewed adequately and that medicines reconciliation did not occur, and found that the DHB failed to provide services to Mrs A with reasonable care and skill, in breach of Right 4(1) of the Code. The DHB advised that since these events there has been an increased presence of pharmacists on the ward and in the emergency department, with an expectation that prescribing errors in the community will be addressed at the time of admission.

Our coding methodology

In order to analyse the types of errors and the contributing factors to medication error in a systematic way, we created a coding taxonomy for both type of error and contributing factors.

The coding taxonomy for type of error was initially created based on common types of medication error reported in the literature, and then refined based on what was seen in the complaints data. It was made up of 11 different types of error.

Contributing factors to each error were coded based on what providers found in their incident reviews and/or on what HDC's expert advisor considered to be the contributing factors to the error. Each error was coded for up to seven contributing factors. A draft coding taxonomy was created based on analysis of 50 errors. This taxonomy was then discussed, which led to further refinement and agreement on 20 factors. These 20 factors were grouped into 5 over-arching categories. This coding taxonomy is further explained and defined in Appendix 1.

2. Prescribing errors

Summary of results

- The most common settings for prescribing errors were general practices, followed by public hospitals.
- The most common medication classes involved in prescribing errors were antibiotics and psychotropic medications.
- The most common prescribing error was the prescribing of an inappropriate medication (prescribing a contraindicated medication or a medication to which the consumer was allergic/had had a previous adverse reaction). The other common type of prescribing error was prescribing the wrong dose of medication.
- The majority of wrong-dose errors and the prescribing of contraindicated medicines occurred in primary care settings. Antibiotics were the most commonly prescribed medication to which the patient was allergic/had experienced a previous adverse reaction.
- The most common factors identified as contributing to prescribing errors were failure to obtain necessary information, failure to communicate effectively with the consumer, failure to act on information, inadequate communication between providers, an inadequate software system, and inadequate/incorrect documentation.
- Failure to obtain necessary information contributed to a disproportionate number of inappropriate medication errors. A higher proportion of inappropriate medication errors were also related to a failure to communicate effectively with the consumer.
- Transcription errors contributed to a disproportionate number of wrong-dose errors.

Introduction

The prescribing of medication is one of the most common forms of medical treatment.[78] A prescription is "a written order, which includes detailed instructions of what medicine should be given to whom, in what formulation and dose, by what route, when, how frequently, and for how long".[79] The act of prescribing a medication involves both deciding what to prescribe and the act of writing the prescription.[80] Each prescribing decision requires the provider to balance the potential for benefit against the risk of harm, and to use their clinical knowledge to apply a body of rules (such as contraindications) to the decision.[81]

A prescribing error is defined as when, as a result of a prescribing decision or the prescription-writing process, there is an unintentional, significant reduction in the probability of treatment being timely and effective, or an increase in the risk of harm when compared to generally accepted practice.[82]

Prescribing errors have been found to be common in both hospital and primary care settings. It has been found that prescribing errors affect around 7% of medication orders in hospitals,[83] and around 5% of prescriptions in primary care settings.[84] The most common types of prescribing errors reported in the literature are incomplete prescription, wrong dose, and omission of clinically indicated treatment.[85 86 87 88 89]

Studies of contributing factors to prescribing errors have found that the majority of errors are mistakes (selecting the wrong plan to achieve a desired goal) due to inadequate knowledge of the medication or patient. Slips and lapses are also commonly reported, for example distractions or interruptions preventing checking of the prescription, or work pressure resulting in forgetfulness.[90] Common error-producing conditions include high workload; the provider's medication knowledge and knowledge of the patient; time pressure; interruptions; poor quality of medication information on hospital admission; poor coordination of care within and between teams, and between primary and secondary

[78] The PRACtICe Study (PRevalence And Causes of prescribing errors in general practiCe). A report for the General Medical Council. 2012.

[79] Aronson JK. Balanced prescribing. Br J Clin Pharmacol. 2006; 62, 629–32.

[80] Aronson JK. Adverse drug reactions: History, terminology, classification, causality, frequency, preventability. In Talbot J, Aronson JK (eds) Stephens' Detection and Evaluation of Adverse Drug Reactions: Principals and Practice, Sixth Edition. John Wiley & Sons Ltd, 2012.

[81] The PRACtICe Study (PRevalence And Causes of prescribing errors in general practiCe). A report for the General Medical Council. 2012.

[82] The PRACtICe Study (PRevalence And Causes of prescribing errors in general practiCe). A report for the General Medical Council. 2012.

[83] Lewis PJ, Dornan T, Taylor D, et al. Prevalence, incidence and nature of prescribing errors in hospital inpatients: A systematic review. Drug Saf. 2009; 35(5), 379–89.

[84] Avery AJ, Ghaleb M, Barber N, et al. The prevalence and nature of prescribing and monitoring errors in English general practice: a retrospective case note review. Br J Gen Pract. 2013; 63(613), e543–53.

[85] Franklin BD, Reynolds M, Shebel NA, et al. Prescribing errors in hospital inpatients: A three-centre study of their prevalence, types and causes. Postgrad M J. 2011; 87(1033) 739–45.

[86] Abramson EL, Bates DW, Jenter C, et al. Ambulatory prescribing errors among community-based providers in two states. J Am Med Inform Assoc. 2012; 19(4), 644–48.

[87] Seden K, Kirkham JJ, Kennedy T, et al. Cross-sectional study of prescribing errors in patients admitted to nine hospitals across North West England. BMJ Open. 2013; 3(1).

[88] Sayers YM, Armstrong P, Hanley K. Prescribing errors in general practice: A prospective study. Eur J Gen Pract. 2009; 15(2), 81–83.

[89] Avery AJ, Ghaleb M, Barber N, et al. The prevalence and nature of prescribing and monitoring errors in English general practice: a retrospective case note review. Br J Gen Pract. 2013; 63(613), e543–53.

[90] Tully MP. Prescribing errors in hospital practice. Br J Clin Pharmacol. 2012; 74(4): 668–75.

care; technology-related issues; and lack of documentation of prescribing decisions. Common latent conditions include reluctance to challenge senior staff members' prescribing decisions; inadequate provision of staff training; and inaccessibility of patient documentation.[91] [92] [93] [94]

The Medical Council of New Zealand (MCNZ) sets out the standards for good prescribing practice.[95] It states that providers should prescribe medications only after assessing the patient's condition adequately, and/or ensuring they have adequate knowledge of the patient's conditions and are therefore satisfied that the medications are in the patient's best interests. MCNZ requires providers to be familiar with the indications, adverse effects, contraindications, major drug interactions, appropriate dosages, monitoring requirements, and effectiveness of the medications they prescribe; to take an adequate history of the patient; to consider whether a prescription is warranted; to ensure that the patient is fully informed and consents to the treatment; to ensure that the patient understands how to take or use any medicine prescribed; to consider the input other providers may be able to offer; to prescribe in accordance with accepted practice and best practice guidelines; to share information about the prescribing with other providers involved in the patient's care; to review the effect of the medication periodically; and to keep a clear, accurate, and timely patient record.

What does the HDC complaints data show?

Thirty-three percent of the medication errors in the complaints data were prescribing errors, with it being the second most common form of error behind dispensing error (39%).

Characteristics of prescribing errors
Table 6 presents the setting in which each prescribing error occurred. The most common settings for prescribing errors in the complaints data were general practice/medical centres (55%), followed by public hospitals (37%).

Table 6. Setting of prescribing errors

Health care setting	Number of prescribing errors	Proportion of prescribing errors
General practice/medical centre	61	55%
Public hospital	41	37%
Residential aged care facility	3	3%
Prison	2	2%
Private hospital/clinic	2	2%
Other setting	2	2%
TOTAL	111	

[91] Tully MP, Ashcroft DM, Dornan T, et al. The causes of and factors associated with prescribing errors in hospital inpatients: A systematic review. Drug Saf. 2009; 32(10), 819-36

[92] Ross S, Ryan C, Duncan EM, et al. Perceived causes of prescribing errors by junior doctors in hospital inpatients: A study from the PROTECT programme. BMJ Qual Saf. 2013; 22(2), 97-102

[93] Franklin BD, Reynolds M, Shebel NA, et al. Prescribing errors in hospital inpatients: A three-centre study of their prevalence, types and causes. Postgrad M J. 2011; 87(1033) 739-45.

[94] Slight SP, Howard R, Ghaleb M, et al. The causes of prescribing errors in English general practices: A qualitative study. Br J Gen Pract. 2013; 63(615), e713-20.

[95] Medical Council of New Zealand. Good prescribing practice. Available from www.mcnz.org.nz; 2016

Table 7 details the most common classes of medications involved in prescribing errors.

Table 7. Most common classes of medications involved in prescribing errors

Medication class	Number of prescribing errors	Proportion of prescribing errors
Antibiotics	26	23%
Psychotropic medications	21	19%
Opioids	15	14%
Analgesics (simple)	11	10%
Cardiovascular medications	8	7%
Steroids	6	5%
Antifungal	5	5%
Chemotherapy drugs	3	3%
Anticoagulants	3	3%

The most common medication classes involved in prescribing errors were antibiotics (23%), psychotropic medications (19%), opioids (14%), and analgesics (10%). This is broadly similar to what was seen across all medication errors; however, there was a higher proportion of antibiotics involved in prescribing errors than was seen for all errors.

Types of prescribing errors
The types of prescribing errors in the complaints data are reported below in Table 8 and Figure 2. All those types of error that occurred in less than 1% of errors have been collated together and labelled as "other".

Table 8. Type of prescribing error

Types of error	Number of errors	Proportion of errors
Inappropriate medication	**53**	**48%**
Allergy/adverse reaction	23	21%
Contraindicated	25	23%
Other	5	5%
Wrong dose	**29**	**26%**
Failure to prescribe	**10**	**9%**
Wrong drug	**7**	**6%**
Monitoring error	**7**	**6%**
Other error	**5**	**5%**
TOTAL	**111**	

The most common prescribing error was the prescribing of an inappropriate medication (48%), with 23% of errors relating to the prescribing of a contraindicated medication and 21% relating to the prescribing of a drug to which the consumer was allergic or to which the consumer had a history of a previous adverse reaction. The other common type of prescribing error was prescribing the wrong dose of medication (26%).

Primary care settings were associated with wrong-dose errors and the prescribing of contraindicated medicines, with 65% of wrong-dose errors and 68% of errors relating to prescribing a contraindicated medication occurring in general practices.

Antibiotics were the most commonly prescribed medication to which the patient was allergic or had experienced a previous adverse reaction (65%), followed by opioids (22%). No other types of prescribing errors were particularly associated with any one class of medication.

Figure 2. Type of prescribing error

Legend:
- Inappropriate medication
- Wrong dose
- Failure to prescribe
- Wrong medication
- Monitoring error
- Other
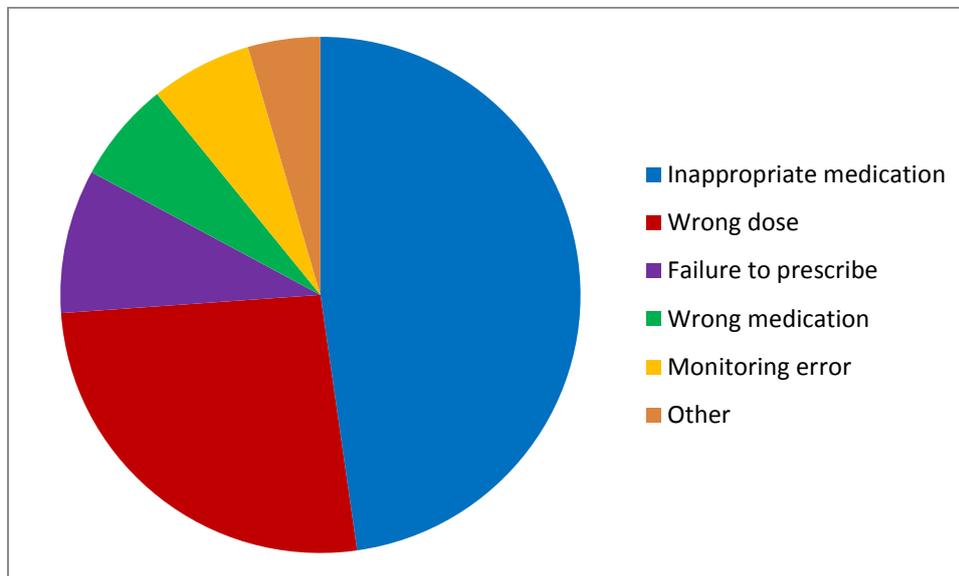
Contributing factors to prescribing errors
The contributing factors to the prescribing errors in the complaints data are reported below in Table 9.

The most common factors identified as contributing to prescribing errors were "failure to obtain necessary information" (60%), "failure to communicate effectively with consumer" (43%), "failure to act on information" (32%), "inadequate communication between providers" (31%), "inadequate software system" (28%), and "inadequate/incorrect documentation" (27%). Compared to what was seen across all medication errors in the complaints data, prescribing errors had a higher proportion of contributing factors related to obtaining necessary information, acting on information, inadequacies in the software system, and inadequate documentation

The prevalence of these factors is identified further in Figure 3.

Table 9. Contributing factors to prescribing errors

	Number of complaints	Percentage
Coordination of care		
Inadequate communication between providers	34	31%
Inadequate/inappropriate supervision of junior staff	5	5%
Documentation		
Inadequate/incorrect documentation	30	27%
Transcription error	18	16%
Medication-specific issue		
Similar names	2	2%
Unusual	3	3%
Organisation/system issues		
Busyness	12	11%
Distractions/interruptions	4	4%
Inadequate policies/procedures	22	20%
Inadequate software system	31	28%
Inadequate training/induction	6	5%
Provider error		
Failure to communicate effectively with consumer	48	43%
Competence issues	4	4%
Failure to act on information	36	32%
Failure to obtain necessary information	67	60%
Failure to follow policies/procedures	22	20%
Inadequate knowledge of medication	19	17%
Provider impairment	2	2%

Figure 3. Contributing factors to prescribing errors

Table 10 below presents the most common contributing factors to the two most common types of prescribing errors.

Failure to obtain necessary information was a common issue for both types of prescribing error; however, this factor contributed to a disproportionate number of inappropriate medication errors. A higher proportion of inappropriate medication errors were also related to a failure to communicate effectively with the consumer. Transcription errors contributed to a disproportionate number of wrong-dose errors.

Table 10. Most common contributing factors to common types of prescribing errors

Inappropriate medication n=53		Wrong dose n=29	
Failure to obtain necessary information	72%	Failure to obtain necessary information	52%
Failure to communicate effectively with consumer	64%	Failure to act on information	38%
Inadequate/inaccurate documentation	36%	Transcription error	38%
Failure to act on information	34%	Inadequate software system	38%
Inadequate software system	28%	Failure to follow policies/procedures	31%

What does this tell us?

Around a third of all medication errors in the complaints data occurred in the prescribing stage. Just over half of these errors occurred in primary care settings. The prescribing of medication is a core clinical task for GPs, and the majority of medicines are prescribed in primary care. However, medication errors by GPs have received relatively little research attention when compared to hospital care. This data indicates that complaints data may be a rich data set for investigating contributing factors to prescribing errors in primary care.

Prescribing errors in primary care tended to involve the prescribing of the wrong dose of medication or the prescribing of a medication that was contraindicated for that consumer. Literature has also found wrong-dose errors to be a prevalent form of error in primary care.

Almost half of the prescribing errors in the complaints data concerned the prescribing of an inappropriate drug — a drug to which the consumer was allergic/had experienced a previous adverse reaction, or a drug that was contraindicated for that consumer. As noted in the section entitled "Using complaints data to investigate medication error", conclusions should not be drawn from the incidence of errors in the complaints data. The prevalence of this error is most likely due to the nature of complaints data. For example, providing the patient with a medication to which he or she is allergic or to which the patient has had a previous adverse reaction is an error that may be likely to be caught by the patient and, therefore, more likely to be complained about. These types of errors can also be associated with a higher likelihood of harm, and consumers may be more likely to complain about events that have a higher risk for harm.

The most common medication that was inappropriately prescribed was antibiotics, with antibiotics being predominantly involved in errors where the consumer was prescribed a medication to which he or she was allergic/had had a previous adverse reaction. This is consistent with the fact that antibiotics have been found to be the most prevalent reported medication allergy,[96] and that they are prescribed commonly.

Monitoring errors have been found to be a frequent form of medication error in the literature; however, a very small number of these types of errors were found in the complaints data. This is probably due to issues around the extraction of the data, with these types of errors less likely to be categorised as medication errors in the complaints database.

Contributing factors to prescribing errors

Information
The most common contributing factor to prescribing errors in the complaints data was a failure by the provider to obtain the necessary information to prescribe a medication correctly. This is consistent with the finding in the international literature that prescribing errors tend to be mistakes attributable to the provider's inadequate knowledge of the patient or medication.

A failure by the provider to obtain the necessary information was often in relation to history-taking and review. When the provider did not elicit or review the patient's medication history adequately, this could lead to the provider not taking note of medications to which the consumer was allergic, or to which the patient had had a previous adverse reaction, or that were contraindicated for the patient. This factor was also related to the provider not reviewing best practice guidelines when prescribing a medication, often resulting in the patient being prescribed a medication at an inappropriate dose or a medication that was contraindicated for that patient. Additionally, 21% of

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[96] Macy E, Poon K-Y T. Self-reported antibiotic allergy incidence and prevalence. Age and sex effects. Am J Med. 2009; 122 (778), e1–7.

prescribing errors in primary care involved a repeat prescription. Errors involving repeat prescriptions were often associated with the provider not physically reviewing the consumer prior to providing a repeat prescription and, therefore, not collecting adequate information to ensure that the prescription continued to be appropriate for the consumer.

