Medication safety, prescribing and the medicines management process in mental health

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Executive summary

Therapeutic interventions for mental health consumers frequently include medication, often in combination with psychosocial treatment. However, adverse drug events (ADEs) associated with medicines used in mental health do occur and some of these cause serious morbidity and mortality. The Health Quality & Safety Commission has reviewed what is known about medication safety within mental health. The review covered all aspects of medicines management: prescribing, dispensing, administration, monitoring, transitions in care and adherence. It considered evidence that adverse events occur, along with prevention strategies that have been tested.

A critical aspect of medication safety in mental health is to have consumer input into how services are provided, as well as their input and agreement to a treatment plan, including clear and full discussions about possible adverse drug reactions (also called adverse effects or side effects). Consumer help in monitoring the risks associated with any medication is equally important. Involving family and whānau in service planning, treatment plans and monitoring can also be very important.

Medication-related adverse drug events in mental health

Growing evidence is available on the type and number of ADEs occurring in mental health hospitals but no evidence is available in the community care setting.[1,2] The majority of medication error studies focus on prescribing and/or administration errors; for example, omitting medicines or doses, or prescribing or administering the wrong dose. Studies report rates from 4.5 to 6.3 percent of prescription items that contain prescribing errors.[3,4,5] Other studies do not report on prescribing error rates in the same way. Dispensing errors were a very small percentage of the errors reported to error reporting systems. Administration errors occur in 20–25 percent of all opportunities for error.[6,7]

Further work on identifying and reporting on errors, in all aspects of medicines management in hospital and community care, would help identify system changes to prevent errors.

Medication safety in mental health

Prescribing

Using electronic systems could reduce errors involving omission of medicines, wrong drug or dose, illegible prescriptions or wrong person.[8,9] Evidence shows that medicine reconciliation or involving clinical pharmacists also reduces prescribing errors.[1]

Other important aspects of safe prescribing for mental health consumers are how and when antipsychotic polypharmacy is used and reducing the duration of untreated psychosis.

Antipsychotic polypharmacy is not recommended except in certain specific situations. In one review, the incidence of antipsychotic polypharmacy ranged between 4 and 70 percent.[10]

The risks associated with antipsychotic polypharmacy are that it increases the likelihood of prescribing doses above the maximum recommended antipsychotic dose, causing increased adverse drug reactions, and that it increases the risk of developing metabolic

syndrome. Australian studies show that one-half to two-thirds of people who have severe mental illness and are taking multiple antipsychotics at the same time have symptoms of metabolic syndrome.[11]

Studies have shown that prescribing as required antipsychotics or prescribing an antipsychotic for a non-psychosis indication are two reasons for antipsychotic polypharmacy.[12,13]

A longer time between the onset of psychotic symptoms and the start of treatment is considered the strongest predictor of symptom severity and prognosis.[14]

Treatment guidelines, pathways or algorithms are often introduced as a method to improve prescribing. Common lessons learnt when introducing any of these tools include:[15,16,17]

- local clinicians may not adopt the method because they have not received the evidence base or there was no opportunity for them to 'buy in' during the development of the tool. Locally and collaboratively developed guidelines, based on national guidelines, can often be implemented successfully
- tools need to take into account the local population, resource availability and local geography
- management needs to be involved
- clinicians need to see the benefit for their consumers and themselves
- documentation needs to be simple and non-repetitive
- clinicians may not adopt a method if it brings extra work that takes them away from direct patient care
- training has to be timely and targeted, and take staff turnover into account
- additional staff are often necessary for evaluation and to run an audit and feedback system.

Introducing guidelines using quality improvement methodology, or multiple interventions, was found to be more successful than education alone.

Dispensing and pharmacy services

Little is known about dispensing error rates in mental health, but dispensing error rates across hospital and community settings range between 0 and 45 percent. Robotic dispensing is seen as the most effective method to reduce dispensing error rates, especially if it is linked to an electronic prescribing system.

One mental health study showed that conducting a clinical pharmacy review on admission, discharge and post-discharge reduced drug-related problems and improved the medication appropriateness index.[18]

While any health professional can carry out medicine reconciliation, pharmacists commonly provide this service. Medicine reconciliation can be particularly important for mental health consumers because they often have many different points of contact with the health system, including with a general practitioner (GP), community care, drugs and alcohol service and various hospital services. A study compared the GP's medicines list with the hospital admission medicines list, with the medicines dispensed on discharge, with the discharge medicines list and finally with the GP's first prescription post-discharge.[19] It found only four

consumers had no discrepancies between the lists and that what the consumer was actually taking had not been taken into account.

Administration

Studies identify that administration errors are common, occurring in 20–25 percent of all opportunities for error, and that the most commonly observed error is omitted doses.[6,7] Other factors that independently predict error are interruptions, the number of when or as required medicines, the total number of consumers on each ward for a medication round and the total number of doses due on a medication round.[20]

Three studies to reduce administration errors in mental health hospitals focused on introducing an automated dispensing cabinet, a quality improvement project to reduce omitted doses and a specially trained health care assistant to observe that the Five Rights* were followed during administration rounds. Electronic prescribing and administration systems, the Five (or more) Rights and dedicated administration rounds where interruptions are not allowed have been studied in other areas of medicine.

Monitoring

Adverse drug reactions are common with many medicines used in mental health. The 2010 Australian survey of people with a psychotic illness found that 77.4 percent have unpleasant adverse effects from their medication and one in three of them lives with moderate to severe impairment due to side effects.[21.] Monitoring can prevent some adverse drug reactions from causing serious morbidity and mortality; for example, clozapine-induced agranulocytosis[22] or metabolic syndrome.[23] Clozapine blood count monitoring reduces the risk of clozapine-induced agranulocytosis by approximately 20 times.[22] Evidence-based guidelines recommend regular metabolic monitoring for consumers taking antipsychotic medication. A meta-analysis of studies showed that monitoring was worryingly low, even after guideline implementation.[24] Monitoring will not prevent the development of metabolic syndrome but clinicians and consumers should be aware that the syndrome is developing and respond appropriately. A programme to prevent the initial weight gain when starting antipsychotics is recommended.[25]

One of the main issues with monitoring is 'who is responsible for doing it' and communicating the results to the consumer and all team members.[26,27,28] To be effective, monitoring needs to be incorporated into clinical practice and any abnormal results it identifies need to be acted on. Partnering with consumers in monitoring, particularly for physical parameters, can empower consumers and improve monitoring.[29,30]

Adherence and patient information

Adherence to medicines is defined as the extent to which the consumer's action matches the agreed recommendations. In people with mental illness, particularly in those grouped under a diagnosis of schizophrenia, up to 75 percent of people after being diagnosed and two years after their hospital discharge are non-adherent with their antipsychotic medication.[31]

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* The Five Rights are: right patient, right drug, right dose, right route, right time. For more information, see www.ihi.org/resources/Pages/ImprovementStories/FiveRightsofMedicationAdministration.aspx

Psychoeducation, motivational interviewing techniques, electronic support and reminders, and a pharmacy-based intervention programme are all methods that have been used to improve adherence to medicines.[32,33,34,35,36] Research supports a strong and positive therapeutic relationship as being critical to promote medication adherence.

One way of improving adherence can be to partner with consumers and, if necessary, their family and whānau, by sharing information about proposed treatment, including possible adverse drug reactions. This approach can help consumers make informed choices and promotes a strong and positive therapeutic relationship.

Transitions

Transitions of care are sources of error and confusion, particularly for mental health consumers who move between hospital and community-based mental health teams for their care but receive input from primary care teams and other specialists as well. Communication failures between primary care and mental health specialists are linked to worse outcomes.[38]

Studies show medicine reconciliation reduces medication discrepancies in transitions of care. Other initiatives to improve communication are: joint case conferences and treatment planning between primary care and psychiatrists; using medicines management coordinators; and improving on-call communication.[37,38,39]

Child and adolescent mental health care

Young people with first episode psychosis can rapidly experience weight gain, obesity, hyperlipidaemia, insulin resistance, hypertension and metabolic syndrome when starting antipsychotics.[40,41] Implementing guidelines and pathways is as difficult for this group as for adults and there is little evidence to support one method over another.

Ideally a healthy lifestyle programme should be available. Monitoring early in treatment is particularly important in this consumer group, with an action plan for when abnormal results are found. One study using a healthy lifestyle programme was successful in reducing weight gain in the young people participating.[42]

1. Introduction

Medication has a long, and at times controversial, history in mental ill health and treatment. However, treatment with medication is one of the most commonly used therapeutic interventions for people with serious mental illness.[43] Medication can help to alleviate symptoms, but successful treatment may also include psychosocial interventions. For example, psychotherapy, other psychological therapies, counselling, goal setting, community navigation and other recovery-based approaches such as peer support, advocacy and self-determination may be part of a holistic treatment, recovery, care or support plan. It is important to always work with the consumer at the centre of planning and treatment, and to involve the family and whānau, particularly when medication is part of the plan.

Reports indicate more than 50 percent of people in the general population are non-adherent with their medication. In people with mental illness, the rate of non-adherence is thought to be much higher. This tendency is particularly evident in those grouped under a diagnosis of schizophrenia: up to 75 percent of people after being diagnosed and two years after their hospital discharge are non-adherent with their antipsychotic medication.[31] Medicines use is frequently associated with problems, errors and adverse events, many of which are avoidable.[43] The 2010 Australian survey of people with a psychotic illness found that 77.4 percent have unpleasant side effects (also referred to as negative or adverse effects) from their medication and one in three lives with moderate to severe impairment due to side effects. The same survey found that using psychotropic medication relieved symptoms, either a lot or a little, in 85.4 percent of the people interviewed.[21]

While medication can benefit people with mental illness, which can motivate adherence, they can be affected by serious morbidity and, in some cases, premature mortality.

The medicines management process includes prescribing, dispensing, administering and monitoring medication. Many studies have evaluated the medication error or adverse drug event (ADE) rate in acute care hospitals, using various methodologies. The evidence in mental health settings for prescribing, dispensing and administration medication error or ADE rates is more limited, and studies vary in their conclusion as to whether medication errors and ADEs occur more or less often than in acute care hospitals.[3] This review has found no studies published after 2000 that considered the medication error or ADE rate in community mental health. In contrast, it found many studies that evaluated monitoring for adverse drug reactions in mental health. Such monitoring has become common following the introduction of the second-generation antipsychotics, recognising that they have adverse metabolic effects and contribute to the serious morbidity and premature mortality in mental health.

The review of the literature searched Medline, CINAHL and Psychinfo from 2000 through to December 2017. Search terms were various combinations of:
- quality improvement
- mental health
- psychiatry
- antipsychotic agents
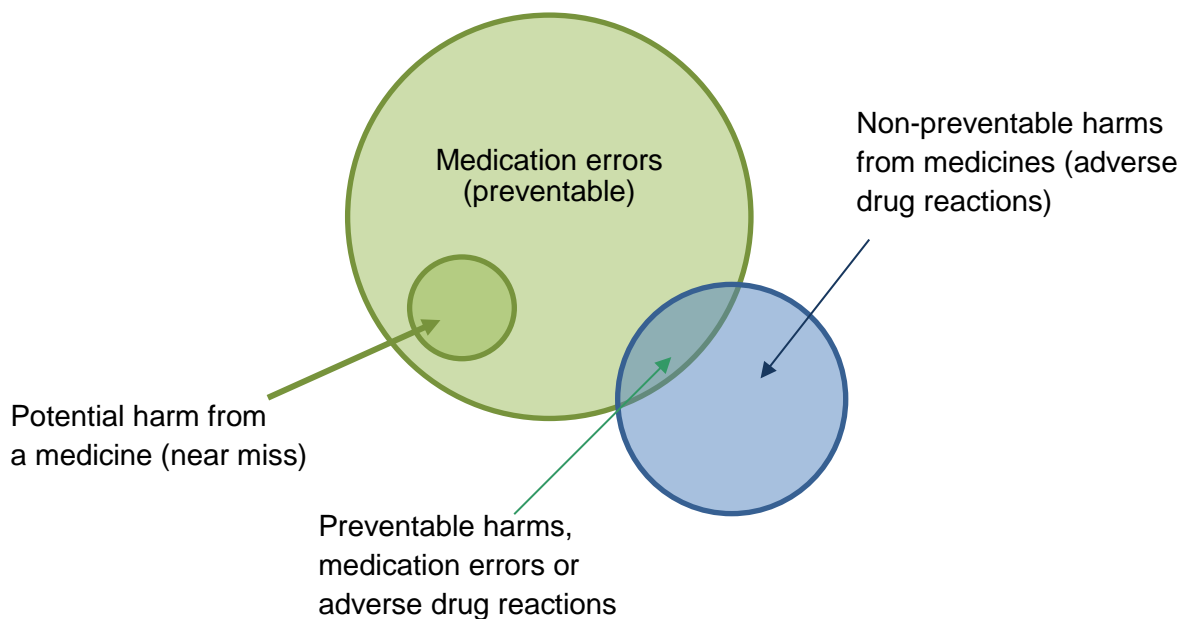- medication errors
- evidence-based medicine

- medicines management
- system redesign
- antipsychotic side effects
- prescribing
- inappropriate prescribing
- opiate substitution treatment
- improving prescribing
- co-design
- adverse drug events
- medicine
- medication.