Around a third of prescribing errors in the complaints data were due, at least in part, to a failure by the provider to act on relevant information. This often reflected situations where the provider had the necessary information to prescribe correctly (e.g., the consumer's relevant medication history and best practice guidelines) but did not synthesise this information adequately and apply it to the patient's individual risk factors. This could result in a patient being prescribed a contraindicated medication or a dose of medication inappropriate for that patient.

The majority of prescribing errors in the complaints data were due to a failure by the provider to gather the necessary information, synthesise that information correctly, and take the appropriate actions. Essentially this is a failure to get the basics right — to read the notes, ask the questions, and talk to the patient. It is difficult for providers to ensure that the patient is being prescribed the right medication for that patient if they do not give these basics due attention.

**Case study: Prescription of diclofenac to a patient
who previously had experienced an adverse reaction (13HDC01041)**

Mr A was an elderly man who had a complicated medical history and was taking several medications. He went to a medical centre with shoulder pain and was prescribed diclofenac (trade name Voltaren). Several months later, blood test results showed a significant deterioration in Mr A's renal function. His GP at the time thought that the diclofenac might be causing the deterioration. The GP told Mr A to stop taking the medication and advised him not to take it again. A warning was placed on his clinical file stating: "Diclofenac sodium — renal failure/retention — avoid." Later Mr A saw another GP, Dr B, for a check-up. Dr B recorded at the time in Mr A's clinical notes: "Note renal impairment with addition of Diclofenac."

Five years later, Mr A saw Dr B again for ongoing ankle pain not relieved by ibuprofen. Dr B prescribed a two-week supply of diclofenac and advised Mr A to return in one month for a blood test to check his renal function. Dr B told HDC that he did not recall that previously Mr A had had a bad reaction to diclofenac, and Dr B did not remember any warning coming up on the computer system about a previous reaction. At the time, the medical centre was merging with another practice, and "possible computer difficulties" in the lead-up to, and during, the merger may have impeded the display of the warning.

Mr A returned the following month with pain in the joints of his right foot. Dr B recommended that he keep taking the diclofenac. Two days later, Mr A returned to Dr B complaining of being unable to pass urine, and Dr B referred him to the public hospital. Mr A was assessed at the hospital the next day and diagnosed with chronic renal failure. It became evident that Mr A had not realised that diclofenac and Voltaren are the same drug. Mr A began showing signs of multi-organ failure and, sadly, passed away.

The Commissioner found that Dr B did not provide services to Mr A with reasonable care and skill, in breach of Right 4(1) of the Code, by failing to establish Mr A's medical history, either by questioning him adequately or reviewing his clinical notes; failing to take adequate regard of Mr A's NSAID associated risks, particularly cardiovascular risks and interaction with concurrent medication; and by failing to monitor his renal function adequately when prescribing diclofenac to him. The Commissioner also found that Dr B breached Right 6(1)(b) because the risks of diclofenac use compared with the risks or benefits of alternative medication were not discussed with Mr A. Without this information, Mr A was not in a position to make an informed choice and give his informed consent to taking the medication and, accordingly, Dr B was found to have breached Right 7(1) of the Code.

In relation to this case, the Commissioner commented: "When prescribing medication to a patient, a doctor must ensure they are familiar with the patient's medical history, in order to accurately assess the patient's needs and to satisfy themselves that the medication will be in the patient's best interests. Failing to do so can have serious and potentially fatal consequences for the patient."

The Commissioner was critical that the medical centre did not ensure that its computer systems were fully functioning, or have in place a temporary system for its doctors to follow while the system was undergoing changes.

The Commissioner recommended that the Medical Council of New Zealand consider whether a review of Dr B's competence was warranted. The Commissioner also recommended that Dr B undergo further training on good prescribing practice. The medical centre was asked to conduct an audit of its clinical records to ensure that no other critical alerts were missed during the merger. These recommendations were met.

Case study: Prescription of medication
contraindicated in pregnancy (14HDC01058)

Mrs A, aged 35 years, was on the statin Cholvastin (a cholesterol-reducing medication) and the antidepressant fluoxetine. Mrs A saw her GP, Dr B, to discuss whether she should recommence taking cilazapril for hypertension. Mrs A told HDC that she told Dr B that she was considering becoming pregnant. Dr B prescribed cilazapril for Mrs A, which is contraindicated in pregnancy. Dr B did not discuss with Mrs A whether the other medications she was on were safe in pregnancy.

Over the following seven months, Mrs A obtained repeat prescriptions for fluoxetine, cilazapril, and Cholvastin from the medical centre on three occasions, but at no time was her blood pressure checked. Approximately nine months after she had been prescribed cilazapril, Mrs A advised Dr B that she was pregnant. Dr B discussed her diet and exercise with her, but did not discuss her medications.

Mrs A's midwife later queried with an obstetrician the appropriateness of Mrs A's medications. The obstetrician also had concerns about the medication, and recommended that Mrs A return to her GP for different prescriptions. Subsequently Mrs A telephoned the medical centre and spoke with a nurse who, following consultation with Dr B, advised Mrs A that she should continue taking Cholvastin and cilazapril, but that she should consider coming off fluoxetine. Later that week, Mrs A was seen at a secondary obstetrics unit, where she was advised to stop taking Cholvastin and cilazapril. Alternative medication was prescribed.

The Commissioner noted: "There were compounding errors in Dr B's management of Mrs A's medication before and after she became pregnant and, even when prompted by the enquiry from Mrs A's midwife, Dr B failed to recognise the need to check whether cilazapril and Cholvastin were appropriate for Mrs A. Furthermore without assessing Mrs A, Dr B advised that she should consider stopping fluoxetine."

The Commissioner considered that by failing to identify that cilazapril and Cholvastin were contraindicated in pregnancy, and by failing to ensure that Mrs A's blood pressure was monitored appropriately, Dr B did not provide services to Mrs A with reasonable care and skill, in breach of Right 4(1) of the Code. The Commissioner also considered that a reasonable consumer in Mrs A's circumstances would expect to receive information about the risks and benefits of continuing cilazapril, Cholvastin, and fluoxetine in pregnancy, and that by not providing this information Dr B breached Right 6(1) of the Code.

Dr B accepted her errors and took steps to ensure that a similar error does not happen again, including by reviewing current best practice guidelines and contacting the primary health organisation's clinical pharmacist to obtain advice; ensuring that statins appeared on the list of "harmful drugs in pregnancy"; ensuring that the medical centre completed an audit of female patients who were on ACE inhibitors and statins so that each GP could review their management; arranging for education on medication management in pregnancy; and ensuring that the medical centre uses a standardised template so that medication review is covered as part of the first antenatal visit. The Commissioner recommended that the Medical Council of New Zealand consider reviewing Dr B's competence.

The Commissioner was critical of the medical centre's policy on repeat medication management, and that the policy was not followed by staff, as Mrs A was not advised that she required GP review of her repeat medications, and blood pressure monitoring. The Commissioner was also critical that when the nurse raised the issue of Mrs A's medication with Dr B, an opportunity was missed to pick up the error.

The Commissioner recommended that the medical centre further clarify the roles and responsibilities of practice nurses, doctors, and administration staff in its repeat medication management policy; audit clinical staff compliance with this policy; and include in its training and induction for all staff, information that the asking of questions and reporting of concerns is expected and accepted from all members of the multidisciplinary team. These recommendations were met.

Documentation and coordination of care

Inadequate documentation contributed to 42% of prescribing errors. This is consistent with research in this area, which has found that lack of documentation of prescribing decisions and lack of availability of documentation are common systems issues leading to prescribing errors.[97] [98] Documentation issues often related to relevant aspects of the patient's history not being documented adequately (e.g., the patient's weight, details of previous prescriptions, reasons for discontinuation of medications, contraindications, previous adverse drug reactions and allergies), or relevant documentation not being available at the point of care (e.g. medication history not being available on admission to hospital).

Inadequate communication between providers contributed to 31% of prescribing errors. This issue is related to the documentation issue, as documentation is one of the vital ways in which providers communicate with one another. In the complaints data these communication issues often related to failure to seek prescribing advice from senior staff, inadequate handover between hospital staff, and inadequate communication across primary care for patients seeing multiple GPs. Additionally, 30% of prescribing errors that occurred in a hospital setting occurred during discharge. This was often due to the discharging doctor not being provided with the information necessary to make appropriate prescribing decisions.

These documentation/coordination of care issues become particularly problematic when patients are seeing multiple providers or being transferred across care settings. A lack of communication between providers and poor documentation during transitions of care makes it difficult for providers to collate and analyse the information they need to make prescribing decisions.

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[97] Ross S, Ryan C, Duncan EM, et al. Perceived causes of prescribing errors by junior doctors in hospital inpatients: A study from the PROTECT programme. BMJ Qual Saf. 2013; 22(2), 97–102.
[98] Franklin BD, Reynolds M, Shebel NA, et al. Prescribing errors in hospital inpatients: A three-centre study of their prevalence, types and causes. Postgrad M J. 2011; 87(1033) 739–45.

Case study: Inappropriate prescription
of narcotic medication (12HDC01608)

Mr A, an elderly man with complex co-morbidities including chronic renal impairment, was admitted to a public hospital for the management of an acutely ischaemic leg. He underwent an angioplasty and his pain improved postoperatively. A decision was made to discharge Mr A home on either the Sunday or Monday. The surgical registrar, Dr C, reviewed Mr A on the Sunday morning and changed his medication from fentanyl to Sevredol. Dr C did not document a discharge management plan, any details of the decision to prescribe Sevredol, or the plan with regard to monitoring and reporting Mr A's Sevredol requirements.

Later that day, the on-call surgical house officer, Dr D, was contacted by a nurse, who requested that Dr D write a prescription for antibiotics for Mr A so that he could be discharged. Dr D prescribed an appropriate antibiotic, taking into account Mr A's renal impairment. As Dr D was leaving the ward, the nurse requested a prescription for analgesia for Mr A. Dr D noted that Mr A had been prescribed Sevredol earlier that day by Dr C, so wrote a prescription for the same dose that had already been prescribed. Dr D did not complete the discharge documentation.

Mr A was then discharged and returned home. He took his medications as prescribed, including five 10mg Sevredol tablets. Mr A was later admitted to hospital and treated for opiate toxicity. Sadly, he died a short time later.

The Commissioner was critical of Dr C for failing to assess critically the appropriateness of prescribing Sevredol to Mr A, given that his pain was already well managed and he had renal impairment. The Commissioner held that having made the decision to prescribe Sevredol, Dr C should then have proceeded with caution. Dr C's failure to document a discharge plan and the decision to prescribe Sevredol, and its monitoring requirements, demonstrated a lack of caution that placed Mr A at unnecessary risk of harm, and Dr C was found in breach of Right 4(4) of the Code.

The Commissioner was critical of aspects of the care provided by Dr D, in particular the failure to question the prescription of Sevredol in a man who had renal impairment, and the failure to complete any discharge documentation.

HDC's expert advisor noted that there was a lack of co-ordination of the medical staff involved, and that there was a poor handover of Mr A, particularly in respect of his pain relief requirements. The Commissioner considered that there had been a sequence of missed opportunities and communication breakdowns in Mr A's care and, therefore, the DHB had failed to ensure that its staff provided services to Mr A with reasonable care and skill, in breach of Right 4(1) of the Code.

In respect of the DHB, the Commissioner noted: "The system in place at the DHB that allowed patients to be discharged by junior doctors on a Sunday is not unusual … however, adequate communication and coordination of care is central to ensure that this works effectively … not only are discharge documents and prescriptions essential for handover, but they also create an opportunity to inform, clarify and educate."

The Commissioner made a number of recommendations to the DHB, including that it undertake monthly monitoring of discharge summaries to ensure its ongoing supervision and monitoring of staff in relation to compliance with its discharge policies; review its current policies and procedures with regard to discharges, in particular weekend discharges, especially in relation to the communication of discharge plans; provide a report to HDC on the outcome of its most recent audit of compliance with discharge planning; and use the anonymised version of the investigation report for educational purposes, highlighting the concerns raised about culture, communication, and coordination of care. The recommendations were met.

Inadequate software systems and transcription errors

An inadequate prescribing software system, or the inadequate use of that system, contributed to 28% of prescribing errors, and was particularly prevalent for wrong-dose errors. Common issues around software systems that contributed to prescribing errors in the complaints data included inadequate access to best practice prescribing guidelines; technological errors resulting in important prescribing alerts not appearing (e.g., an alert not appearing to warn a provider that a drug is contraindicated); the ease with which alerts could be ignored or overridden; and a lack of access to electronic patient notes.

Related to software system issues, transcription errors were found to be particularly prevalent for wrong-dose errors. These errors often represented slips where the provider inadvertently selected the wrong dose from a drop-down list on the prescribing software. These types of errors could be exacerbated by how dose lists were organised on prescribing software, e.g., listing the highest dose first.

Often electronic systems are presented as a way of reducing medication errors. However, as this data shows, it is important to be aware that such systems can exacerbate errors or create new errors when they are not well designed.

Case study: Prescription and dispensing of incorrect dose of medication to a child (15HDC01542)

Miss A, aged almost three years, experienced painful and difficult urination following bladder surgery. She was reviewed by a paediatric registrar, Dr C, at a public hospital. After discussion with a senior colleague, Dr C prescribed her oxybutynin, which is indicated for the management of urinary urgency and incontinence. Dr C chose an appropriate dose of 2mg oxybutynin, but inadvertently wrote "oxybutynin 20mg", three times daily for ten days, which was a ten times higher dose. Dr C failed to follow DHB prescribing guidelines, which stated: "Never write a trailing zero after a whole number ie 8mg, not 8.0mg." Dr C told HDC that she does not usually use trailing zeros, but believes she did in this case because the range as specified in the NZFC had fractions of a milligram with a decimal point in each dose (eg, 1.25 and 2.5mg).

A pharmacist noticed that the oxybutynin dose seemed high but did not question it at the time. A second pharmacist delivered the medication to Miss A's mother, but did not discuss the medication with Miss A's mother. After Miss A's mother gave Miss A the prescribed dose of oxybutynin, Miss A experienced side effects and was taken to hospital. She was monitored and discharged later that day.

In relation to this case, the Commissioner noted: "It is essential that all providers involved in the prescribing and dispensing of medication remain attentive to the possibility of errors occurring at different steps in the process. Providers must take great care to ensure they have performed their role in the process accurately."

The Commissioner found that the first pharmacist failed to take steps to contact the prescriber when she noticed that the oxybutynin dose seemed high. She also failed to follow the pharmacy's Standard Operating Procedure (SOP) and sign the date stamp to indicate that she had dispensed and/or checked the prescription. The Commissioner held that the pharmacist did not provide services in accordance with professional standards, and breached Right 4(2) of the Code. The Commissioner was also critical of the second pharmacist for not checking the prescription and for missing the opportunity to check the appropriateness of the prescription at the time of delivery of the medication to Miss A's mother. The Commissioner held that the second pharmacist did not provide services with reasonable care and skill, and breached Right 4(1) of the Code. The Commissioner considered that non-compliance with the Dispensing Prescriptions SOP played a part in the girl receiving an inappropriate dose of oxybutynin. Accordingly, he found that the pharmacy did not provide services with reasonable care and skill, in breach of Right 4(1) of the Code.

In response to a recommendation by the Commissioner, the pharmacy undertook audits regarding compliance with its SOP, and uses the case for education of future pharmacist or pharmacy intern employees of the pharmacy.

The Commissioner held that it was Dr C's responsibility to ensure that she prescribed a clinically appropriate dose of oxybutynin. By failing to do so, she did not provide services to Miss A with reasonable care and skill and, accordingly, breached Right 4(1) of the Code.

Although the Commissioner was satisfied that the error in failing to prescribe a clinically appropriate dose of oxybutynin to Miss A was Dr C's alone, the Commissioner considered that if electronic prescribing had been available to Dr C at the DHB when she prescribed the medication to Miss A, it could have minimised the risk of the error occurring. HDC's expert advisor commented: "Digital systems are in their infancy in NZ. In the meantime, continuing education of clinical staff on manual prescribing with continuing innovation to mitigate risks is essential."

In response to recommendations by the Commissioner, the DHB provided feedback to HDC on the implementation of its new electronic prescribing system and its use of the case for the education of paediatric medical staff. The Commissioner also recommended that the Ministry of Health actively continue to support the rollout of electronic prescribing across New Zealand's DHBs in both inpatient and outpatient settings, and work with the sector to progress an integrated approach to medicines management.

Reducing prescribing errors

Prescribing errors are complex and can involve a number of contributing factors. They are often caused by a mix of individual error, and error-producing conditions and latent failures within organisational environments. While individual providers must ensure that they are taking the necessary steps to prevent medication errors, literature suggests that system interventions are the most effective in reducing error.

This section collates the lessons from our findings and from the case examples in this report. The aim is to assist providers and organisations to recognise and address factors that contribute to prescribing errors.

Doing the basics well

In order to make the best prescribing decision for the patient, providers need to ensure that they have all the relevant information regarding the patient's current medications, illnesses, and known allergies and past adverse reactions to medications,[99] often by eliciting information from the patient and reviewing the patient's history. It is also important that when prescribing medications, providers regularly review best practice guidelines — including the correct dose, possible contraindications, and benefits and risks, particularly for high-risk medications — and consider these guidelines in the context of the consumer's individual risk factors.