The review also involved searching grey literature for medicines management initiatives related to mental health.

2. Medication errors, adverse drug events and adverse drug reactions

Medication errors are incidents where there has been an error in the process of prescribing, dispensing, preparing, administering, monitoring or providing medicines advice, regardless of whether any harm occurred or was possible.[44] The definition used varies in different studies. Most errors result in no or low harm. Incidents that result in harm to the consumer are also termed ADEs. ADEs can be preventable or non-preventable. Non-preventable ADEs are classified as ADRs.

Figure 1: Taxonomy of medication-related harm

Source: National Patient Safety Agency, National Reporting and Learning Service. 2007. *Safety in Doses: Improving the safe use of medicines in the NHS*. London: National Patient Safety Agency.

2.1 The impact of medication errors and ADEs

The most recent New Zealand study focused on ADEs in six district health boards and used trigger tool methodology.[45] It found that 28 percent of the patients (non-mental health) had experienced one or more medication-related harms. Most of the harm (96 percent) was classed as minor with no long-term consequences but some of this harm did increase the length of stay. Serious harm happened in 2.4 percent of the cases and, in 1.6 percent of cases, harm resulted in permanent injury or death. Medicines started in hospital caused 65.5 percent of the harm, while 29 percent of the cases related to medicines started in the community. The other 5.5 percent were people whose harm was identified on readmission to hospital when the medicines had been started on the previous admission.[46] Compared with similar international studies, the New Zealand rate of harm was in the high range, although the ADE rate as a percentage of admissions varies widely between studies (3.4–31 percent).[47,48,49,50,51,52,53] Note that study design can dramatically

alter percentages (eg, a study of elderly patients taking multiple medicines is likely to dramatically increase the rate).

Incident or ADE rates in mental health will not necessarily reflect those of the general population because of the nature of the diagnoses, the consumers and the medicines used.[54] The ADE trigger tool used in the above New Zealand study was designed for medical patients and not for mental health consumers. The Institute for Healthcare Improvement has developed a trigger tool for mental health that broadens the triggers to include some that are specific to mental health.[55]

Knowing and understanding the errors and ADEs that are happening in an organisation, on a ward, in a community clinic or in a care home can help identify the serious and/or common errors and ADEs that are causing consumer harm. With this information, clinicians can work out the root causes so that system change can be considered. System change might involve actions to change something at an organisation level or with the support of the organisation, or local changes could make a difference. For example, having a national guideline available does not automatically mean that all clinicians will follow the guideline. Local implementation and quality improvement (QI) work may be needed to drive a change in practice. In mental health services, it is particularly important to involve consumers and their family and whānau in system change whenever possible. Any changes made should maximise the safety benefit to the consumer, as well as the clinician.

Antipsychotic medicines are critical in the pharmacological management of severe psychotic disorders.[21] However, when more than one antipsychotic medicine is used concurrently, or when the dose is at or above the upper limit of evidence from clinical trials, the burden of side effects often causes considerable distress.[56,57] Side effects can become so troubling that some people are non-adherent with the prescribed treatment regimen.[58,59] In some cases, people do benefit from treatment to an extent that motivates them to continue to use it, but they are nevertheless affected by serious morbidity and, in some cases, premature mortality.[60,61,62]

2.2 Findings on medication incidents and adverse events in mental health services

A review of the studies reported in the literature over the past 17 years shows 21 individual studies have looked at medication incidents or ADEs. All the studies are in the hospital setting, focusing on acute, care of the elderly or general mental health wards. Most were carried out in the United Kingdom, while other studies occurred in the United States of America, Thailand, India, Japan, Denmark and Pakistan. No studies in the community setting were identified.

Reviews of medication incident reports and ADEs have commented on the difficulty of comparing results between studies because investigators differ in the definition of medication incident or adverse event they use. Another difficulty in comparing study results, particularly those using incident reports, occurs when no denominator is available; for example, number of incidents per number of medicines prescribed, or administered, or per number of bed days. The incidence of monitoring-related ADEs or errors is only reported in one study but further work in Chapter 6 identifies baseline data on the frequency of monitoring and, in some studies, the associated adverse drug reactions.

In the 12 studies published from 2000 to 2010 inclusive (see Appendix 1), the sources of information were: incident reports; chart or record review; or pharmacist intervention reports. Four studies identified prescribing errors; two were based on pharmacy intervention reports and two based on chart or record review. Administration errors were identified in two studies through an ADE reporting scheme and an incident reporting system. Four studies – two using incident reports, one using chart review and one using a combination of an ADE study, incident reports and pharmacist intervention reports – included prescribing, dispensing and administration incidents. One pharmacist intervention study reported both prescribing and administration errors. One electronic incident reporting system study included monitoring errors.

The studies reported the number and types of errors differently. While some considered the overall quality of prescribing, most did not.

1. Nirodi and Mitchell report that 16.1 percent of all prescription items were illegible. Review of the 112 consumers' prescriptions found only 20 consumers (18 percent) had prescriptions that were legible and free from all errors. Overall the review showed the quality of prescribing was inferior in consumers with dementia compared with those with functional psychiatric illness.[63]
2. Grasso et al identified that 11 percent of the total number of errors were prescribing-related, 1 percent dispensing-related, 66 percent administration-related and 23 percent transcribing-related.[64]
3. Paton and Gill-Banham found that the biggest percentages of pharmacist interventions were clinical (38 percent) and clerical (27 percent).[65]
4. Haw and Stubbs used pharmacist interventions to identify 311 errors in 260 prescribed items.[66]
5. Ito and Yamazumi used 221 reports of potential administration-related ADEs to identify 35.7 percent of the total involved administering the wrong dose and 24.9 percent were intercepted before reaching the consumer.[67]
6. Stubbs et al, using pharmacist intervention reports, found that 23.7 percent of the errors were in decision-making and 76.3 percent in prescription writing.[68]
7. Maidment and Thorn, using a new incident reporting system, identified errors and potential incidents/near misses from the reports. Over a 12-month period, they found one prescribing error report and one potential incident/near miss prescribing report; four dispensing error reports and one potential incident/near miss dispensing report; 47 administration error and 3 potential incident/near miss administration reports; and one monitoring error report.[69]
8. Haw et al report on 123 administration incident reports over three-and-a-half years.[70]
9. Rothschild et al triangulated medication incidents, pharmacist interventions and the results of an ADE study to report that, over 1871 admissions; 68 percent of incidents were prescribing-related, 10 percent administration-related and 20 percent transcribing-related. The ADE study found preventable events occur in 13 percent of cases.[71]
10. Shawahna and Rahman, using chart review, found 39.4 percent of items contained a prescribing error.[72]
11. Haw and Cahill, through an analysis of two years of incident reports, found that 6.7 percent of the incidents were prescribing-related, 4.5 percent dispensing-related and 89.8 percent administration-related.[73]

12. Sirithongthavorn et al reviewed 7,444 prescriptions and found 180 errors: 68 were prescribing-related, 17 dispensing-related and 86 administration- or transcription-related.[74]

Because studies used a variety of definitions for the level of harm, direct comparisons between their results are impossible. The different studies gave the following descriptions of the harm potential and/or severity (with examples, if given).

1. Nirodi and Mitchell did not consider risk of harm.[63]
2. Grasso et al: 58 percent of errors had a high risk of causing harm.[64]
3. Paton and Gill-Banham: 11 percent of incidents had a potentially serious outcome.[65]
4. Haw and Stubbs identified a potential source of harm to the consumer in 9 percent of intervention reports but none was potentially life-threatening.[66]
5. Ito and Yamazumi: 14.9 percent of the ADE's identified were potentially significant and 28.5 percent potentially serious.[67]
6. Stubbs et al: 11.4 percent of the prescription interventions if left unchanged could cause harm to the consumer; none was life-threatening.[68]
7. Maidment and Thorn judged 23 percent of the incidents to be of moderate severity and 3 percent of high severity (for example, when a prescription was rewritten, the dose of lithium was doubled).[69]
8. Haw et al rated 17 percent of the incident reports as having the potential to cause moderate adverse effects and 1 percent had the potential to cause serious adverse effects.[70]
9. Rothschild et al: severity of harm for most ADEs was significant (66 percent) while fewer were serious (31 percent) or life-threatening (2 percent).[71] An example of a life-threatening preventable ADE was when an elderly consumer was given a total of 275 mg quetiapine and 50 mg trazodone, orally at night; the next morning the consumer was found lethargic and fell out of bed resulting in a cervical spine fracture. An intercepted near-miss, life-threatening example was when the pharmacy had an order for benztropine 50 mg intramuscular or oral for chemical restraint changed to diphenhydramine 50 mg.
10. Shawahna and Rahman did not assess severity.[72]
11. Haw and Cahill considered 5.4 percent of the incidents were of moderate severity and 0.9 percent serious.[73]
12. Sirithongthavorn et al did not assess severity.[74]

The Stubbs et al 2004 study, in repeating the Haw and Stubbs 2003 study, noted a reduction of 32 percent in the overall number of prescribing errors. Considering the number of interventions recorded and the number of medicines prescribed in the two studies, the benefits gained from the changes made between the two studies are minimal. The number of interventions per medicine prescribed was 1.19 in the first study and 1.12 in the second study. The changes made in the time between the two studies were to introduce a redesigned medication card and to provide clearer guidance to prescribers on prescription writing. The 2004 study noted that 25 percent of the prescribing errors were on a particularly busy ward.

The results of nine studies (Appendix 2) published between 2010 and 2018 include three that used direct observation as a source of administration ADE information. One of these studies also used chart and discharge summary review to identify prescribing ADEs. Reviewing chart or discharge prescriptions for potential ADEs is the methodology in four

studies reporting on prescribing errors. One study reporting prescribing errors used medicine reconciliation and one study reporting prescribing and administration error used chart review. No studies used incident reports as the source.

The studies used a variety of methodologies, but most were chart review. They varied in their reporting of the numbers and types of errors.

1. Jhangee et al used chart review to look at prescribing errors and identified 1,131 errors in 648 prescriptions.[75]
2. Soerensen et al identified errors through a mix of chart review, direct observation and unannounced audits of medicines that nurses dispense to administer to consumers. Errors occurred in 23 percent of opportunities for error in discharge prescribing, compared with 4 percent of opportunities for error in computerised physician order entry. Administration errors occurred in 42 percent of opportunities for error (95 percent of these were lack of identity control). Direct observation found errors in 3 percent of opportunities for error in the nurse dispensing of medicines, but unannounced control visits found them in 13 percent of opportunities for error.[76]
3. Keers et al 2014, using chart review and medicine reconciliation, found 288 prescribing errors in 4,427 prescription items. The highest error rate was in prescriptions written on admission (10.7 percent) and the lowest rate was in rewritten prescriptions (2.5 percent).[3]
4. Cottney and Innes, using direct observation, identified 139 errors in 4,177 administrations.[20]
5. Keers et al 2015 identified that 54 of 274 discharge prescriptions contained one or more prescribing errors. The common errors were: failing to indicate or incorrectly indicating who was responsible for continuing care; and prescriptions not containing information on medicines discontinued in hospital.[4]
6. Hema et al identified that 52.2 percent of inpatient prescription charts and 100 percent of outpatient charts contained errors.[77]
7. Ayani et al, in their ADE study, used chart review to identify (with the incidence per 1,000 patient days in brackets) 955 ADEs (42.0) and 398 medication errors (17.5). Of these errors, 166 (7.3) resulted in harm and were classified as preventable ADEs.[78]
8. Scott et al identified 288 prescribing errors in 5,127 items (4.5 percent).[5]
9. Abduldaeem et al, through direct observation of medication administration, found 153 errors in 317 opportunities for error.[79]

Because studies used a variety of definitions for the level of harm, direct comparisons between their results are impossible. The different studies gave the following descriptions of the harm potential and/or severity (with examples, if given).