MCNZ standards for good prescribing practice[100] state that providers should prescribe medications only after assessing the patient's condition adequately, and/or ensuring that they have adequate knowledge of the patient's conditions, and prescribe in accordance with accepted practice and current best practice guidelines. It is important that prescribers ensure that they are aware of "high-alert medications", medications with specific monitoring regimens, and medications that are known to have a high potential for interactions.

Prescribing errors in the complaints data tended to be contributed to by a failure to do the basics well — to read the notes, ask the questions, and talk to the patient. Although these basics are often not difficult to do, they can be easily overlooked in the context of a busy workload and time pressures. However, these basics are the standard expected of prescribers, and getting them right every time is vital to improving prescribing safety.

Medication information provided to consumers

A failure to communicate effectively with the patient was a prevalent contributing factor to prescribing errors. The more information patients have about their medication, the better they are able to act as a defence against any medication errors. It is important that, as set out in the MCNZ standards, providers take the time to check the prescription with the patient, verbally check for any allergies, and educate the patient about his or her medication regimen, including possible contraindications, side-effects, and when and how to take the medication.

Electronic prescribing and clinical decision support tools, and effective use of such systems

Paper-based prescribing is associated with high error rates.[101] Electronic prescribing reduces errors from poor handwriting or incorrect transcription. Often electronic prescribing systems also have inbuilt clinical decision support tools that alert providers to allergies and possible contraindications

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[99] Hughes RG, Ortiz, E. Medication errors: Why they happen and how they can be prevented. Am J Nurs. 2005; 105(3 Suppl), 14–24.
[100] Medical Council of New Zealand. Good prescribing practice. Available from www.mcnz.org.nz; 2016.
[101] Kushal R, Shojonia KG, Bates DW. Effects of computerized physician order entry and clinical decision support systems on medication safety: A systematic review. Arch Intern Med. 2003; 163(12), 1409–16.

and interactions, provide advice on correct dosage, and ensure availability of best practice guidelines, helping to prevent inappropriate prescribing and wrong-dose errors. These systems also provide a single and comprehensive view of a patient's current and historical medication record, helping to eliminate errors caused by lack of availability of documentation. Such systems have been associated with reductions in medication errors.[102] [103] [104]

However, as noted by international literature[105] and this analysis, these systems also have the potential to create new errors, such as the selection of the wrong dose of medication from drop-down lists. Factors such as the ease with which significant alerts can be ignored also have the potential to exacerbate errors. The quality of data contained in the patient record, e.g., current medications, disease coding, and recording of adverse reactions to medication, also influences the effectiveness of electronic prescribing modules. This emphasises the importance of ensuring that these systems are well planned, well designed, and subject to close scrutiny, and that providers are trained appropriately on the use of these tools to ensure that they make the best use of the safety features.

The Ministry of Health has signalled that smart use of digital systems, e.g., electronic prescribing and administration, is desirable. Roll-out at DHB level and across the health sector is incomplete. Lack of progress in this area is concerning, and it is recommended that this be prioritised.

Documentation of prescribing decisions
The quality of the information in the patient record has an influence on the safety and quality of subsequent prescribing decisions, and is vital to continuity of care. If a person's medication allergies or past medication history is not documented, a provider may not be alerted to an issue. It is therefore important that prescribers regularly document patients' medication histories and any prescribing decisions made. MCNZ standards state that prescribers must share information about the prescribing with other providers involved in the patient's care, and keep a clear, accurate, and timely patient record.

It is also important that organisations ensure that they have documentation policies and procedures that are consistent with relevant standards, and that they have systems in place to ensure that staff are complying with these policies. These systems should allow for the effective oversight and monitoring of staff compliance — for example, through regular audits of patient allergy documentation.

Medication reconciliation
It is known that transitions of care are particularly prone to medication error. Poor coordination of care and inadequate documentation contributed to a large number of prescribing errors in the complaints data. Medication reconciliation is a process for obtaining an accurate list of patient medicines, allergies, and adverse drug reactions during transitions in care. The process has been found to reduce medication errors caused by incomplete or insufficient documentation of medicine-related information at care transitions, and to reduce the risks of medications being omitted, being

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[102] Nuckols TK, Smith-Spangler C, Morton SC, et al. The effectiveness of computerized order entry at reducing preventable adverse drug events and medication errors in hospital settings: A systematic review and meta-analysis. Syst Rev. 2014; 3, 56.

[103] Radley DC, Wasserman MR, Olsho LE, et al. Reduction in medication errors in hospitals due to adoption of computerized provider order entry systems. J Am Med Inform Assoc. 2013; 20(3), 470–76.

[104] Cochran GL & Haynatzki G. Comparison of medication safety effectiveness among nine critical access hospitals. Am J Health Syst Parm. 2013; 70, 2218–24.

[105] Radley DC, Wasserman MR, Olsho LE, et al. Reduction in medication errors in hospitals due to adoption of computerized provider order entry systems. J Am Med Inform Assoc. 2013; 20(3), 470–76.

prescribed at the wrong dose, and being prescribed inappropriately. Collaboration and communication between the multidisciplinary healthcare team involved in the patient's care, and with the patient and the patient's family, is vital to the success of this process.

Currently there is a national programme to roll out electronic medication reconciliation throughout New Zealand DHB hospitals.[106] Roll-out at DHB level is incomplete, and it is recommended that this be prioritised.

Additionally, some GP practices and DHBs have access to a shared electronic health record, which includes a record of the primary care prescribed medication list. Many patients also have electronic access to their own primary care record via a patient portal, and this information can be shared with other providers if required. Work in this area is encouraging.

The design and adoption of an electronic health record and use of digital systems would allow consumers' medication information to follow them on their journey through the healthcare system. This would facilitate the seamless sharing of information and would assist in the prevention of a number of medication errors that occur during transfers of care. The Ministry of Health has developed an indicative business case for the development of a national health information platform. It is recommended that this work be prioritised.

Repeat prescribing in primary care

International research has pointed to repeat prescribing processes in primary care being particularly error prone.[107] [108] The data presented in this report notes that inappropriate medications can be prescribed when patients are provided with repeat prescriptions without clinically appropriate examinations/assessments being undertaken.

It is important that general practices have robust policies and procedures regarding patients on repeat prescriptions being reviewed at clinically appropriate intervals, and that they have systems in place to ensure that these policies are adhered to by practice staff.

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[106] Health Quality & Safety Commission. Quality and safety markers update: April–Jun 2018. Available from www.hqsc.govt.nz; 2018.

[107] Garfield S, Barber N, Walley P, et al. Quality of medication use in primary care — mapping the problem, working to a solution: a systematic review of the literature. BMC Medicine. 2009; 7, 50–58.

[108] Slight SP, Howard R, Ghaleb M, et al. The causes of prescribing errors in English general practices: A qualitative study. Br J Gen Pract. 2013; 63(615), e713–20.

3. Dispensing errors

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Summary of results

- 98% of the dispensing errors in the complaints data occurred in a community pharmacy setting.
- The most common medication class involved in dispensing errors was psychotropic medication.
- The most common dispensing error was dispensing the wrong medication, followed closely by dispensing the wrong dose/strength of medication.
- The most common factors identified as contributing to dispensing errors were failure to follow policies/procedures, inadequate policies/procedures, busyness, physical space layout issues, medications with similar names, failure to communicate effectively with consumer, distractions/interruptions, and medications with similar packaging.
- Failure to follow policies/procedures, inadequate policies/procedures, busyness, and layout of the physical space were common contributing factors to both wrong medication and wrong strength errors. However, medications with similar names contributed to a disproportionate number of wrong medication errors, whereas medications with similar packaging contributed to a disproportionate number of wrong strength errors.

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Introduction

Dispensing is the process by which medications are prepared and provided to a patient on the basis of a prescription. Dispensing involves the correct interpretation of the prescription and ensuring that an effective form of the correct medication is given to the right patient in the correct dosage and quantity, with clear instructions to the patient on use of the medication. Traditionally, dispensing involves a number of steps, including:

1. Receiving and validating the prescription.

2. Understanding and interpreting the prescription, including confirming that the doses prescribed are in the normal range for the patient, correctly performing any calculations of dose and quantity, and identifying any common drug–drug interactions.

3. Preparing and labelling the items for issue, including selecting the correct item from the pharmacy shelf and cross-matching the product name and strength against the prescription, transferring the correct number of medication or dose units to a container, and labelling the medication.

4. Making a final check — this involves checking the dispensed preparation against the prescription and the stock containers used. Often this is done by a staff member other than the one who prepared the medication. The final check should include reading and interpreting the prescription, checking the appropriateness of the dose and drug prescribed, checking the identity of the drug dispensed, checking the labels, and countersigning the prescription.

5. Issuing the medicine to the patient with clear instructions and advice on use.[109]

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[109] World Health Organization. Ensuring good dispensing practices. Available from: http://apps.who.int/medicinedocs/en/d/Js19607en; 2012.

Errors can occur at any stage of the dispensing process. Rates of dispensing errors reported in the literature vary widely depending on the study design and setting (whether community pharmacy or hospital), with incidence rates varying from 0.5% to 24% of medications dispensed.[110] The most common types of dispensing errors reported in research are dispensing the wrong drug, dispensing the wrong strength, dispensing the wrong quantity, and labelling errors.[111] [112] [113] [114]

The literature examining the contributing factors to dispensing errors has reported that dispensing errors tend to be slips leading to providers inadvertently selecting the wrong medication or strength, or mistakes when the provider makes assumptions about the medications concerned. Common error-producing conditions for dispensing errors include high workload; the organisation of the physical work space; being short-staffed; time constraints; provider fatigue; interruptions or distractions during the dispensing process; look-alike/sound-alike medications; ambiguous or illegible prescriptions; and inadequate technology. Latent conditions include a lack of adequate training; inadequate supervision of pharmacy assistants; lack of guidance for dealing with distractions/interruptions; staffing; inadequate policies/procedures; and staff attitudes towards safety.[115] [116] [117] [118] [119] [120]

The Pharmacy Council of New Zealand sets out competence standards for pharmacists when supplying medication. This includes the requirement that pharmacists (a) assess prescriptions, including assessing and reviewing available patient medical history, undertaking a clinical assessment of the prescription to ensure appropriateness of the treatment and initiating action, in consultation with the patient and/or prescriber to address any identified issues; (b) maintain a logical safe and disciplined dispensing procedure, including monitoring the dispensing process for potential errors and acting promptly to mitigate them; and (c) provide patient counselling, including providing the patient with sufficient information to ensure the safe and proper use of medicine.[121]

Additionally, pharmacies have Standard Operating Procedures (SOPs), which outline the technical aspects of the dispensing process that staff are expected to follow when working in that pharmacy. SOPs should cover all aspects of the dispensing process and comply with professional requirements.

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[110] James KL, Barlow D, McArtney R, et al. Incidence, type and causes of dispensing errors: A review of the literature. Int J Pharm Pract. 2009; 17: 9–30.

[111] James KL, Barlow D, McArtney R, et al. Incidence, type and causes of dispensing errors: A review of the literature. Int J Pharm Pract. 2009; 17: 9–30.

[112] Ashcroft DM, Quinlan P, Blenkinsopp. Prospective study of the incidence, nature and causes of dispensing errors in community pharmacies. Phamacoepidemiol Drug Saf. 2005; 14(5), 327–32.

[113] Bohand X, Simon L, Perrier E, et al. Frequency, types and potential clinical significance of medication-dispensing errors. Clinics. 2009; 64(1), 11–16.

[114] Flynn EA, Barker KN, Gibson JT, et al. Impact of interruptions and distractions on dispensing errors in an ambulatory care pharmacy. Am J Health-Syst Pharm. 1999; 56(1), 1319–25.

[115] Cheung KC, Bouvy ML, De Smet PA. Medication errors: The importance of safe dispensing. Br J Clin Pharmacol. 2009; 67(6), 676–80.

[116] James KL, Barlow D, McArtney R, et al. Incidence, type and causes of dispensing errors: A review of the literature. Int J Pharm Pract. 2009; 17: 9–30.

[117] Anacleto TA, Perini E, Rosa MB, Cesar CC. Medication errors and drug-dispensing systems in a hospital pharmacy. Clinics (Sao Paulo). 2005; 60(4), 325–32.

[118] Harvey J, Avery AJ, Ashcroft D, et al. Exploring safety systems for dispensing in community pharmacies: Focusing on how staff relate to organizational components. Res Social Adm Pharm. 2015; 11(2), 216–27.

[119] Ashcroft DM, Quinlan P, Blenkinsopp A. Prospective study of the incidence, nature and causes of dispensing errors in community pharmacies. Phamacoepidemiol Drug Saf. 2005; 14(5), 327–32.

[120] Beso A, Franklin BD, Barber N. The frequency and potential causes of dispensing errors in a hospital pharmacy. Pharm World Sci. 2005; 27(3), 182–90.

[121] Pharmacy Council of New Zealand. Safe Effective Pharmacy Practice: Competence Standards for the Pharmacy Profession. Wellington: Pharmacy Council of New Zealand; 2015.

SOPs specify which activities must be carried out personally by the pharmacist, including the clinical check, which activities can be delegated to support staff, and how the checks for accuracy are to be carried out. SOPs should also be explicit regarding the added value of pharmacy services, for example, the pharmacist's assessment of the safety and appropriateness of a prescription and the provision of information and counselling to the patient.[122]

What does the HDC complaints data show?

Dispensing errors were the most common form of error in the complaints data, with 39% of errors occurring during this stage of the medication management process.

Characteristics of dispensing errors
Ninety-eight percent of the dispensing errors in the complaints data occurred in a community pharmacy setting.

Table 11 details the most common classes of medications involved in dispensing errors.

Table 11. Most common classes of medications involved in dispensing errors

Medication class	Number of dispensing errors	Proportion of dispensing errors
Psychotropic medications	26	20%
Cardiovascular medications	17	13%
Antibiotics	14	11%
Analgesics (simple)	13	10%
Opioids	11	8%
Steroids	6	5%
Supplements	6	5%

The most common medications involved in dispensing errors were psychotropic medications (20%), followed by cardiovascular medications (13%), antibiotics (11%) and analgesics (10%). This is broadly similar to what was seen across all medication errors.

Types of dispensing errors
The types of dispensing errors in the complaints data are reported in Table 12. All those types of error that occurred in less than 1% of errors have been collated together and labelled as "other".

Table 12. Types of error

Type of error	Number of errors	Proportion of errors
Wrong medication	49	37%
Wrong dose/strength	48	37%
Labelling error	16	12%
Wrong quantity	11	8%
Expired medication	3	2%
Other	4	3%
TOTAL	**131**	

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[122] Pharmacy Council of New Zealand. Writing Standard Operating Procedures. Available from: www.pharmacy council.org.nz; 2008.

The most common dispensing error was dispensing the wrong medication (37%), followed closely by dispensing the wrong dose/strength of medication (37%).

Psychotropic medications were commonly associated with errors involving the wrong medication being dispensed, with 24% of these errors involving a prescription for a psychotropic medication. Cardiovascular medications, on the other hand, were commonly associated with errors involving the wrong strength of medication being dispensed, with 23% of these errors involving a prescription for cardiovascular medications.

Figure 4. Type of dispensing error

Legend:
- Wrong medication
- Wrong dose/strength
- Labelling error
- Wrong quantity
- Expired medication
- Other
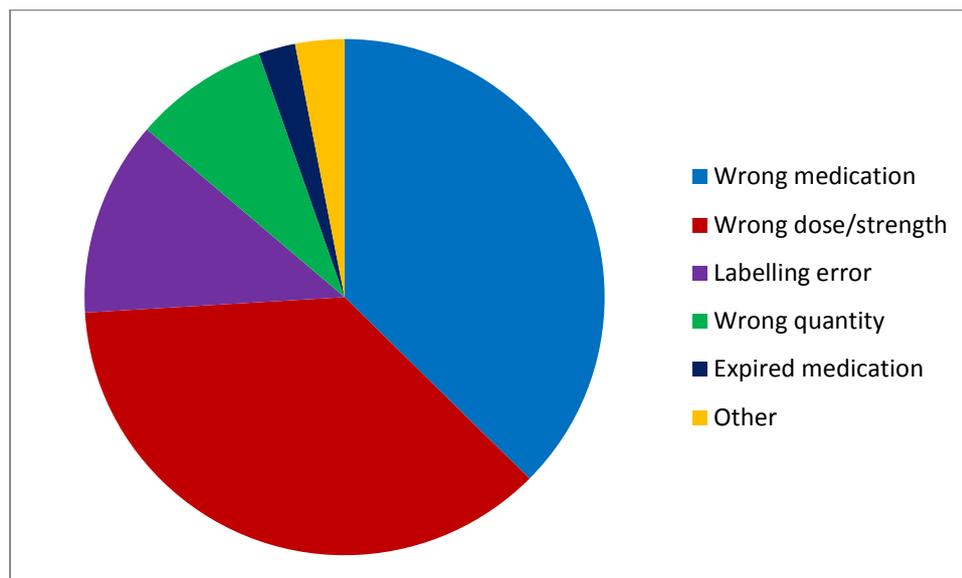
Contributing factors to dispensing errors

The contributing factors to the dispensing errors in the complaints data are reported below in Table 13.

The most common factors identified as contributing to dispensing errors were "failure to follow policies/procedures" (78%), "inadequate policies/procedures" (34%), "busyness" (28%), "physical space layout issues" (25%), "medications with similar names" (22%), "failure to communicate effectively with consumer" (22%), "distractions/interruptions" (21%), and "medications with similar packaging" (20%). Dispensing errors had a higher proportion of contributing factors related to following policies/procedures, issues with the layout of the physical space, and medications with similar names/packaging than was seen across all errors in the complaints data.

The prevalence of these factors is identified further in Figure 5.

Table 13. Contributing factors to dispensing errors

	Number of complaints	Percentage
Coordination of care		
Inadequate communication between providers	18	14%
Inadequate/inappropriate supervision of junior staff	1	0.8%
Documentation		
Ambiguous prescription	12	9%
Inadequate/incorrect documentation	4	3%
Transcription error	24	18%
Medication-specific issue		
Similar names	29	22%
Similar packaging	26	20%
Unusual	11	8%
Organisation/system issues		
Busyness	37	28%
Distractions/interruptions	27	21%
Inadequate policies/procedures	45	34%
Inadequate software system	15	11%
Inadequate training/induction	10	8%
Physical space layout issues	33	25%
Provider error		
Failure to communicate effectively with consumer	29	22%
Competence issues	4	3%
Failure to act on information	3	2%
Failure to obtain necessary information	6	5%
Failure to follow policies/procedures	102	78%
Inadequate knowledge of medication	4	3%
Provider impairment	6	5%

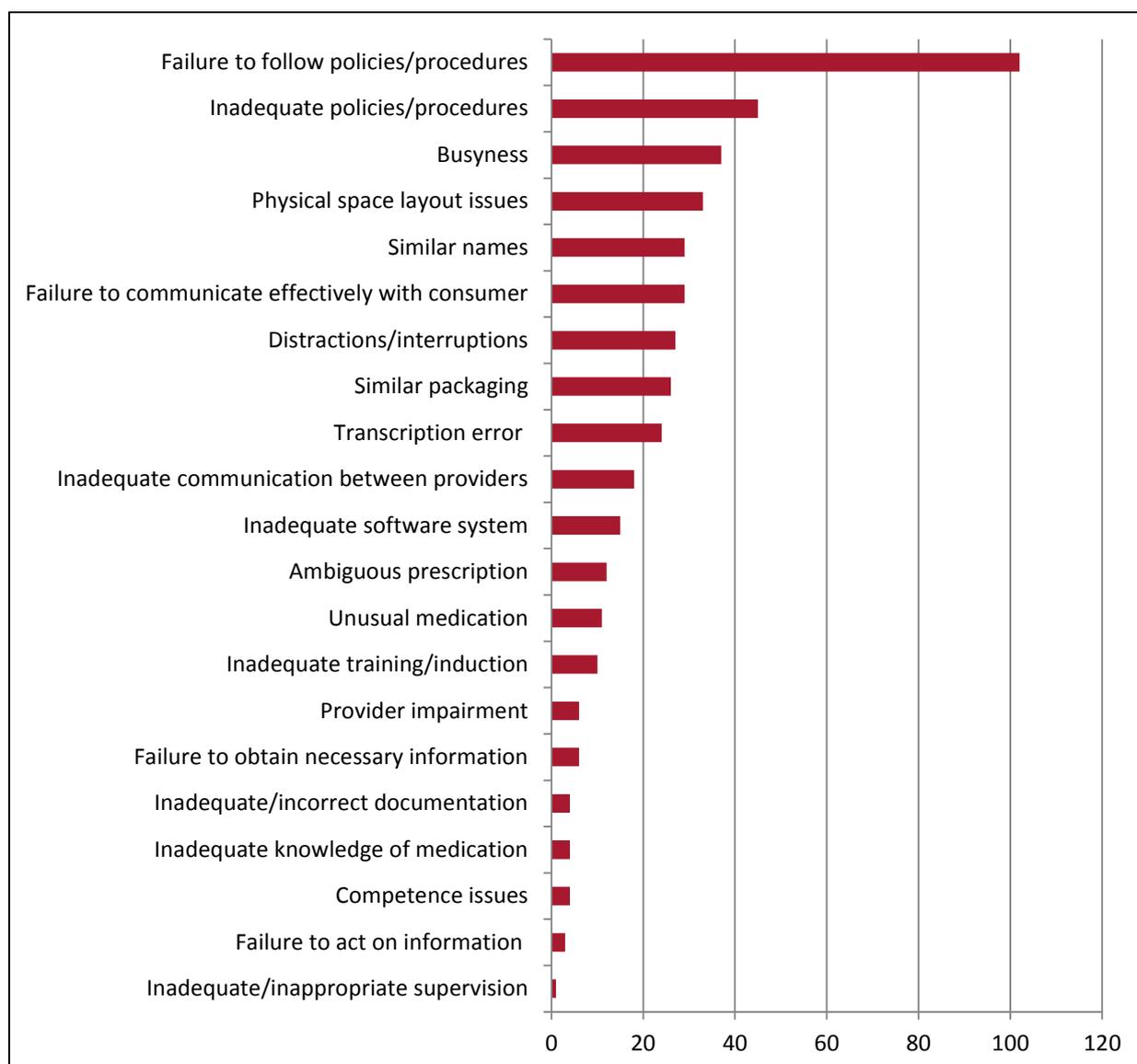**Figure 5.** Contributing factors to dispensing errors

Table 14 presents the most common contributing factors to the two most common types of dispensing errors. Failure to follow policies/procedures, inadequate policies/procedures, busyness, and layout of the physical space were common contributing factors to both wrong medication and wrong strength errors. However, medications with similar names contributed to a disproportionate number of wrong medication errors, whereas medications with similar packaging contributed to a disproportionate number of wrong strength errors.

Table 14. Most common contributing factors to common types of prescribing errors

Wrong medication n=49		Wrong dose/strength n=48	
Failure to follow policies/procedures	78%	Failure to follow policies/procedures	83%
Medications with similar names	55%	Busyness	35%
Inadequate policies/procedure	39%	Inadequate policies/procedure	33%
Busyness	33%	Medications with similar packaging	33%
Layout of physical space	33%	Layout of physical space	33%

What does this tell us?

Almost 40% of all medication errors in the complaints data occurred in the dispensing stage. Almost all of these errors occurred in community pharmacies, with only one error occurring in a hospital setting. This finding is likely due to the nature of complaints data, and is not indicative of the prevalence of errors in these settings. It may be that given that medication dispensed in community pharmacies is handed directly to the patient to administer, patients are more aware of any dispensing errors that occur in these settings and, therefore, are more likely to make a complaint about such errors.

The majority of dispensing errors in the complaints data were the dispensing of the wrong medication to the consumer or the dispensing of the wrong strength of medication, with these errors collectively being responsible for 74% of the dispensing errors in the complaints data. This is in line with the international literature, which reports both these types of errors as among the most prevalent forms of dispensing errors. This also supports the idea that the majority of dispensing errors are slips leading to pharmacists inadvertently selecting the wrong medication or strength of medication.

Contributing factors to dispensing errors
The majority of dispensing errors in the complaints data were slips or lapses where a number of error-producing conditions led the pharmacist to inadvertently select the wrong type or strength of medication, with the error then subsequently being inadvertently missed during the checking process. Some dispensing errors also represented violations, where the provider purposefully deviated from policies/procedures.

Standard operating procedures (SOPs)
The most common contributing factor to dispensing errors in the complaints data was a failure by the provider to follow the pharmacy's SOP. Seventy-eight percent of these errors may have been prevented from reaching the patient had the provider followed the pharmacy's SOP.

The majority of these errors involved a failure by the provider to follow the checking procedure as set out in the SOP. Checking processes are a vital defence to ensuring that errors are caught before they reach the patient. Studies have emphasised the importance of checking procedures, with it being found that hospital pharmacies without an independent check on pharmacist dispensing have a significantly higher rate of errors than pharmacies with a second independent check on all work.[123]

The checking errors in the complaints data often related to a failure to follow the SOP requirement to open the packaging and check the medication inside. Other common checking SOP requirements not followed included checking the medication against the label rather than the prescription, meaning that any errors that occurred during the transcription of the prescription on to the label were not picked up, and pharmacists either conducting a self-check (i.e., not getting a second pharmacist to check their work) despite the SOP advising against this, or not following the process for self-checking where the SOP allowed it.

Another common process in the SOP that was not followed by pharmacists was that of dispensing only from the prescription. Some errors occurred because pharmacists instead dispensed using the information on the label rather than the prescription, resulting in any errors that occurred during the preparing of the label being carried into the medication selection. Often these errors were

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[123] Spencer MG, Smith AP. A multicenter study of dispensing errors in British hospitals. Int J Pharm Pract. 1993; 2(3), 142–46.

compounded further by the medication being checked against the label, rather than the prescription.

The failure by multiple staff to follow SOPs often reflects organisational deficiencies, and can be affected by a number of other contributing factors that can lead staff to inadvertently fail to follow SOPs or purposefully deviate from SOPs by using workarounds. These factors include busyness, staffing, the physical layout of the dispensing space, training/induction processes for new staff, distractions/interruptions, communication between providers, and an inadequate organisational safety culture whereby non-adherence to policies/procedures has become normalised.

Inadequate SOPs also contributed to a number of dispensing errors in the complaints data, with this being at issue for around a third of dispensing errors. Often these issues also related to checking procedures, with the most common being inadequacies around the procedures for self-checking.

Thirty-six percent of the dispensing errors in the complaints data failed to be picked up by a pharmacist who was self-checking, emphasising that self-checks should be avoided if possible. Self-checks can be prone to error owing to confirmation bias — a tendency to interpret information in a way that confirms a person's preconceptions. When self-checking cannot be avoided, it is often recommended that the pharmacist separate the dispensing and checking process with another task, thereby ensuring that the final check is undertaken with "fresh eyes". However, for a number of errors in the complaints data, staff either did not follow the SOP requirement for a "fresh eyes" check, or the SOP did not have a requirement to undertake a "fresh eyes" check when self-checking. Around half of these self-checks were carried out because only one pharmacist was present in the pharmacy at the time. Where self-checks cannot be avoided, it is particularly important that the pharmacist carry out a "fresh eyes" check.

Case study: Wrong strength of
medication dispensed to child (15HDC00183)

Master A, a seven-year-old child, had cerebral palsy and was prescribed baclofen (a muscle relaxant and antiseptic agent). Master A's mother (Ms A) visited a pharmacy to have a prescription filled. A pharmacist, Ms B, processed the prescription, and a pharmacy technician, Ms C, compounded the baclofen. A second pharmacist, Ms D, checked the prescription. The pharmacy dispensed 10mg/ml of baclofen instead of the prescribed 10mg/10ml, meaning that Master A was dispensed ten times the strength prescribed.

Following the dispensing error, the child presented to the emergency department at a public hospital on three occasions with increased seizures, shortness of breath, and deep breathing with salivation. On the third presentation, the dispensing error was identified by a pharmacist at the hospital and reported to the pharmacy. The pharmacy apologised to Ms A and undertook an investigation into the error.

The error occurred when Ms B entered the medication into the pharmacy's computer system. Ms B selected the incorrect strength of baclofen from the dropdown list on the computer. This generated a label that listed the incorrect strength. HDC's expert advisor advised that the entered strength should have immediately raised concern, considering that Master A's age was listed on the prescription. The pharmacy's SOPs in place at the time of the incident required Ms B to enter the prescription into the computer system correctly, and to check that the dosage prescribed was appropriate for the individual patient and within appropriate limits. The Deputy Commissioner noted that maintaining a logical, safe, and disciplined dispensing process, including assessing the efficacy and safety of medicine, are fundamental aspects of pharmacy practice. By failing to identify the correct strength of baclofen listed on the prescription, and by failing to check the appropriateness of the strength of the medication for Master A, Ms B failed to provide Master A with services in accordance with professional standards, in breach of Right 4(2) of the Code.

The checking pharmacist, Ms D, failed to notice that the prescription had been entered incorrectly and, subsequently, that the medication had been compounded at the incorrect strength. The pharmacy's SOPs required Ms D to check the accuracy of the dosage listed on the label, and the dosage of the dispensed medication against the prescription. The SOPs also required her to consider whether the dosage was appropriate. The Deputy Commissioner noted that checking that the correct medication is being dispensed and assessing the efficacy and safety of medicine are fundamental aspects of pharmacy practice. By failing to identify the discrepancy between the baclofen strength compounded and the strength listed on the prescription, and by failing to check the appropriateness of the strength of medicine dispensed, Ms D failed to provide Master A with services in accordance with professional standards, in breach of Right 4(2) of the Code.

The Deputy Commissioner was concerned that both pharmacists and the pharmacy technician failed to adhere to the SOPs. If each step of the SOP had been adhered to, it is likely that the error would have been identified and corrected before Ms A had left the pharmacy with the medication. The Deputy Commissioner noted that "it is the responsibility of the Pharmacy to ensure that every staff member complies with the SOPs in order to prevent harm to patients … without staff compliance policies become meaningless". As non-compliance with the SOPs by multiple staff played a significant part in Master A receiving the incorrect strength of medication, the Deputy Commissioner considered that the pharmacy did not provide services to Master A with reasonable care and skill, in breach of Right 4(1) of the Code.

The Deputy Commissioner recommended that Ms B and Ms D arrange for an assessment through the New Zealand College of Pharmacists regarding the processing of prescriptions and processes for dispensing and checking medications. The Deputy Commissioner asked the pharmacy to conduct an audit of three months' compliance with the SOPs for dispensing. These recommendations were met.

Case study: Wrong medication dispensed
(13HDC01413)

Mrs A visited a pharmacy to collect a prescription for mesalazine (Pentasa), which is used to treat ulcerative colitis, and atorvastatin (Lipitor), which is a cholesterol-lowering medication. The sole pharmacist on duty at the pharmacy that day, Mr B, dispensed her medications, intentionally replacing her Lipitor with another brand of atorvastatin, Zarator. Mr B mistakenly dispensed Salazopyrin instead of Pentasa. Salazopyrin is another medication used to treat ulcerative colitis, but it can cause liver abnormalities. Mr B did not speak directly to Mrs A when she asked a shop assistant about the change from Pentasa, as he mistakenly believed that she was querying the change from Lipitor.

Mrs A started taking the dispensed medications and began to feel extremely fatigued. Her blood test results were markedly deranged. Mrs A's GP then discovered that she had been taking Salazopyrin in place of Pentasa for approximately three weeks, and she was admitted to hospital with a primary diagnosis of deranged liver function. The overall opinion was that her condition was caused by a reaction to Salazopyrin.

Mr B accepted that he mistakenly dispensed Salazopyrin in place of Pentasa. He was unable to recall the incident, but suggested that he may have erroneously transposed the generic names (sulfasalazine and mesalazine respectively). Mr B also accepted that he failed to perform the necessary checks required by the SOP in place at the time. In particular, the SOP stated that when working alone in the dispensary, pharmacists are to ensure that the dispensing and final checking procedures are mentally and physically separated.

The Deputy Commissioner was particularly concerned by the error, given that Mrs A queried the dispensed medication at the time. Mr B should have addressed Mrs A's query with her directly. The Deputy Commissioner noted that this was an important missed opportunity to identify the error that had occurred, and that Mrs A was entitled to rely on Mr B to dispense the correct medication and to provide her with accurate advice in response to any queries or concerns she had in relation to the medication.

The Deputy Commissioner found that Mr B failed to ensure that he dispensed the correct medication to Mrs A, and failed to counsel her effectively about her medications. Accordingly, Mr B failed to provide Mrs A with services in accordance with professional standards, in breach of Right 4(2) of the Code.

In response to recommendations by the Deputy Commissioner, the pharmacy audited staff compliance with its checking procedures, particularly when a pharmacist was working alone in the pharmacy, and provided HDC with evidence that all relevant staff had been trained in these procedures. Recommendations were not made in relation to Mr B, as he had retired from practice.

Medications with similar names and similar packaging

Medication-specific issues contributed to a disproportionate number of dispensing errors when compared to prescribing and administration errors. The most common medication-specific issues that contributed to dispensing errors were the medication being dispensed having a similar name to another medication, or the medication being dispensed having similar packaging to another medication. In the literature, these types of medications are called "look-alike/sound-alike medications", and are known to be prone to dispensing errors.[124][125][126]

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[124] James KL, Barlow D, McArtney R, et al. Incidence, type and causes of dispensing errors: A review of the literature. Int J Pharm Pract. 2009; 17: 9–30.

Look-alike/sound-alike medications lead to slips/lapse errors (performing an unintended action), where the pharmacist inadvertently selects the wrong medication or wrong strength of medication when dispensing. These errors can then be hard to pick up during checking owing to confirmation bias. In the complaints data, medications with similar names were more likely to have contributed to wrong medication errors, where a similar sounding medication to the one prescribed was selected inadvertently. Medications with similar packaging, on the other hand, were more likely to have contributed to wrong strength errors, where the wrong strength of medication was selected inadvertently owing to the different strengths of the medication having similar looking packaging.

In the complaints data, the majority of medications with similar names were psychotropic medications. This is consistent with the literature, which has found that one of the reasons this class of medication may be more prone to error is the fact that the medications can have look-alike/sound-alike names. Some name confusion errors in the complaints data included:

- Tenoxicam — Tamoxifen
- Amitriptyline — Nortriptyline
- Amlodipine — Allopurinol
- Salazopyrin — Mesalazine
- Carbamazepine — Carbimazole

It should be noted that other contributing factors can exacerbate errors involving look-alike/sound-alike medications, for example, if the pharmacy's checking processes are not followed these types of errors may not be identified before they reach the patient. Additionally, factors such as busyness, pharmacy layout, and distractions/interruptions can affect the likelihood of these errors occurring.

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[125] Ashcroft DM, Quinlan P, Blenkinsopp A. Prospective study of the incidence, nature and causes of dispensing errors in community pharmacies. Phamacoepidemiol Drug Saf. 2005; 14(5), 327–32.
[126] Ostin R, Roughead EE, Kirkpatrick CM, et al. Quality use of medicines — Medication safety issues in naming; look-alike, sound-alike medication names. Int J Pharm Pract. 2012; 20(6), 349–57.