1. Jhangee et al did not assess severity in detail but identified some errors as having potentially great significance.[75]
2. Soerensen et al: of the opportunities for error, 8 percent had the potential to cause serious harm or were potentially fatal. Of the 189 errors identified, 84 had the potential to cause serious harm or were potentially fatal.[76]
3. Keers et al 2014: 6.9 percent of the identified prescribing errors were potentially serious or life-threatening. For example, the drug prescribed has the potential to cause a life-threatening reaction based on the consumer's medication history.[3]
4. Cottney and Innes classified 11 percent of errors as likely to result in serious adverse effects or relapse, but did not identify any errors likely to result in a fatality. An example

of an error likely to result in a serious adverse event was prescribing and administering the wrong insulin – intermediate acting instead of rapid acting.[20]

5. Keers et al 2015: clinically significant prescribing errors involved those rated as potentially clinically significant, serious or life-threatening for consumers.[4] The study identified 54 (73 percent) prescribing errors as potentially clinically significant for consumers and 4 as associated with potentially serious harm. One example of potentially serious harm was when risperidone 3.5 mg was prescribed instead of risedronate 35 mg on the discharge prescription for a 74-year-old consumer.
6. Hema et al did not assess severity.[77]
7. Ayani et al report that none of the ADEs was preventable, and classified 1.4 percent as life-threatening and 28 percent as serious.[78]
8. Scott et al did not assess severity.[5]
9. Abduldaeem et al did not assess severity.[79]

In a 2010 review of medication errors in psychiatry, Procyshyn et al examined patient-related, provider-related or system-related factors that contribute to medication errors.[1] Consumer-related factors include non-adherence, and consumers not informing care providers about their current medication and their symptoms of psychiatric illness. The clinical medicine management practices of prescribing, transcription, dispensing, administration and monitoring are provider-related factors. The system-level issues contributing to medication errors are non-seamless continuity of care, not providing medicine reconciliation services, not having an adequate clinical pharmacy service and not supporting a non-punitive medication error reporting system.

The review found gaps in the literature for 'community residential care for mentally retarded individuals, community and out-patient settings and in the geriatric psychiatric population'.

A more recent (2017) systematic review[2] concludes that 'medication errors occur frequently in mental health hospitals and are associated with risk of consumer harm'. The review suggests that medication safety interventions should target the risk associated with psychotropic medication. Further research is needed, in particular, into the causes of medication errors and ADEs in mental health.

Medication errors and ADEs have been shown to occur in psychiatric services. While the knowledge from the studies has to take into account the different care methods in the different countries involved, it is clear that errors and ADEs are relatively common. Learning from the results of studies and reviewing adverse events and medication incidents in any organisation can highlight the issues causing the most harm and guide efforts to reduce the risk of ADEs affecting consumers in the New Zealand mental health service.

3.   Prescribing

3.1 Guidelines, pathways and algorithms with medicines included

All fields of medicine have a gap between published evidence and clinical practice. To change clinical practice, a growing number of bodies are publishing guidelines that are based on a review of the current evidence. Many guidelines, along with associated pathways and algorithms, were published between 2000 and 2018 for different psychiatric conditions. The uptake of guideline recommendations in clinical practice is known to be poor. Reasons that contribute to the poor uptake include difficulties with accessing guidelines and transferring the evidence into everyday clinical practice, the unique nature of a country's consumer population, the availability of medicines and the availability of staff. Clinical pathways are often seen as a way to translate guidelines into local protocols for introduction into clinical practice and, in the process, promoting those changes in clinical practice. Appendix 3 lists the current national guidelines (English language) identified.

National Institute for Health and Care Excellence (NICE) guidelines are regularly updated and six are listed in Appendix 3.[80,81,82,83,84,85] The Canadian Psychiatric Association updated its guidelines in 2017, of which the appendix lists five.[86,87,88,89,90] The appendix includes the Royal Australian and New Zealand College of Psychiatrists' clinical practice guidelines for managing schizophrenia and related disorders and the Orygen's Australian clinical guidelines for early psychosis (in children), both published in 2016.[91,92] The other guideline less than five years old included in the appendix is the European Psychiatric Association guidance on early intervention in clinical high-risk states of psychoses.[93]

Other guidelines, such as the American Psychiatric Association guidelines, were published more than five years ago and have not been updated to reflect current research and newer medicines. Where the guidelines in Appendix 3 are more than five years old the publishing organisation still considers them to be current, with the proviso that some treatments may have changed.[94,95,96] The appendix includes the American Psychiatric Association's Choosing Wisely recommendations because they represent a simple set of recommendations, developed with consumers, that aim to reduce the use of low-value and inappropriate clinical interventions.[97] Reviews of guidelines specific to areas of care – for example, pharmacological treatment in early psychoses – provide information on available guidelines although many are considered out of date because they are more than five years old.[98,99]

The clinical guidelines give information on the treatment options for various diagnoses. They include information on starting medicines, continuing use and monitoring but rarely include details about stopping medicines. As consumers may want to stop their medicines for a variety of reasons, it is important that health professionals are able to discuss this and agree on a safe method of doing so with the consumer. While not all consumers will suffer medicine discontinuation symptoms from abruptly stopping a mental health medicine, there is no method of predicting whether a consumer will suffer symptoms or not. The best approach for withdrawing a medicine is to gradually reduce or taper the dose. Information on safely withdrawing a variety of mental health medicines is available for health professionals and consumers.[100,101]

A Cochrane review[15] considering mental health guideline implementation suggests that, on the current evidence, 'uncertainty remains about clinically meaningful and sustainable effects

of treatment guidelines on patient outcomes and how best to implement such guidelines for maximal benefit'. The review includes only six studies based on the inclusion criteria of using randomised controlled trials only and requiring those trials to be conducted in adults with schizophrenia or related severe mental disorders, including schizophreniform disorder, schizoaffective disorder and delusional disorder. The evidence from the six studies was of low quality and the authors conclude that more large-scale, well-designed, well-conducted studies are necessary to fill the knowledge gap. The review's authors note that:

- whenever possible, treatment guidelines should be developed in the local service where they will be used to take into account such matters as local context characteristics, resource use, feasibility and clinician buy-in
- a balance is needed between the care of the individual and how work is organised
- an audit and feedback system is needed to check that what is recommended is actually done
- audit and feedback of consumer outcomes may be relevant, particularly for providing consumers and carers (including family and whānau) with data to make informed treatment choices.