Case study: Tenoxicam dispensed
instead of prescribed tamoxifen (13HDC01235)

Ms A, who underwent a bilateral mastectomy and chemotherapy due to breast cancer, was prescribed a five-year course of tamoxifen, which is indicated for the treatment of breast cancer.

On one occasion when Ms A presented at the pharmacy with a repeat prescription for a further three-month supply of tamoxifen, she noticed that the tablets had changed in appearance. However, she attributed the difference in appearance to funding changes, and took the tablets for three months. When she returned to the pharmacy to collect a further supply of tamoxifen, she noticed a return to the previous tablets and questioned why. It was then established that five months earlier Ms A had been dispensed tenoxicam, instead of the prescribed tamoxifen. Tenoxicam is described as an antirheumatic, anti-inflammatory, and analgesic agent.

The pharmacy undertook an investigation to determine how the error occurred. It was noted that Ms A's prescription had been entered into the computer correctly, as a label for 20mg tamoxifen had been generated. However, tenoxicam 20mg had been selected from the shelf incorrectly and dispensed to Ms A. At the time of the error, the pharmacy's SOPs required that the dispenser and checker must be able to be identified at all times. However, the pharmacy was unable to identify the pharmacist responsible for the dispensing error, as Ms A's prescription had not been initialled by the dispenser.

The pharmacy's dispensary stock was organised in alphabetical order on the shelves according to the generic name of the drug. Therefore, at the time of the error, tamoxifen and tenoxicam were in close proximity. The pharmacy had alerts in place for medications that had the potential to be confused. However, at the time of the dispensing error, there was no specific alert or precaution in place for tenoxicam and tamoxifen. The Deputy Commissioner noted: "Look-alike sound-alike medication names are one of the most common causes of medication errors throughout the world. Insufficient systems within the pharmacy environment increase the chances of these types of medication errors occurring."

The Deputy Commissioner held that the pharmacy's failure to have sufficient measures in place within the pharmacy environment to ensure knowledge of, and compliance with, its SOPs played a significant part in Ms A receiving the incorrect medication. In particular, the pharmacy failed to place an alert or precaution notice near the tamoxifen and tenoxicam, did not review and update its SOPs regularly, was unable to demonstrate that staff read the SOPs and, despite being aware of on-going non-compliance with the dispensing SOP, failed to enforce compliance. Accordingly, the Deputy Commissioner found that the pharmacy did not provide services to Ms A with reasonable care and skill, in breach of Right 4(1) of the Code.

The pharmacy made a number of changes in response to the error, including placing a notice beneath both tenoxicam and tamoxifen on the shelves and relocating the two medicines so that they are not in close proximity to each other; using branded labelling for similar generically named medicines; placing electronic notes in the files of the similar generically named medicines to draw attention to their higher than usual potential for error; and requiring that two people check every prescription (except where a pharmacist is in sole charge of the dispensary).

The Deputy Commissioner recommended that the pharmacy audit compliance with its SOPs over a three-month period on three separate days; ensure that SOPs and updates of SOPs are signed by all staff to indicate that they have read and understood the procedures; ensure that SOPs are reviewed at least every two years, and that the date of review is clearly documented; and ensure that all medications with look-alike sound-alike names stocked in the pharmacy are associated with specific measures to prevent dispensing errors. The recommendations were met.

Pharmacy environment

Consistent with the literature in this area, a number of aspects of the pharmacy environment were found to contribute to a number of dispensing errors in the complaints data, including the busyness of the pharmacist, the physical layout of the dispensing space, and the presence of distractions/interruptions.

Busyness contributed to 28% of dispensing errors in the complaints data. Often errors were noted to have occurred in periods of high demand or when pharmacies were short-staffed. Previous studies have found that workload and busyness are prevalent error-producing conditions for dispensing errors. Increased workload leads to an environment prone to errors owing to providers becoming more susceptible to using "workarounds" and unsafe practices, such as self-checking; providers "rushing" through their work; and cognitive overload and divided attention, including an increase in distractions/interruptions. Research has found that errors caused by busyness can be exacerbated by inadequate SOPs, a perceived lack of support from management and colleagues, an inadequate skills mix among staff, and the inadequate layout of the dispensing area.

Consistent with the literature in this area, 21% of the dispensing errors in the complaints data were contributed to by distractions/interruptions during the dispensing process. Interruptions can have a significant effect on memory, and can result in a loss of focus and concentration, increasing the opportunity for error. Community pharmacies are complex environments with numerous possible sources of interruption or distraction. A high workload and a busy pharmacy increase the potential for interruption, with around 50% of errors contributed to by distractions/interruptions also involving busyness as a factor.

The physical layout of the dispensing area was a contributing factor to a quarter of the dispensing errors in the complaints data. Often this was in relation to a cluttered work environment or to the way in which medications were organised on the shelf. Dispensing in restricted or cluttered spaces is a known risk factor for error. Cluttered spaces can result in a chaotic and unorganised dispensing process, making it both easier to make mistakes and harder to pick up on errors made. Additionally, the way in which medications are organised on dispensing shelves is an important factor that can ameliorate or exacerbate drug selection errors due to look-alike/sound-alike medications. A number of these errors in the complaints data were exacerbated by the medications at issue being next to each other on the shelf — for example, because shelves were arranged alphabetically.

Case study: Incorrect strength of lithium carbonate dispensed
(15HDC01016)

Mrs A saw her GP, who prescribed her with a 90-day supply of lithium carbonate, totalling 450 tablets of 250mg strength, with the instruction to take five tablets once daily at night. Mrs A went to a pharmacy to have her prescription filled. A pharmacist, Ms B, assembled, checked, and dispensed the prescription and, in doing so, mistakenly provided Mrs A with 400mg lithium carbonate tablets instead of the prescribed 250mg tablets.

When assembling the medication, Ms B was interrupted by a dispensing technician enquiring about the medication of another consumer and, once Ms B finished her conversation with the technician, Ms B picked up the lithium carbonate stock bottle (containing 400mg tablets) but did not check the strength of the bottle. Ms B told HDC that at the time of these events "they were short on staff" so she decided to perform the two-stage checking process herself. However, she did not open and check the contents of the bottle to be given to Mrs A against the original prescription or the stock bottle. Ms B then gave the medication to a shop assistant to give to Mrs A.

The pharmacy's SOP required that the person assembling medication with multiple strengths (such as lithium carbonate) check the strength of the medication. At the checking stage, the SOP required that the person checking the medication open the bottle to check the contents against the prescription and stock bottle. The SOP also stated that where more than one member of the dispensary staff is on duty, dispensing should be checked by another appropriate person (at this time there were other dispensary staff on duty).

The Commissioner noted that the Pharmacy Council's Code of Ethics requires that a pharmacist's workload or working conditions do not compromise patient care or public safety. Notwithstanding the fact that Ms B was interrupted before selecting Mrs A's medication, or that other members of the dispensary staff may have been busy, Ms B was required to ensure that she dispensed medications safely and in accordance with her professional obligations. Accordingly, by failing to dispense the prescribed medication correctly and ensure that her dispensing was checked appropriately, the Commissioner considered that Ms B failed to provide Mrs A with services in accordance with professional standards, in breach of Right 4(2) of the Code.

Ms B advised HDC that since this incident she always ensures that she undertakes a "fresh eyes" check when undertaking a self-check. The pharmacy advised that as a result of the error, the different strengths of lithium were moved to separate shelves, and the dispensing shelves were labelled with bright red STOP signs to remind dispensing staff to double check that they are selecting the correct strength of medication. The Commissioner recommended that the pharmacy conduct an audit of all errors and near misses over a six-month period, and identify any common themes or patterns. The pharmacy was also asked to audit staff compliance with its SOPs over a six-month period, including, where appropriate, that dispensing staff had checked each other's work. The recommendations were met.

Reducing dispensing errors

The dispensing process can be complex and involves a number of steps during which error can occur. Although the majority of dispensing errors in the complaints data were essentially inadvertent human errors, a complex interplay of organisational error-producing and latent conditions contributed to the errors. While individual providers must ensure that they are taking the necessary steps to prevent medication errors, literature suggests that system interventions are the most effective in reducing error.

This section collates the lessons from our findings and from the case examples in this report. The aim is to assist providers and organisations to recognise and address factors that contribute to dispensing errors. As almost all of the dispensing errors occurred in a community pharmacy setting, this section looks primarily at strategies for reducing errors in this setting.

The importance of following Standard Operating Procedures
The majority of dispensing errors in the complaints data were contributed to by staff not following the pharmacy's SOPs. This was often in relation to checking procedures, but could also be in relation to pharmacists dispensing from the label rather than the prescription.

The Pharmacy Council requires pharmacists to maintain a logical, safe, and disciplined dispensing procedure. It is imperative that individual pharmacists ensure that they practise in accordance with SOPs. However, it is just as important that organisations ensure an environment that allows pharmacists to maintain a safe dispensing procedure. This includes ensuring that interruptions/ distractions are minimised; pharmacies are adequately staffed; dispensing environments are well laid out; staff are orientated to and trained on relevant policies/procedures; and that there is an embedded culture within the organisation that values and consistently reinforces the importance of following SOPs, and values checking as an important defence against error.

Pharmacies must ensure that they have SOPs that are consistent with relevant standards, and that they have systems in place to ensure that staff are complying with their policies. These systems should allow for the effective oversight and monitoring of staff. Regular auditing of staff compliance with policies/procedures can be a valuable tool in ensuring that staff are adhering to SOPs. In the complaints data, a commonly missed step was the opening of the container during the final check. A checklist of the steps required during the final check can be used as a reminder for staff to ensure that they are following SOP requirements.

Avoiding self-checks where possible
A number of the complaints data errors were not picked up during a final self-check. Confirmation bias can make self-checking a poor method of error reduction, and should be avoided where possible. Checks are most effective when they are conducted independently by a second person.

Where self-checking cannot be avoided, the pharmacist should ensure that a "fresh eyes" check is conducted — where the dispensing process and the checking process are separated with a separate task. Additionally, if self-checks cannot be avoided in all cases, consideration could be given to using independent double checks for those high-alert medications that have the potential to cause greater harm, and those medications that are known to be more prone to error.

A pharmacy's SOP should highlight the importance of obtaining an independent final check and, in organisations where self-checks cannot be avoided, the requirement to conduct a "fresh eyes" check when self-checking should be explicitly laid out in the SOP.

Strategies to reduce look-alike/sound-alike medication errors
In the complaints data, look-alike/sound-alike medications contributed to a number of the dispensing errors. A number of strategies can be employed by organisations to reduce the occurrence of these errors, including:

- Placing reminders on stock bottles or on the computer system to alert pharmacists to commonly confused medication names and strengths.
- Ensuring that different strengths of medication are stored away from each other.
- Ensuring that medications with similar names are not stored alphabetically by name, but are instead stored away from each other.
- Using "Tall Man" lettering to distinguish between similar drug names. "Tall Man" lettering is where the parts of similar medication names that are different from each other are emphasised in capitals. Alternatively, these parts of the names can be highlighted using highlighting, colouring, or boldfacing. New Zealand's Health Quality & Safety Commission has developed a "Tall Man" lettering list of medicine names that have been predicted to pose the greatest risk to patient safety.[127]
- Mitigating confirmation bias with look-alike/sound-alike medications by obtaining an independent final check of this type of medication.

Optimal staff mix and effective use of technology
A number of innovations in pharmacy practice can reduce the risk of human error, including:

- **Barcode verification:** The use of barcode verification as an alternative to the final check has been suggested as having the potential to prevent errors from reaching the patient. Barcode scanning verifies that the medication type and strength that has been selected matches what has been entered into the pharmacy computer system. Barcode scanning has been found to be superior to a visual check by a pharmacist in detecting dispensing errors, and was noted to have the potential to reduce pharmacist workload.[128] Currently, barcode verification is used only in the hospital context in New Zealand, and is not a routine part of community pharmacy practice.
- **Dispensing robots**: The use of dispensing robots has been shown to reduce medication selection errors. Dispensing robots are widely used in New Zealand.
- **Pharmacy accuracy checking technicians**: A pharmacy accuracy checking technician is a technician who has been trained and certified to carry out the final accuracy check on dispensed medications. Certification for these technicians became available in New Zealand in 2016.

These innovations not only help to prevent errors, they can also decrease pharmacist workload and free up pharmacist time for patient counselling.

However, it should be noted that the use of technology in pharmacies cannot prevent all errors — for example, if the wrong dose is entered into the system, automated systems will not identify the error. In the complaints data, 18% of dispensing errors were contributed to by a transcription error,

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[127] Health Quality & Safety Commission. Tall Man Lettering List: Report. Wellington: Health Quality and Safety Commission; 2013.
[128] Wang BN, Brummond P, Stevenson JG. Comparison of barcode scanning by pharmacy technicians and pharmacists' visual checks for final product verification. Am J Health Syst Pharm. 2016; 73(2): 69–75.

where the prescription had been entered into the computer system erroneously. Often this related to the wrong medication name or strength being inadvertently selected from a drop-down list.

The use of technology can both reduce the occurrence of some errors while introducing the potential for new errors. Therefore, it is important that the introduction of these systems is well planned, well designed, and subject to close scrutiny, and that providers are trained appropriately on the use of such tools and their potential for error.

Improving the dispensing environment
Aspects of the dispensing environment contributed to a number of dispensing errors, including pharmacist workload, distractions/interruptions, and the organisation of the workplace.

Dispensing environments should be organised so that dispensing can be performed accurately and efficiently. Organising the workspace so that it facilitates the flow of dispensing work from one task to another reduces dispensing errors. This includes ensuring that there is adequate lighting and counter space, and ensuring that the space is clean and clutter is removed. Having a system in place and designated areas for entering, dispensing, and checking prescriptions enhances workflow and can protect against medication mix-ups.

Ensuring that pharmacies have sufficient staff and appropriate workloads for each staff member can help to reduce dispensing errors. It is also important to have robust organisational policies and procedures for the management of pharmacist workload and to direct staff on how to prioritise their work during periods of high demand. The Pharmacy Council sets out guidance for pharmacists and employers for dealing with workplace pressures.

It is important that dispensing environments minimise distractions/interruptions as much as possible. Managing workload is an important aspect of minimising distractions/interruptions. Additionally, consideration could be given to moving safety-critical work to a specific area away from distractions, ensuring that pharmacy staff know not to interrupt colleagues while they are dispensing/checking prescriptions, and training dispensing staff to avoid interruptions/distractions during the dispensing process.

The importance of patient counselling
In the complaints data, 22% of dispensing errors were contributed to by inadequate patient counselling. The Pharmacy Council requires pharmacists to provide patient counselling, including providing the patient with sufficient information to ensure the safe and proper use of medicine.

As mentioned previously in this report, providing the consumer with adequate information regarding the medication he or she is being given can help to ensure that the consumer acts as a defence against error. Patient counselling is often the last point in the dispensing process at which errors can be caught before they cause harm. Counselling provides consumers with the opportunity to pick up on and clarify any potential discrepancies, and it acts as an additional accuracy check for the pharmacist.

Additionally, this information is the particular expertise of pharmacists, and the provision of this information is an expected and fundamental part of their scope of practice.

4. Administration errors

Summary of results

- In the complaints data, the most common setting for administration errors was public hospitals, followed closely by residential aged care facilities and general practice/medical centres.
- The most common medication classes involved in administration errors were psychotropic medications, followed by opioids and vaccines.
- The most common type of administration error was wrong dose, followed by failure to administer and wrong patient.
- The most common factors identified as contributing to administration errors were failure to follow policies/procedures, inadequate communication between providers, busyness, inadequate policies/procedures, failure to communicate effectively with consumer, inadequate/incorrect documentation, and provider competence issues.
- Failure to follow policies/procedures was a common contributing factor to wrong dose, failure to administer, and wrong-patient errors; however, this factor contributed to a disproportionate number of wrong-patient errors. Distractions/interruptions and provider competence issues also disproportionately contributed to wrong-patient errors.
- Inadequate communication between providers, busyness, and inadequate policies/procedures were common contributing factors for both wrong-dose and failure-to-administer errors. Inadequate documentation contributed to a disproportionate number of failure-to-administer errors.

Introduction

Medication administration, when it is undertaken by healthcare professionals, is a task primarily undertaken by nurses, with it being claimed that nurses may spend as much as 40% of their time on medication administration.[129] Medication administration is complex. The administrator's role when administering medications is to ensure that he or she gives the appropriate medication to the right patient in the right dose at the right time by the right method, to evaluate and support the desired effect of the medication, and to keep accurate records.[130]

The most common types of administration errors reported in the research are wrong time, omission (failure to administer), and wrong dose.[131] [132]

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[129] Armitage G, Knapman H. Adverse drug events in drug administration: A literature review. J Nurs Manag. 2003; 11(2), 130–40.

[130] Gunes UY, Gurlek O, Sonmez M. Factors contributing to medication errors in Turkey: Nurses' perspective. J Nurs Manag. 2014; 22(3), 295–303.

[131] Hughes RG, Blegen MA. Medication administration safety. In Hughes RG (eds) Patient safety and quality: An evidence-based handbook for nurses. Rockville: Agency for Healthcare Research and Quality; 2008.

[132] Keers RN, Williams SD, Cooke J, Ashcroft DM. Prevalence and nature of medication administration errors in health care settings: A systematic review of direct observational evidence. Ann Pharmacother. 2013; 47(2), 237–56.