The papers in Appendix 4 (not randomised controlled trials) illustrate the problems and sometimes lack of results that occur when implementing guidelines or associated pathways and algorithms.

The Chong et al study introduced a treatment algorithm for early psychoses consumers in Singapore.[102] It has two weaknesses.

- It has a small comparator group measured in 2000 but a large study group measured between 2001 and 2004.
- After using first-generation antipsychotics for the comparator group, the study switched to second-generation antipsychotics for the study group. The algorithm is likely to prompt for this, but this could influence the rate of adding a second antipsychotic.

Reilly et al, in Victoria, Australia, undertook QI work to implement a first-presentation psychosis clinical pathway.[16] Although the work was not evaluated, the process generates many lessons for organisations seeking to implement guidelines and pathways. The lessons include the need to:

- adequately document the evidence base for the guidelines as clinicians do not follow them where such documentation is lacking
- establish measurable objectives or active management involvement at the start of the process
- work with clinicians before starting the process to ensure they are engaged and willing to change practice
- ensure that clinicians see any extra work as having a positive benefit for them and the consumers
- provide non-repetitive documentation that is easy to complete
- provide training that is timely and targeted and runs for a duration that fits with clinicians' timetables
- have additional support to evaluate the process, rather than relying on clinicians to do this

- use forward planning to prepare for staff changes and losses, which will affect any process implementation.

The Steinacher study, while not randomised, tested the sample from the two wards both cross-sectionally and longitudinally and found the consumer groups did not differ significantly.[17] However, other study limitations were the small sample size, lack of power analysis, limitation to a single centre committed to pathway implementation and the short time between the before and after data collection. The study's authors were unable to explain why they found lower treatment efficacy after the pathway implementation and the effect was the same on both wards.

Bedard et al found nine different sets of policies and processes were operating in northeastern Ontario, Canada before the implementation of a care path for early psychosis intervention.[103] Nurses, social workers and other unregulated health professionals, linked through a hub but employed and supervised individually by their respective agencies, provided care. The lessons learnt during the implementation are similar to those learnt during the process in Victoria. While the managers in each service had agreed to participate, the clinicians in the services had not been engaged before the implementation began. Post-implementation interviews with clinicians indicated that they had believed the pathway would require extra work and would take them away from direct consumer care. One regional spoke, which had been unable to participate in the programme initially, later asked to join, and both the clinicians and the managers saw the care path as a way to ensure best practice in early psychosis intervention was followed. Subsequent reviews of their forms showed a high level of compliance with best practices.

Documentation was identified as an issue, which improved when compatibility with the systems operating in the individual spokes was addressed. Other barriers clinicians identified were caseload, time constraints and increased paperwork as barriers. Other pitfalls that made it more difficult to follow the care path timelines were:

- difficulties in contacting consumers and contact taking longer than expected
- consumers who were unwilling to engage
- the geography of the area, such as travel distances
- inclement weather, for example, winter storms
- numerous referrals occurring at the same time.

Following the post-audit, the care path implementation was modified to work within clinicians' and agencies' parameters. This is an ongoing process.

3.2 Reducing the duration of untreated psychosis

The longer the time between the onset of symptoms of psychosis and the start of treatment (duration of untreated psychosis, DUP) is considered the strongest predictor of symptom severity and prognosis.[14] The 2005 systematic review of 26 studies by Marshall et al identified a modest association between DUP and a broad range of outcomes but the effect is only seen after a period of treatment. The review importantly found that consumers with a longer DUP were less likely to achieve remission.

Integrated pathways are considered necessary so that people are recognised and referred early to secondary care and so that physical health is integrated into treatment at an early

stage. A Cochrane review considered early intervention studies completed and reported before 2011.[104] Most of the 18 studies were in small samples and six of them were from the EPPIC centre in Melbourne, Australia, so the results may not be widely applicable. In addition, most studies did not capture the views of consumers, family, whānau and carers. The review concludes that the study results provided some support for specialised services in early intervention for psychosis, but further evidence is needed.

Interventions to reduce DUP have had mixed results. A cross-sectional study in Birmingham, which was the first service in the United Kingdom for early intervention in first-episode psychosis, looked at DUP and care pathways.[105] The study includes data from 343 consumers. The median duration for DUP was 50 days but there was a big disparity between the mean and the median and a large standard deviation in all DUP components, suggesting significant outliers. Following entry to a mental health service, the mean delay before acceptance by an early intervention service was 188 days. A third of the consumers had a DUP longer than six months. Delays in accessing early intervention services were due to structural barriers. First contact with a crisis team rather than a community, or child and adolescent, mental health team predicts a shorter DUP and faster access to an early intervention service. The longest DUP was associated with early discharge from community mental health teams in consumers who were subsequently identified and adequately treated for psychosis. The main reason for such early discharges was that consumers did not attend outpatient appointments and the service was unable to contact the consumer. Other reasons were that a mental health issue could not be drawn out, psychosis was not considered or the consumer was sent to another agency.

A large non-randomised controlled trial in the United Kingdom is looking at the implementation of TRIumPH, an integrated care pathway for psychosis.[106] TRIumPH sets timeframes around access and clinical interventions. The pathways use information gathered in a co-production model with individuals and caregivers with lived experience of a mental illness, clinicians and other stakeholders. Training, for those in the active arm of the trial, has followed QI methodology. The training covers implementing the pathway and key aspects of care. Each team in the active arm has a facilitator and data collection is ongoing. The control arm is care as usual; this varies from service to service, depending on the team culture, resource allocation and leadership. The results of this trial may inform future work in this field.