The literature examining the contributing factors to administration errors has reported that administration errors tend to be slips and lapses where providers inadvertently make errors due to error-producing and latent conditions in the environment.[133] Common error-producing conditions for administration errors include high workloads; distractions/interruptions; communication failures between providers; issues with technology; provider impairment; patient acuity; level of training; and confusion between medications with similar names/packaging. Latent conditions include inadequate staffing; lack of appropriate policies/procedures; and the organisational culture.[134] [135] [136]

Nursing guidelines emphasise the importance of following the Five Rights of Medication Safety (the Five Rights) when administering medication. The Five Rights are checking the right patient, right medication, right dose, right time, and right route. The administrator should check the Five Rights at three different checkpoints in the medication administration process — when the medication is retrieved, when the medication is prepared for administration, and at the patient's bedside just before the medication is administered.[137] Research has found that when administration errors occur, often the Five Rights have not been followed.[138] [139] [140]

What does the HDC complaints data show?

In the complaints data, 28% of the medication errors were an administration error, with it being the third most common form of error behind dispensing (39%) and prescribing (33%) errors.

Characteristics of administration errors
Table 15 below presents the setting in which each administration error occurred. In the complaints data, the most common setting for administration errors was public hospitals (34%), followed closely by residential aged care facilities (27%) and general practice/medical centres (22%).

Administration errors were responsible for the vast majority of the complaints data medication errors that occurred in residential aged care facilities.

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[133] Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of medication administration errors in hospitals: A systematic review of the quantitative and qualitative evidence. 2013; 36, 1045–67.

[134] Hughes RG, Blegen MA. Medication administration safety. In Hughes RG (eds). Patient safety and quality: An evidence-based handbook for nurses. Rockville: Agency for Healthcare Research and Quality; 2008.

[135] Hewitt P. Nurses' perceptions of the causes of medication errors: An integrative literature review. MedSurg Nurs. 2010; 19(3), 159–67.

[136] Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of medication administration errors in hospitals: A systematic review of the quantitative and qualitative evidence. 2013; 36, 1045–67.

[137] New Zealand Nurses Organisation. Guidelines for nurses on the administration of medicines. Wellington: New Zealand Nurses Organisation; 2012.

[138] Hewitt P. Nurses' perceptions of the causes of medication errors: An integrative literature review. MedSurg Nurs. 2010; 19(3), 159–67.

[139] Kim J, Bates DW. Medication administration errors by nurses: Adherence to guidelines. J Clin Nurs. 2013; 22(3–4), 590–98.

[140] Jones JH, Treiber L. When the 5 rights go wrong: Medication errors from the nursing perspective. J Nurs Care Qual. 2010; 25(3), 240–47.

Table 15. Setting of administration errors

Healthcare setting	Number of administration errors	Proportion of administration errors
General practice/medical centre	21	22%
Public hospital	33	34%
Residential aged care facility	26	27%
Other residential facility	7	7%
Prison	5	5%
Private hospital/clinic	2	2%
Other	2	2%
TOTAL	96	

Table 16 details the most common classes of medications involved in administration errors.

Table 16. Most common classes of medications involved in administration errors

Medication class	Number of administration errors	Proportion of administration errors
Psychotropic medications	20	21%
Opioids	14	15%
Vaccines	12	13%
Cardiovascular medications	9	9%
Analgesics (simple)	8	8%
Anticonvulsants	7	7%
Diabetes medications	7	7%
Antibiotics	6	6%

The most common medications involved in administration errors were psychotropic medications (21%), followed by opioids (15%) and vaccines (13%). This is broadly similar to what was seen across all medication errors; however, there was a higher proportion of vaccines involved in administration errors than was seen for all errors. All errors associated with vaccines occurred in general practice settings.
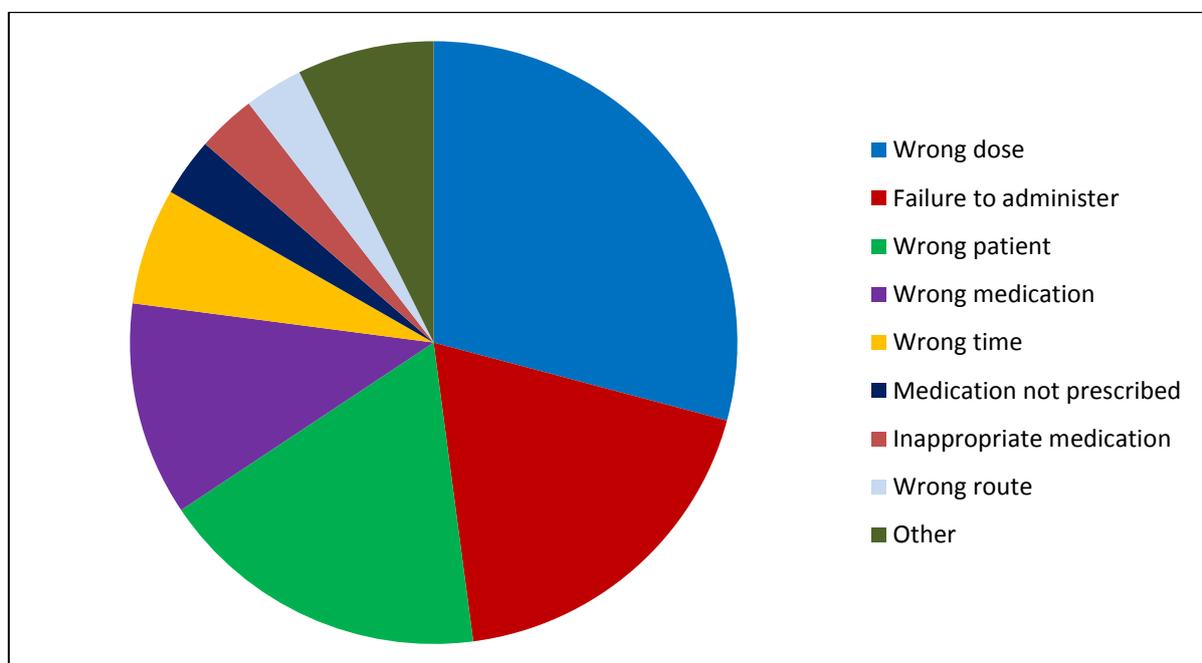
Types of administration errors
The types of administration errors in the complaints data are reported below in Table 17 and Figure 6. All those types of error that occurred in less than 1% of errors have been collated together and labelled as "other".

The most common types of administration error were wrong dose (29%), failure to administer (19%), and wrong patient (18%).

Table 17. Type of administration error

Types of error	Number of errors	Proportion of errors
Wrong dose	28	29%
Failure to administer	18	19%
Wrong patient	17	18%
Wrong medication	11	11%
Wrong time	6	6%
Drug not prescribed	3	3%
Inappropriate medication	3	3%
Wrong route	3	3%
Other	7	7%
TOTAL	96	

Figure 6. Type of administration error

Contributing factors to administration errors

The contributing factors to the administration errors in the complaints data are reported below in Table 18.

The most common factors identified as contributing to administration errors were "failure to follow policies/procedures" (55%), "inadequate communication between providers" (42%), "busyness" (32%), "inadequate policies/procedures" (23%), "failure to communicate effectively with consumer" (23%), "inadequate/incorrect documentation" (21%), and "competence issues" (20%). Administration errors had a higher proportion of contributing factors related to communication between providers and competence issues than was seen across all medication errors.

Table 18. Contributing factors to administration errors

	Number of complaints	Percentage
Coordination of care		
Inadequate communication between providers	40	42%
Inadequate/inappropriate supervision of junior staff	14	15%
Documentation		
Ambiguous prescription	5	5%
Inadequate/incorrect documentation	20	21%
Transcription error	1	1%
Medication-specific issue		
Similar names	3	3%
Similar packaging	1	1%
Unusual	11	11%
Organisation/system issues		
Busyness	31	32%
Distractions/interruptions	18	19%
Inadequate policies/procedures	22	23%
Inadequate software system	10	10%
Inadequate training/induction	13	14%
Physical space layout issues	3	3%
Provider error		
Failure to communicate effectively with consumer	22	23%
Competence issues	19	20%
Failure to act on information	7	7%
Failure to obtain necessary information	15	16%
Failure to follow policies/procedures	53	55%
Inadequate knowledge of medication	12	13%
Provider impairment	3	3%

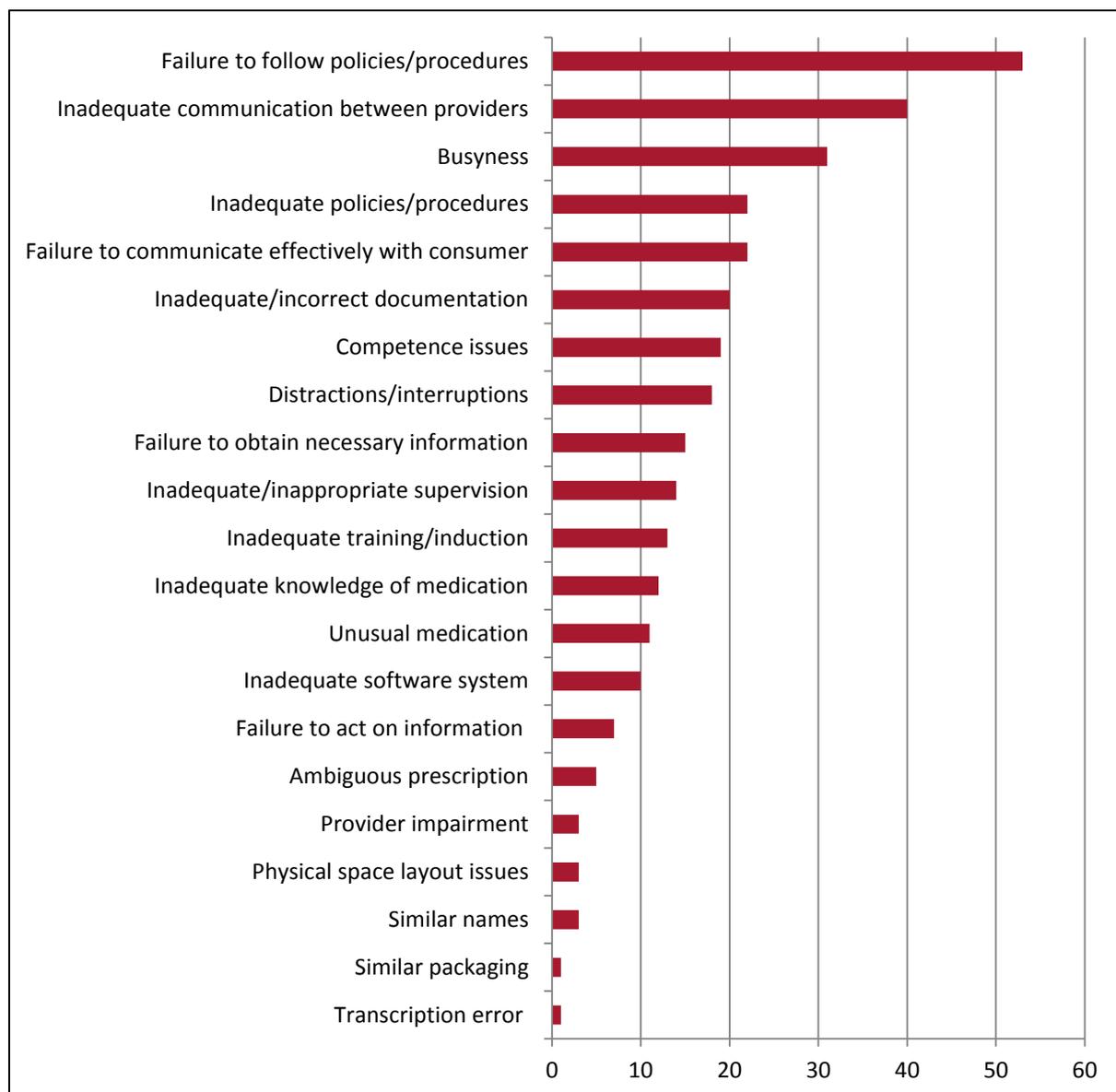The prevalence of these factors is identified further in Figure 7.

Figure 7. Contributing factors to administration errors

Table 19 below presents the most common contributing factors to the three most common types of administration errors.

Failure to follow policies/procedures was a common contributing factor to all three types of administration error; however, this factor contributed to a disproportionate number of wrong-patient errors. Distractions/interruptions and competence issues also disproportionately contributed to this type of error.

The factors contributing to wrong-dose and failure-to-administer errors were quite similar, with inadequate communication between providers, busyness, and inadequate policies/procedures being common contributing factors for both these types of administration errors. Inadequate documentation, however, contributed to a disproportionate number of failure-to-administer errors.

Table 19. Most common contributing factors to common types of prescribing errors

Wrong dose n=28		Failure to administer n=18		Wrong patient n=17	
Inadequate communication between providers	54%	Failure to follow policies/procedures	61%	Failure to follow policies/procedures	94%
Failure to follow policies/procedures	36%	Inadequate communication between providers	56%	Distractions/interruptions	41%
Busyness	36%	Busyness	39%	Provider competence issues	35%
Inadequate policies/procedures	25%	Inadequate policies/procedures	39%	Inadequate communication with consumer	24%
Knowledge of medication	21%	Inadequate/incorrect documentation	39%	Inadequate supervision	24%

What does this tell us?

In the complaints data, 28% of medication errors were attributable to the administration stage.

Public hospitals and residential aged care facilities were common settings for administration errors. This is consistent with previous research, which has found that administration errors are a common form of medication error in these settings,[141] [142] and makes sense given the large amount of medications that are administered to patients in these settings.

Twenty-two percent of administration errors occurred in general practice settings. Typically, administration errors have not been associated with primary care, perhaps because research in this setting has tended to focus on prescribing by GPs. Sixty-three percent of the administration errors that occurred in general practice settings were related to the administration of a vaccine, with half of these being wrong-dose errors. This is possibly due to the large number of vaccines administered in this setting. However, errors related to the administration of vaccines in primary care may be worthy of further research.

Opioids were the most common class of medication involved in administration errors, with most of the errors involving this medication being wrong-dose errors. This is consistent with previous research, with morphine being particularly associated with wrong-dose errors in the literature.[143] [144] This finding may also be due to the fact that the potential for harm with these medications is high and, therefore, administration errors involving these types of medications may be more likely to result in a complaint.

The most common types of administration errors in the HDC complaints data were "wrong dose" (29%), "failure to administer" (19%), and "wrong patient" (18%). "Wrong dose" and "failure to

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[141] Hicks RW, Cousins DD, Williams RL. Selected medication-error data from USP's MEDIMARX program for 2002. Am J Health Syst Pharm. 2004; 61(10), 993–1000.

[142] Szczepura A, Wild D, Nelson S. Medication administration errors for older people in long-term residential care. BMC Geriatr. 2011; 11.

[143] Dy SM, Shore AD, Hicks RW, Morlock LL. Medication errors with opioids: Results from a national reporting system. J Opioid Manag. 2007; 3(4) 189–94.

[144] McDonnell C. Opioid medication errors in paediatric practice: Four years' experience of voluntary safety reporting. Pain Res Manag. 2011; 16(2), 93–98.

administer" are commonly cited in the research literature as being the most prevalent administration errors. However, wrong-patient errors were over-represented in our complaints data, and wrong-time errors were under-represented as compared to this literature. This is likely due to the nature of complaints data. It may be that because wrong-patient errors can be obvious to the consumer and have the potential to cause harm, these types of errors may be more commonly complained about, whereas patients may be less aware of wrong-time errors.

Contributing factors to administration errors

The majority of administration errors in the complaints data were slips or lapses where a number of error-producing conditions led the administrator to inadvertently administer the wrong dose of medication, administer medication to the wrong patient, or fail to administer the medication at all. Some errors were knowledge-based mistakes caused by inadequate provider knowledge of the medication, and others were violations where staff purposefully deviated from policies/protocols.

Policies and procedures

The most common contributing factor to administration errors in the complaints data was a failure by the provider to follow the organisation's policies/procedures for medication administration. Fifty-five percent of these errors may have been prevented from reaching the patient had the provider followed relevant policies and procedures. Many of these deviations from policies/procedures were inadvertent slips/lapses, while others were violations.

The majority of these errors involved a failure by the provider to follow the Five Rights. This is consistent with research in this area, which has found that a failure to follow protocol and a lack of adherence to the Five Rights commonly contribute to administration errors.[145] [146] [147] [148] A failure to follow the Five Rights contributed to almost all of the wrong-patient errors in the complaints data. This is in line with the finding that checking patient identification tends to be the Five Right check most commonly not adhered to.[149] [150]

Other aspects of medication administration policies/protocols not followed by staff included the requirement for double checking; overriding alerts on electronic administration systems; documentation of administration; and protocols to avoid distractions/interruptions.

The failure by multiple staff to follow policies/procedures often reflects organisational deficiencies, and can be affected by a number of other contributing factors, such as busyness and distractions/interruptions. When administrators have heavy workloads, are rushed and tired, and/or are interrupted, the chances of deviating from standard protocols increase. Other factors such as training/induction for new staff on policies/procedures, inadequate policies/procedures, inadequate communication between staff, and an inadequate organisational culture that does not place value on the importance of the Five Rights as routine, safe administration, can also affect staff adherence.

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[145] Hewitt P. Nurses' perceptions of the causes of medication errors: An integrative literature review. MedSurg Nurs. 2010; 19(3), 159–67.

[146] Kim J, Bates DW. Medication administration errors by nurses: Adherence to guidelines. J Clin Nurs. 2013; 22(3–4), 590–98.

[147] Westbrook JI, Woods A, Rob MI, et al. Association of interruptions with an increased risk and severity of medication administration errors. Arch Intern Med. 2010; 170(8), 683–90.