3.3 Reducing polypharmacy with specific interventions

Polypharmacy in mental health is where a consumer is taking two or more antipsychotics at the same time. A 2013 review identifies prevalence rates of polypharmacy ranging from 4 to 70 percent, depending on the treatment setting and the consumer population.[10] There is no firm evidence that combinations of antipsychotics are more effective than monotherapy. Conversely, polypharmacy raises concerns about possible increased adverse effects when multiple antipsychotics are prescribed, as well as about the increased costs and the increased risk of non-adherence. Current international guidelines generally recommend using a single antipsychotic in most mental health treatments. In certain instances, multiple antipsychotics are recommended:

- when a person is transitioning from one antipsychotic to another
- where clozapine alone has failed to relieve severe psychotic symptoms.

Guidelines rarely recommend using multiple antipsychotics in other cases.

A critical review of antipsychotic polypharmacy in schizophrenia concludes:[107]

- clozapine augmented with another antipsychotic may be beneficial for symptom control, but findings are inconsistent
- the unique mechanism of action of aripiprazole may reverse metabolic side effects caused by ongoing antipsychotic treatment.

However, these statements do not have a large amount of good evidence and there is concern about potential side effects. Prescribing multiple antipsychotics could reduce adherence, as evidenced in other chronic diseases where people are on multiple medicines. The 2013 review found evidence that people prescribed two antipsychotics, in order to transition from one to another, did not always complete the switch. For instance, in one study 39 percent of consumers were on multiple antipsychotics for transition, but only 46 percent of those consumers had completed the switch after 12 months.

Trials provide limited evidence that consumers can be successfully switched from multiple antipsychotics to a single antipsychotic. The results from one open-label study, one randomised controlled trial and one double-blind placebo-controlled trial indicate that consumers can be successfully switched from antipsychotic polypharmacy to monotherapy. The reviews by Tani et al[10] and Fleischhacker and Uchida[107] identify studies by Essock et al[108] and Suzuki et al.[109]

The Essock et al trial successfully switched 69 percent of the 58 consumers in the monotherapy arm of the trial while the Suzuki et al study successfully switched 42.9 percent of consumers (n = 47) to monotherapy. In the Essock et al trial, treatment discontinuation was significantly more frequent in the monotherapy group than the polypharmacy group but body mass index reduced significantly in the monotherapy group compared with the polypharmacy group. Only first-generation antipsychotics and risperidone were used in the Suzuki et al study and, of the 47 consumers; 22.7 percent deteriorated, 22.7 percent improved and 54.5 percent remained stable. In the more recent double-blind, placebo-controlled trial, 14 of 18 consumers (almost 80 percent) were successfully switched to monotherapy.[110] One consumer in the polypharmacy arm and four in the monotherapy arm were withdrawn because of clinical deterioration. In some non-blinded or placebo-controlled trials, the study reports mention no detrimental effects on the consumer's mental health after the switch from multi- to single antipsychotic.

The issue

Antipsychotics generally have dose-related adverse effects – for example, postural hypotension, sedation, sexual dysfunction, extrapyramidal and anticholinergic effects – which can be more prevalent with antipsychotic polypharmacy. There is the risk that antipsychotics may cause prolonged corrected QT (QTc) interval. Other adverse effects – for example, significant weight gain and metabolic syndrome, with associated cardiovascular risk that develops over a longer period – are more common in polypharmacy. For the consumer, this increases the risk of morbidity and mortality, as well as increasing their hospitalisation rates.

The UK Royal College of Psychiatrists recognises that polypharmacy can contribute to the overall antipsychotic total daily dose and includes this in its prescribing standard 9. The definition of high-dose antipsychotic prescribing in prescribing standard 9 was: the current total daily dose of antipsychotic drug does not exceed the upper limit of the dose range recommended by the British National Formulary (BNF); if it does, the rationale has been documented (the standard is not available on Royal College of Psychiatrists' website at the time of publication).[111] The convention for consumers receiving more than one antipsychotic medicine is to calculate the percentage of 'BNF maximum' at which each medicine is being prescribed, and then add these percentages to obtain an overall 'percentage of maximum' for that consumer and determine whether they are receiving above the recommended upper limits – that is, above 100 percent BNF maximum.

In New Zealand, this convention could be applied using the upper limit of the dose range that the NZ Formulary recommends.[112]

The 19 Australian studies in a review by Westaway et al cover a range of settings and include studies in adults and children.[11] Across the studies, dual antipsychotic use was reported for 11 to 20 percent of inpatients. Two studies of discharge prescriptions reported that:

- between 9 and 11 percent of schizophrenia consumers were discharged on dual antipsychotics in one Australian state
- 43 percent of consumers with schizophrenia spectrum disorders were prescribed dual antipsychotics at discharge in a different Australian state.

A small study of inpatient children identified that of the 28 treated with an antipsychotic, two (7 percent) received an atypical in combination with a typical antipsychotic.

A forensic unit study found 32 percent of consumers were on dual antipsychotic therapy, while a study in a forensic hospital reported 26 percent of consumers were on dual therapy.

The prescription of dual antipsychotics was also noted in consumers with community treatment orders and, historically, in consumers in the community.

In studies where consumers were considered 'treatment resistant', required intensive case management or were using clozapine, the percentage of consumers on dual antipsychotics ranged from 20 percent in 'treatment resistant psychosis' consumers to 61 percent of clozapine users.

The Westaway et al review used National Australian Survey data to look at adverse effect incidence. It found that:

- 90 percent of consumers taking two or more antipsychotics concurrently experienced at least one side effect
- 80 percent of consumers taking one antipsychotic experienced at least one side effect
- the number of side effects an individual consumer experienced was greater among people on multiple antipsychotics.

Australian studies show that one-half to two-thirds of people with severe mental illness taking multiple antipsychotics at the same time have symptoms of metabolic syndrome.[11] One study showed that the prevalence of metabolic syndrome in 221 adults with serious mental illness who were taking more than one antipsychotic at the same time was considerably higher than in those taking one antipsychotic.