[148] Jones JH, Treiber L. When the 5 rights go wrong: Medication errors from the nursing perspective. J Nurs Care Qual. 2010; 25(3), 240–47.

[149] Westbrook JI, Woods A, Rob MI, et al. Association of interruptions with an increased risk and severity of medication administration errors. Arch Intern Med. 2010; 170(8), 683–90.

[150] Kim J, Bates DW. Medication administration errors by nurses: Adherence to guidelines. J Clin Nurs. 2013; 22(3–4), 590–98.

Inadequate policies/procedures also contributed to a number of administration errors in the complaints data, with this being at issue for 23% of administration errors. This issue related to deficiencies with a number of different types of administration policies/procedures, including protocols around checking the identity of a consumer; double-checking processes; processes for avoiding distraction/interruptions; and policies for the management and administration of patient's own medication (medication that the patient had brought into the healthcare setting). Inadequate policies/procedures can both cause errors on their own and exacerbate errors caused by other factors, such as workload, inadequate communication between providers, and distractions/ interruptions.

Case study: Resident at residential mental health service given medication prescribed for another resident (13HDC00298)

Mr B was a resident at a community residential mental health service (the Service). One evening, a community support worker assisted Mr B in taking his evening medication. The Service stored residents' medication in drawers according to the room numbers. Mr B had changed rooms before the support worker's shift, and his medication had been moved accordingly. The support worker was aware of Mr B's room change.

The support worker opened a medication filing drawer, removed a blister pack corresponding to the room Mr B had been in previously, and took it to him. The support worker did not carry out the appropriate Five Rights checks to ensure that safe medication taking had occurred, as required by the Service's medication support procedures. This resulted in the support worker giving Mr B another resident's medication, which included the antipsychotic clozapine.

The support worker returned to the office, where he placed the blister pack back in the filing drawer. He then realised that he had made a serious error. The dose of clozapine Mr B had taken was very high for a person who had never taken the medication previously. The support worker immediately contacted senior staff and sought medical help for Mr B.

The Deputy Commissioner considered that not adhering to well-established medication checking processes was a departure from policy, and that this resulted in Mr B receiving inadequate care. Accordingly, the Deputy Commissioner found the support worker in breach of Right 4(1) of the Code for failing to provide services to Mr B with appropriate care and skill.

The Deputy Commissioner was critical of the Service for aspects of its system that contributed to an increased risk of error occurring. In particular, Mr B's room change was not documented, and the medication storage system in place was based on room numbers, rather than the resident's identity.

The support worker acknowledged his error and that he had not followed policy and procedure. He undertook collaborative remedial actions to improve his care in the future, including repeating his medication administration induction and re-reviewing the medication safety process; attending a workshop on clozapine; and ensuring that he now performs triple checks before giving any medication. The Service's processes were subsequently altered so that medication storage is now solely based on the person's identity rather than by association with room number. The Service also re-familiarised staff with the Five Rights process, reviewed medication training packages, and placed Five Rights stickers on all medication tins and in resident folders, as a reminder to staff.

The Deputy Commissioner recommended that the support worker report back to HDC on how the changes he made to his practice subsequent to this event have affected his community support work. It was recommended that the Service review its policy and processes to further minimise the risk involved in medication storage and administration, and audit its medication administration processes, and report back to HDC on the effectiveness of the changes it implemented. These recommendations were met.

Coordination of care and documentation

Coordination of care issues contributed to half of all administration errors in the complaints data, with inadequate communication between providers contributing to 42% of errors. Inadequate communication between providers was particularly prevalent for wrong-dose and failure-to-administer errors, whereas inadequate supervision of junior staff contributed to almost a quarter of wrong-patient errors. Communication issues between providers is commonly cited in the research literature as a contributing factor to administration errors.[151] [152] [153]

Inadequate communication between the providers involved in a consumer's care can result in the administrator not having all the information required to administer the medication to the consumer safely and correctly. In the complaints data, a common issue was administrators not being provided with enough information during shift handovers regarding previous medication administrations, which could result in the consumer receiving a double dose of the medication (two doses of the medication close together) or not receiving the medication at all (failure to administer).

Often these coordination of care issues also reflected deficiencies in the documentation of the medication record, for example, previous times of administration and doses of medication administered not being recorded. Documentation issues were common in the complaints data, with these issues contributing to around a quarter of administration errors. Other studies have pointed to issues around documentation of medication administration, with studies finding that medication name, dose, and time of administration are documented inconsistently.[154]

Another common issue involved administrators not seeking advice from the prescriber or senior staff when they were unsure about aspects of the prescription or medication. This could result in errors in the prescription being administered to the patient, or in the administrator making incorrect assumptions about the medication being administered.

Inadequate/inappropriate supervision contributed to 15% of all administration errors, and to 24% of wrong-patient administration errors. Just under two-thirds of issues around supervision related to supervision by registered nurses of the administration of medication by healthcare assistants, with this being a particular issue in residential care settings.

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[154] Hughes RG, Blegen MA. Medication administration safety. In Hughes RG (eds). Patient safety and quality: An evidence-based handbook for nurses. Rockville: Agency for Healthcare Research and Quality; 2008.

Case study: Overdose of codeine administered to child
(13HDC00213)

Master A, aged three years, was due to have a tonsillectomy and adenoidectomy performed at a private hospital. His sister, aged four years, was due to have the same procedures performed immediately afterwards.

Prior to surgery, an anaesthetist wrote prescriptions for the children's pre-surgery medications. Pre-medications are administered to patients prior to surgery to help prepare them for surgery. In this case, the anaesthetist prescribed paracetamol and codeine. The recommended adult dose for codeine is 30–60mg, while the prescribed dose for Master A, based on his weight, was 8.5mg.

Before administering the pre-medications, the children's allocated admissions nurse, RN D, asked a senior nurse, RN C, to check Master A's prescription with her, in accordance with the private hospital's policy. The nurses both read the prescription for codeine as 85mg. The nurses discussed that it was a large dose, but neither checked the prescription with the anaesthetist.

RN D administered Master A 85mg of codeine orally. When she checked his sister's prescription, which was for 8mg of codeine, she realised that a mistake had been made. Master A had his stomach washed out and showed no evidence of a codeine overdose postoperatively.

The Commissioner considered that RN D demonstrated very poor judgement when she administered Master A 85mg of codeine. Codeine is a commonly prescribed analgesia, and RN D acknowledged that she was aware of the usual adult dose. The Commissioner considered that by administering more than the recommended adult dose of a commonly prescribed analgesia to a three-year-old child, RN D failed to provide services to Master A with appropriate care and skill, in breach of Right 4(1) of the Code.

RN C acknowledged that she was partly to blame for the medication error, and should have been proactive in double checking the dose, which she knew was wrong. RN C noted that usually she would check with the prescribing doctor when she was unsure about a prescription. The Commissioner noted that the role of an independent checker, in the context of medication management, is to provide a safeguard against errors such as this occurring. RN C failed in this regard and, as a result, her actions contributed to an error that, in the circumstances, could have been easily prevented. Accordingly, The Commissioner considered that RN C failed to provide services to Master A with appropriate care and skill, in breach of Right 4(1) of the Code.

The Commissioner was critical of the legibility of the anaesthetist's prescription and the quality of her documentation. The Commissioner was also critical of the private hospital for the fact that two nurses failed to question with the prescriber a drug dose that they both recognised as high. HDC's expert advisor noted that "a culture of nurses not questioning medical colleagues is a disservice to both professions and to the patients to whom they owe a duty of care". The Commissioner considered that the hospital should reflect on the importance of ensuring that it fosters a culture where staff communicate openly and effectively with one another, in order to provide good care to consumers and minimise the chance of similar errors occurring in the future.

The Commissioner recommended that the Nursing Council of New Zealand consider whether reviews of RN D's and RN C's competence were warranted. The Commissioner recommended that the private hospital consider amending its Medication Management Policy in light of the case; provide HDC with a copy of its last quarterly prescribing audit and copies of the last three months of its medication administration incident reviews; and use an anonymised version of the case as a basis for staff training. These recommendations were met.

Busyness and distractions/interruptions

Being busy and being distracted/interrupted during the medication administration process contributed to a number of administration errors, with busyness contributing to 32% of errors and distractions/interruptions contributing to 19% of errors. These two issues go hand-in-hand, with busyness often causing administrators to become distracted or leading to interruptions. Additionally, the complaints data indicated that busyness can lead to or exacerbate a number of other contributing factors, including inadequate coordination of care, inadequate documentation, inadequate communication with the consumer, and a failure to follow policies/procedures.

Research has found that a high workload and distractions/interruptions can have a significant impact on patient safety, and both of these factors have commonly been found to contribute to administration errors.[155] [156] [157] [158] [159] An observational study in Australian hospitals found that the occurrence and frequency of interruptions was significantly associated with the incidence and severity of administration errors.[160] Thought processes can be distorted by high workloads and distractions/interruptions. These factors lead to divided attention and lapses in concentration, which can have a significant impact on an administrator's memory, resulting in slips and lapses where administrators inadvertently select the wrong type or dose of medication, fail to administer the medication at all, or forget to undertake the Five Rights checks.

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Case study: Retirement village resident given
medication prescribed for another resident (14HDC00568)

Mrs A, aged 89 years, was living in a serviced apartment at a retirement village. She received an assisted living package that included medication management. Mrs A was prescribed a number of medications, which staff administered to her from blister packs.

One morning, a coordinator, Ms H, took out a blister pack that she thought was Mrs A's, removed the morning medication from the blister pack, and placed the medication in a kidney dish to be checked against Mrs A's medication chart. However, at this point, Ms H was interrupted by another resident and went to assist the resident. When Ms H returned to the medication trolley, she failed to check the medication against the medication chart.

Ms H gave Mrs A medications that were prescribed for another resident. The medications concerned were aspirin, simvastatin 20mg, and dihydrocodeine 60mg, which Mrs A swallowed. Ms H then gave Mrs A frusemide and cilazapril medications. At this point, Ms H realised the medication error and asked Mrs A to spit out the additional medications, which she did. Ms H then immediately informed the registered nurse on duty, RN D, that she had given Mrs A the wrong medications. RN D advised Ms H to give Mrs A her usual medications, excluding aspirin. Due to differing recollections of events, it is unclear whether RN D gave Ms H any further instructions.

Ms H notified Mrs A's family of the medication error that morning. At lunchtime, Ms H told RN D that Mrs A was "OK" and that there were no changes evident. Mrs A went out with family, and returned in an unstable condition. The next registered nurse on duty assessed Mrs A, took her observations, and instructed Ms H to contact the woman's doctor. That evening, the doctor reviewed Mrs A and arranged for her to be transported to hospital, where she was admitted for further treatment and assessment.

The Medication Administration policy in place at the time required a number of steps to be taken before a resident was administered any medication, including taking the medication folder and trolley to the resident's room, checking the medication against the medication chart, administering the medication from the blister pack in front of the resident, and checking that the right medication was being administered to the right resident at the right dose. Ms H failed to undertake these steps. The Deputy Commissioner was critical that Ms H allowed herself to become distracted, and that she did not comply with the relevant policy. The Deputy Commissioner noted that had Ms H followed the mandatory steps, including the Five Rights check, it is likely that she would have realised the error before Mrs A ingested the medication.

The Deputy Commissioner held that RN D failed to follow the Medication Errors policy, which required her, as a senior member of staff, to undertake a number of actions, including taking Mrs A's observations and contacting her doctor. The Deputy Commissioner was also critical of RN D's decision to delegate her duties to Ms H. Nursing Council of New Zealand professional standards required RN D to adhere to such organisational policies, and it was held that by not following such standards RN D breached Right 4(2) of the Code.

The Deputy Commissioner was concerned that in this case neither Ms H nor RN D followed the policies in place at the retirement village, and that it was not routine practice for staff to take the medication trolley to Mrs A's room. Such failures pointed to a culture of non-compliance with policies at the retirement village. Accordingly, the Deputy Commissioner found that the retirement village failed to provide services to Mrs A with reasonable care and skill, in breach of Right 4(1) of the Code.

The retirement village made a number of changes following the event, including introducing a policy that staff giving out medications were required to wear a "Do Not Disturb" apron and not to carry the telephone with them; reminding staff to follow policy at all times; providing staff with education on medication management and incident reporting; developing a medication error flow chart; making enhancements to its senior carer and leadership training programmes; and implementing a new electronic medication system to reduce the risk of medication errors.

The Deputy Commissioner recommended that the retirement village review the actions taken pursuant to its internal investigation report and report to HDC on the implementation and effectiveness of those actions, including the recently implemented electronic administration system. It was recommended that RN D arrange further training through the Nursing Council of New Zealand on the principles and requirements for delegation to healthcare assistants, and undertake training on medication incident/error management. These recommendations were met.

Provider competence and knowledge of medication

Provider competence issues were a common contributing factor to administration errors in the complaints data, with it contributing to 20% of errors. Research has found that provider experience and skill and inadequate medication knowledge can contribute to administration errors.[161] [162] [163] Additionally, 13% of administration errors in the complaints data related to the provider having inadequate knowledge of the medication being administered. Often knowledge errors were exacerbated by a failure to seek advice, or by inadequate supervision.

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[161] Hughes RG, Blegen MA. Medication administration safety. In Hughes RG (eds). Patient safety and quality: An evidence-based handbook for nurses. Rockville: Agency for Healthcare Research and Quality; 2008.
[162] Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of medication administration errors in hospitals: A systematic review of the quantitative and qualitative evidence. 2013; 36, 1045–67.
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Case study: Administration of IV promethazine
(14HDC00958)

Mrs A went to an accident and medical clinic (the clinic) after disturbing a wasp nest and being stung approximately 10–15 times. Mrs A had experienced a delayed skin reaction to wasp stings in the past. Within 15 minutes of her arrival at the clinic, Mrs A was attended to by a physician, Dr C. Dr C noted that Mrs A had no hypotension, asthma, or throat swelling, and he prescribed intravenous (IV) promethazine 25mg and hydrocortisone 200mg. Dr C also requested that Mrs A's vital signs be monitored.

A registered nurse, RN B, then administered 25mg of promethazine to Mrs A. Promethazine must be diluted before IV administration to reduce the risk of vein irritation. However, RN B injected an undiluted form of promethazine into the cannulation site on Mrs A's hand.

Mrs A became drowsy, and, 10 minutes after the administration of promethazine, she was unable to be roused. Mrs A was monitored closely by RN B for one hour, with stable vital signs noted. However, as there had not been significant improvement in Mrs A's ability to be roused, she was transferred to a hospital by ambulance. She was discharged the next day and subsequently diagnosed with thrombophlebitis (vein inflammation).

RN B told HDC that at the time of administration, she believed that her knowledge of how to administer the drug was correct and safe, which is why she did not consult any of the medication resources available. HDC's expert advisor advised that safe medication practice requires and expects that a registered nurse will use appropriate organisational resources to check or inform his or her knowledge when involved in medication administration, and it was RN B's responsibility to check the available medication resources prior to administering promethazine. Additionally, the clinic's IV Manual provides that all intravenous drugs must be double-checked by two qualified persons. Dr C told HDC that the IV medications were not brought to him to be checked, and that had he checked the medications, "it would have prompted [him] to order its dilution".

The Deputy Commissioner held that by failing to comply with the clinic's IV Manual, in that she did not double-check the IV medications with another qualified person prior to administering them, and by administering an undiluted form of promethazine to the woman, RN B made a significant departure from the accepted standards of medication administration. Accordingly, the Deputy Commissioner considered that RN B did not provide Mrs A services with reasonable care and skill, in breach of Right 4(1) of the Code.

Following the incident, RN B completed an update of her pharmacological knowledge, and re-sat and passed the IV medications competency and IV drug calculation assessments. She also advised that it is now her practice always to check drug resources and references for any drugs that she has not administered on a frequent basis. In response to a recommendation by the Deputy Commissioner, RN B undertook further professional training on the administration of IV medications.

Reducing administration errors

Administering medication can be a complex task conducted in an environment with a number of competing demands. Administration errors in the complaints data were contributed to by a complex interplay of human and organisational factors. While individual providers must ensure that they are taking the necessary steps to prevent medication errors, literature suggests that system interventions are the most effective in reducing error.

This section collates the lessons from our findings and from the case examples in this report. The aim is to assist providers and organisations to recognise and address factors that contribute to administration errors.

Adherence to policies/procedures
Following the Five Rights is crucial to reducing medication administration errors. Over half of the administration errors in the complaints data reflected a failure to follow policies/procedures, most often the Five Rights. Administrators must ensure that they are following relevant policies and procedures and that the appropriate checks are carried out every time they administer medication – not doing so can seriously compromise patient safety.

The failure by multiple staff to adhere to policies and procedures points towards an organisational environment and culture that does not support and assist staff sufficiently to do what is required of them. Facilities must ensure that they have policies and procedures that are consistent with relevant standards, and that they have systems in place to ensure that staff are complying with these policies. These systems should allow for the effective oversight and monitoring of staff. Compliance also requires facilities to ensure that they have in place sufficient support for staff to allow them to follow policies and procedures, for example, ensuring that administrators have manageable workloads and that distraction/interruptions are minimised. Facilities should also have training and education programmes that provide training for new staff, and refresher training for current staff, on aspects of their policies/procedures to ensure that staff have the sufficient skills to follow them. Regular auditing of staff compliance with policies/procedures can be a valuable tool in ensuring staff adherence. Additionally, visual reminders highlighting the importance of following safe medication administration procedures may effectively raise awareness of this issue among providers, and the risks associated with it. The use of checklists that require providers to check off each step of the medication administration process as they complete it, can also help to encourage adherence.[164]

Use of electronic medication administration systems
The use of bar-code technology to verify a patient's identity and the medication being administered is a strategy that has the potential to reduce administration errors and ensure that the Five Rights are being followed.[165] Bar-code technology is often implemented in conjunction with electronic medication management systems that allow nurses to document the administration of medication automatically by means of bar-code scanning, thus reducing errors associated with inadequate documentation around previous administrations. Additionally, because the electronic system is linked to electronic medication orders, its implementation has the potential to reduce transcription errors, and can alert the administrator to any overdue medications. With the introduction of such

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[165] Bainbridge M, Askew D. Barcoding and other scanning technologies to improve medication safety in hospitals. Sydney: ACSQHC; 2017.

systems, studies have found a decline in the incidence of medication administration errors, and an increase in adherence to checking procedures.[166] [167] [168]

It should be noted that the introduction of such electronic systems will not eliminate all errors, and in fact has the potential to introduce new errors, such as the use of workaround strategies.[169] [170] In the complaints data, 10% of medication administration errors were associated with an electronic system, and often these issues were in relation to the ease with which alerts could be overridden. These systems need to be well designed, subject to close scrutiny, and introduced in a way that ensures that staff use their functions appropriately and as intended. Such systems do not remove responsibility from providers to adhere to the Five Rights in the same way as they would in the absence of an electronic system.

The Ministry of Health has signalled that smart use of digital systems, e.g., electronic prescribing and administration, is desirable. Roll-out at DHB level and across the health sector is incomplete. Lack of progress in this area is concerning, and it is recommended that this be prioritised.

Documentation and improving communication between providers
A number of administration errors in the complaints data were contributed to by a lack of information flow between administrators. Often the administration of a patient's medication is carried out by a number of different individual providers, and therefore it is vital that information about previous administrations is passed between these providers. Often this is done through documenting the details of medication administration and signing the medication chart, to provide evidence that the medication has been administered to the patient.

Administrators need to ensure timely recording of the administration of medicines, and ensure that reasons for overdue, withheld, missed, or rescheduled medicines are documented. It is important that organisations ensure that the work environment enables providers to meet documentation requirements, and that a culture is encouraged that values the importance of documentation in patient safety and continuity of care. Regular auditing of documentation can provide a useful check to ensure that documentation requirements are being met. The use of an electronic health record can help to ensure that the provider administering the medication has all the available information. Electronic medication management systems and barcode scanning may have the potential to reduce variation in administration documentation and reduce errors associated with inadequate or missing documentation.[171]

A number of coordination of care issues also reflected a failure by the administrator to seek advice or question senior staff when they had concerns about a medication order. It is important that organisations work to reduce the impact of hierarchy, and that a culture is embedded whereby all staff are empowered to ask questions and raise issues.

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[169] Poon EG, Keohane CA, Toon CS, et al. Effect of bar-code technology on the safety of medication administration. N Engl J Med. 2010; 362: 1698–707.

[170] Bainbridge M, Askew D. Barcoding and other scanning technologies to improve medication safety in hospitals. Sydney: ACSQHC; 2017.

[171] Bainbridge M, Askew D. Barcoding and other scanning technologies to improve medication safety in hospitals. Sydney: ACSQHC; 2017.

Reducing unnecessary distractions/interruptions

Distractions/interruptions contributed to 19% of all medication administration errors in the complaints data, and 41% of wrong-patient errors.

A strategy for reducing such distractions/interruptions is the introduction of a "no interruption zone" or protected drug administration times, where patients and staff are discouraged from disturbing an administrator when he or she is administering medication. It has been found that the overall number of interruptions during medication administration declines with the use of these interventions.[172] [173]

It is also important that organisations have strategies and processes in place to minimise distractions/interruptions, such as ensuring that there are other staff to attend to telephone calls and non-emergency patient requests, so that nurses who are administering medications are not interrupted. Staff should be provided with guidance about how to deal with distractions/ interruptions during times of high demand.

It should be noted that not all distractions/interruptions can be eliminated in busy healthcare settings where emergencies can occur at any time; therefore, it is important that the system, while trying to reduce unnecessary interruptions as much as possible, also has a number of defences to catch any errors that occur owing to necessary distractions/interruptions, including ensuring that the Five Rights checks are carried out.

Provider training

A number of administration errors in the complaints data were related to the provider's competence and knowledge. Educational packages designed to increase administrators' working knowledge of pharmacology and safety principals have shown positive results for decreasing error prevalence.[174] [175] [176] [177] Educational packages can also assist to improve provider adherence to medication administration policies/procedures.[178] It is also important that organisations ensure that providers have access to up-to-date medication information and best practice guidelines.

Communication with consumers

Patients have an important role to play in safe medication administration. In the complaints data, 23% of administration errors were contributed to by inadequate communication with the patient regarding the administration of the patient's medication. Providing the consumer with information about the medication he or she is being administered, including the type of medication, dose, route, and why the medication has been prescribed, provides an additional check for the provider, and empowers the patient to act as a safety net to reduce the chance of error.

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Error Reporting

For around 8% of medication errors in the complaints data, the error was either not reported to the organisation's incident reporting system, or the incident report that was documented was inadequate. For a further 6% of errors, the provider did not follow the organisation's open disclosure policy, and the consumer was not told of the error.

The reporting, and analysis, of medication errors is fundamental to error prevention. When errors are identified, their root causes analysed, and preventative action taken, similar errors will be reduced and patient safety increased. The reporting of those "near-miss" errors that were intercepted before harm was done, and those errors that did not cause patient harm, is just as important as reporting errors that do result in patient harm. The errors that do not cause harm can point to problems in the system and to error-producing conditions, which can then be rectified before harm occurs.

Additionally, Right 6 of the Code of Health and Disability Services Consumers' Rights gives all consumers the right to be fully informed, including the right to be informed about any adverse event that occurred in their care. Error disclosure to consumers should include acknowledgement of the incident, and explanation of what happened, how it happened, why it happened, and what actions have been taken to prevent it happening again.

Organisations must ensure that they have robust policies outlining expectations regarding open disclosure and incident reporting that reflect legal and professional standards, and that they have systems in place to ensure that staff are complying with these policies. Incident reports should be analysed, preventative actions put in place, and changes monitored to ensure that they have been implemented and are effective. Learnings from errors should also be reported throughout the organisation regularly.

Case study: Reporting of dispensing error
(14HDC00439)

Mr A, who previously had had a kidney transplant, presented at a pharmacy to have a new prescription filled and to pick up a repeat of his regular medications. One of the repeat medications was cyclosporine 50mg. Cyclosporine is an immunosuppressant used to prevent rejection following transplants.

Mr A's prescriptions were processed by a pharmacy technician, who inadvertently selected cyclophosphamide 50mg tablets from the shelf, instead of the prescribed cyclosporine 50mg tablets. Cyclophosphamide is a chemotherapy drug. The pharmacist, Mr C, checked the medications and initialled the dispensing record for each repeat medication dispensed.

Approximately seven weeks later, Mr A showed the cyclophosphamide tablets to Mr C, and enquired as to why the tablets were different from his regular cyclosporine capsules. Mr C told Mr A that the tablets were a "discontinued product", and he should stop taking them. Mr A left the cyclophosphamide tablets with Mr C.

Following this consultation, Mr C looked up who had dispensed the cyclophosphamide tablets and noted that the prescription had been processed by the pharmacy technician, and the dispensing record signed off by himself. Mr C then changed the stock levels on the pharmacy's computer system. Mr C did not complete an incident form or notify the pharmacy owner of the error. When questioned by the pharmacy owner about stock levels of cyclophosphamide tablets, Mr C did not disclose the error.

Two days later, Mr A returned to the pharmacy and spoke to the pharmacy owner about the cyclophosphamide tablets. Following this conversation, the dispensing error was discovered, and the pharmacy owner contacted Mr A and his GP to alert them to the incident, and undertook an investigation of the error.

The Deputy Commissioner held that Mr C did not check the medication being dispensed to Mr A adequately in accordance with professional standards, in breach of Right 4(2) of the Code.

The Deputy Commissioner also found Mr C in breach of Right 6(1) of the Code for failing to disclose the dispensing error to Mr A as soon as he became aware of it. The Deputy Commissioner considered that Mr C's failure to report the error was not in line with the requirements set out in the pharmacy's policy, and did not meet professional standards, in breach of Right 4(2) of the Code. The dispensing error in this case placed Mr A at a significant risk of harm, both because of the risk of medication toxicity from the cyclophosphamide and also because of the risk of not taking his immunosuppressant medication. The Deputy Commissioner noted that when Mr C became aware of the error, he needed to notify all relevant parties, including Mr A's GP, in order for any relevant tests and monitoring to be carried out. By failing to do so, Mr C failed to minimise the potential harm to Mr A, in breach of Right 4(4) of the Code.

In respect of this case, the Deputy Commissioner stated: "Consumers have a right to know what has happened to them when an error has occurred. In this case the dispensing error placed the man at significant risk of harm, and the pharmacist's actions after he became aware of the dispensing error failed to mitigate that risk … I consider that his actions demonstrate a serious lapse of judgement."

The Deputy Commissioner referred Mr C to the Director of Proceedings, who filed a charge before the Health Practitioners Disciplinary Tribunal. Professional misconduct was made out, and Mr C was fined and had two conditions placed on his practice.

Case study: Re-use of needle for injection, and communication of error
(13HDC00917)

Ms A attended a medical centre to receive a Depo-Provera injection. Another patient was also awaiting a Depo-Provera injection. A registered nurse, RN C, attended both patients. RN C obtained two Depo-Provera injections from the drug cupboard and placed both in the same kidney dish. After administering the medication to the first patient, RN C placed the used needle and syringe back in its box, instead of immediately disposing of them in the sharps bin, and returned the box to the kidney dish. RN C then inadvertently injected Ms A with the used needle. In addition, RN C did not check Ms A's weight and blood pressure, but documented that she had done so.

RN C realised her mistake immediately and mentioned to Ms A that the syringe was empty, but did not explain to her that she had injected her with a used needle. RN C allowed Ms A to return home without informing her of the needle-stick injury. The following day, RN C advised the practice manager of the error, and was told to inform Ms A and Ms A's GP of the error. RN C did not do so, and then went on leave for the next four days. When she returned from leave, RN C informed Ms A's GP. Ms A was contacted immediately, and appropriate blood tests were arranged. The blood tests all returned negative.

RN C admitted that she was aware of the relevant policies at the medical centre for administering injections but did not follow the policies. She advised that she was feeling stressed at the time of the error and, although she had asked for help from the other registered nurses, they were too busy to assist. While the Deputy Commissioner accepted that it was a busy day at the medical centre, and that human factors can result in errors, she stated that this does not excuse the failure to follow protocol. RN C's failure to

follow the standard protocols in place to counter the risk of human error led to the needle-stick injury. Accordingly, the Deputy Commissioner found that RN C failed to provide services to Ms A with reasonable care and skill, in breach of Right 4(1) of the Code. By failing to assess Ms A's blood pressure and weight, but documenting that she had done so, RN C failed to comply with professional standards, in breach of Right 4(2) of the Code.

The Deputy Commissioner stated that RN C knew that she had made an error, and therefore had a professional and ethical obligation to advise Ms A immediately, as well Ms A's GP and the practice manager. Ms A had a right to know what had happened to her without delay. RN C's failure to notify Ms A promptly about the adverse event meant that Ms A did not have the information that she would expect to receive, in breach of Right 6(1) of the Code. Additionally, the Deputy Commissioner considered that RN C's failure to notify Ms A's GP until five days later displayed a lack of accountability for her mistake. RN C should have appreciated the importance of reporting her error in a timely manner, so that the appropriate actions could be taken. By failing to disclose the needle-stick error to Ms A's GP openly and promptly, RN C failed to comply with professional standards, in breach of Right 4(2) of the Code.

The Deputy Commissioner was critical of the practice manager for failing to follow up with RN C to confirm that she had discussed the needle-stick error with Ms A's GP and make arrangements for Ms A to return to the medical centre to undergo blood tests.

The Deputy Commissioner noted that a medical centre should have an environment that supports safe care, promptly identifies risks to patient safety, and responds appropriately. Whilst the medical centre had appropriate policies in place in relation to the administration of injections and managing stress in the workplace, the Deputy Commissioner considered that the medical centre needed to be more cognisant of individual staff stress and of its ongoing responsibility to ensure that all nurses comply with its policies.

In response to recommendations made by the Deputy Commissioner, RN C reflected on her documentation practices to ensure that future clinical documentation is completed in accordance with accepted standards; reviewed initiatives at her workplace to deal with stress, and implemented strategies to deal with pressure in the workplace in order to help prevent this type of error from occurring again; reviewed her time management and prioritisation skills in order to manage patients better during busy periods; and ensures that she adheres to workplace policies at all times. The practice manager reflected on her actions after she was made aware of the needle-stick error, reported back to HDC on further actions she could have taken, and reviewed and familiarised staff on the medical centre's policies on incident reporting.

The Deputy Commissioner noted that the medical centre has employed additional nursing staff to reduce pressure during busy periods. She recommended that the medical centre also include additional actions in the needle-stick, sharps, and body fluid injury/contact protocol that reflect the required actions when a needle-stick injury is sustained by a consumer; consider reviewing the Depo-Provera injection protocol, so that it mirrors all the required practice steps, including circumstances when administration should not proceed; and update the Depo-Provera injection protocol to indicate clearly the expectations regarding the monitoring of blood pressure and weight. These recommendations have been met.

Conclusion

The majority of medication errors in the complaints data were due to a complex interplay of human and organisational factors. Many medication errors were slips/lapses, whereby providers made inadvertent errors often due to error-producing conditions or latent factors in the organisational environment. Therefore, system interventions are essential to reducing medication error.

A number of errors seen in this report were contributed to by a failure by providers to follow medication policies and procedures. Non-adherence to policies and procedures is concerning, and seriously compromises patient safety. While individuals must be held accountable for reckless behaviour and deliberate deviations from policies/procedure, these issues often reflect a culture of tolerance within an organisation — where not following policies/procedures has become normalised. It is vital that organisational leaders are alert to such issues and ensure that staff are supported to do what is required of them, and that they have a culture and system in place that ensures compliance with policies/procedures.

Additionally, electronic medicine management systems with clinical decision support tools that are fit for purpose, fully integrated across the care continuum at a national level, and take into account the complexity of the process and the multiple providers involved, would mitigate against a number of the contributing factors to errors seen in this report. In order to reduce error it is important that these systems are well planned, well designed, and subject to close scrutiny, and that providers are trained appropriately on the use of these tools to ensure that they make the best use of the safety features.

Medication errors are somewhat inevitable due to the fact that human error is inevitable; however, it is vital that organisations have a series of defences built into their system to prevent such errors from reaching the patient. This report has collated the lessons from our findings and from the case examples in this report, in order to assist providers and organisations to recognise and address factors that contribute to prescribing, dispensing, and administration errors.

APPENDIX: Contributing Factors

Coordination of care

- **Inadequate communication between providers**, e.g., failure to pass on information about medication during shift handovers, inadequate communication between primary and secondary care, inadequate communication between primary care providers, inadequate communication between secondary care teams, failure to contact prescriber to query prescription, failure to escalate concerns and seek advice from senior staff etc.
- **Inadequate supervision of junior staff** often related to inadequate supervision of house officers, registrars, enrolled nurses , health-care assistants and pharmacy technicians by more senior staff

Documentation

- **Inadequate documentation** failure to adequately document important aspects of consumer's medication management
- **Transcription error** inadvertently transcribing a prescription incorrectly e.g. putting a decimal point in the wrong place when transcribing medication dose or selecting the wrong dose from an electronic drop down list.

Medication-specific issue

- **Similar names** where the wrong medication is inadvertently prescribed, dispensed or administered because the provider inadvertently selected medication with similar name to the one they intended to select
- **Similar packaging** where the wrong medication or dose is inadvertently dispensed or administered because they provider inadvertently selected medication with similar packaging to the one they intended to select
- **Unusual** where an error is inadvertently made because the process deviates from the norm e.g. due to an unusual dosing schedule

Organisation/system issues

- **Busyness** where provider makes an error due to busyness of their work environment
- **Distractions/interruptions** where provider makes an error due to being distracted or interrupted while prescribing, dispensing or administering medication
- **Inadequate policies/procedures** where an organisations' policies/procedures do not adequately support safe prescribing, dispensing or administration of medication
- **Failure to follow policies/procedures** where an error is made because provider deviated from organisation's policies/procedures
- **Inadequate software system** errors contributed to by electronic medication management systems e.g. alerts not appearing, the ease with alerts can be over-ridden, lack of access to electronic patient notes etc.
- **Inadequate training/induction** where new staff have not received the training or induction they require to follow the organisation's medication-related policies/procedures

Provider error

- **Provider competence** error made due to issues with provider's competence
- **Failure to communicate effectively with consumer** where consumer is not given the information they require to pick up on the medication error e.g. consumer's allergy history not discussed, consumer's medication history not discussed, not checking the medication being administered with the consumer etc.
- **Failure to obtain necessary information** where the provider does not obtain the necessary information they need to safely prescribe, dispense or administer the medication e.g. not eliciting consumer's medication history, not reviewing best practice guidelines, failure to review consumer's notes etc.
- **Failure to act on information** where the provider has the necessary information to make the correct decision but does not act on it – often a failure to synthesize relevant information correctly and apply the information to the individual patient
- **Failure to follow policies/procedures** where an error has occurred because the provider failed to follow the relevant policies/procedures
- **Inadequate knowledge of medication** where the provider made an error due to a lack of knowledge about the particular medication they were prescribing, dispensing or administrating
- **Provider impairment** e.g. error made due to provider illness