The incidence of antipsychotic polypharmacy is similar in the United Kingdom. For example:

- 48 percent of 3,132 consumers were on antipsychotic polypharmacy as inpatients[113]
- 57 percent of prescriptions for over 200 consumers were for antipsychotic polypharmacy as inpatients[114]
- 43 percent of 3,942 consumers were on antipsychotic polypharmacy[115]
- overall, 16 percent of consumers were receiving more than one antipsychotic at a time; in some mental health trusts, this was occurring in up to 30 percent of consumers[116]
- on average, 11 percent of 5,608 consumers were receiving more than one antipsychotic at a time, with a range between 1 percent (in two trusts) and 24 percent (in one trust) of consumers being cared for in the community.[117]

In the United States, a study at an academic medical centre looked at the reasons why consumers were prescribed antipsychotic polypharmacy and the subgroups of consumers who were on polypharmacy.[12] A relatively low 9.4 percent of consumers who had had a stay of greater than three days were discharged on polypharmacy during the study. These consumers were more likely to have had a longer length of stay and a psychotic disorder. The study identified four main subgroups of consumers prescribed multiple antipsychotics:

1. consumers with refractory illness who had three reported trials of monotherapy and/or were prescribed clozapine and had refractory symptoms
2. consumers with recommended taper post-discharge
3. consumers with an unchanged antipsychotic regimen from admission
4. consumers who received an (additional) antipsychotic for a non-psychosis indication. This was commonly quetiapine, prescribed for a variety of reasons. The dose used was commonly less than 300 mg daily (the lowest dose recommended for bipolar disorder) and indicated that it was prescribed for a non-psychotic indication. The indication was commonly insomnia or anxiety.

The study's authors thought multiple antipsychotics were justified for the first three groups (group 3 consumers could later be changed to monotherapy). The use of an antipsychotic for a non-psychosis reason was problematic because of the associated side effects and they felt this could only be justified for short-term use.

Internationally work has been undertaken to reduce antipsychotic polypharmacy prescribing based on the guideline recommendations that are available. Appendix 5 identifies some of these studies.

Some of the studies show a reduction in polypharmacy after the introduction of the guidelines. In the two studies of an education-based approach to introducing guidelines, the results were not as successful as those using multiple interventions or QI methodology.[118,119] Thompson et al used reminder stickers on medication charts in addition to education and did reduce polypharmacy during the study.[118] The Baandrup et al study was not successful at reducing polypharmacy at outpatient clinics.[119] The studies using multiple interventions usually involved continual feedback from senior medical staff or pharmacists, or by electronic reporting.[120,121,123,13,125] The Constantine et al and Finnerty et al 2014 studies report no results post-interventions.[122,124] Interestingly, in the Finnerty et al 2011 study, the incidence of polypharmacy after phase three returned almost to the post phase one level, when interventions from senior medical staff and inclusion as a standing agenda item were discontinued.[123] Sustainability is likely to be a problem unless measurement continues and

prompts remain in place. The Hazra et al study excluded as required prescriptions contributing to antipsychotic polypharmacy, which may have influenced the results.[13] Other studies show that as required antipsychotics are one of the main reasons for antipsychotic polypharmacy.

3.4 Polypharmacy and high-dose antipsychotic prescribing

Two QI programmes looking at reducing high dose and polypharmacy antipsychotic prescribing were found (Appendix 6).[115,126] Both programmes were in inpatient mental health trusts in the United Kingdom. Constantine et al, while initially looking at a broader range of indicators in the Florida Medicaid program (Appendix 5), came to work principally on antipsychotic polypharmacy and high-dose psychotherapeutic medication use because of the prescription analysis results.[122]

The improvement work of Paton et al did not result in a decrease in either polypharmacy or high-dose antipsychotic use.[115] What they identified was that polypharmacy often occurs because of the prescription of antipsychotics, as required, for agitation. This same effect is evident in other studies where quetiapine, at doses lower than those needed when used as an antipsychotic, was prescribed, generally for anxiety or agitation. Possible reasons for the failure of the proposed interventions in reducing polypharmacy or high-dose prescribing are:

- clinicians at the participating trusts did not agree with the standards or guidelines being used for audit
- the interventions that the improvement team suggested were not necessarily implemented by all the sites in the study
- different trusts may have implemented the interventions in different ways.

The Mace and Taylor study required three phases of interventions over six years before polypharmacy and high-dose antipsychotic prescribing decreased significantly.[126] Factors likely to have contributed to this success include working with management and clinicians and setting a definitive target in the third phase for reducing both polypharmacy and high-dose prescribing. The report does not mention co-design or consumer involvement, but including this element could also help achieve positive results. It is unknown whether the results have been sustained or if they would be reproducible in other settings.

4. Dispensing and pharmacy services

4.1 Dispensing

While the papers on ADEs and medication error did not identify any issues with pharmacy dispensing in mental health services, their methodology is not designed to identify, and does not easily identify, pharmacy dispensing errors. Previous studies in non-mental health hospital settings have found a lower rate of pharmacy dispensing errors, compared with prescribing and administration errors. A review of papers with published dispensing error rates in hospital and community settings found error rates of between 0 and 45 percent.[127]

One method of reducing error rates is to introduce robotic dispensing systems. Linking a robotic system to electronic prescribing and administration systems could further reduce dispensing errors, providing a clinical check remained in place.

4.2 Pharmacy services other than dispensing

Medicines are an important part of treatment in mental health. They raise particular considerations in terms of medication safety for consumers because of their side-effect profile and the importance of adherence. Medication is a concern because many consumers are under the care of multiple health providers in primary and secondary care and communication breakdowns about medicines can happen among providers and between providers and consumers.

Clinical pharmacy

Pharmacy intervention reports show that pharmacists routinely identify potential errors and, in many cases, prevent the errors from causing consumer harm. In one large study in the United Kingdom, clinical pharmacists collected prescribing errors from nine diverse hospitals, including mental health, and found one or more errors in 43.8 percent of prescriptions.[128]

The mental health hospital had one of the lowest error rates. However, when this was corrected for the number of medicines each consumer was prescribed, the rate was no different to that for other hospital types.

Some studies identify omission of a medicine as the most common prescribing error on admission.[129,130] While electronic prescribing systems routinely reduce some prescription writing errors, such as illegible prescriptions, they do not prevent all errors and can introduce new errors to the system.[8,9]

Clinical pharmacist input can go beyond chart review to being involved in the choice of medicine before prescribing, multidisciplinary team review meetings and medication monitoring. Pharmacists are involved in medication reviews in both primary and secondary care and, while most published literature is on the general population, some is specific to mental health consumers. The results from some of these small trials, which do not have a control group, are presented in Chapter 2 – for example, Stubbs et al, and Paton and Gill-Banham. One prospective controlled trial investigating the effect of pharmacist-led medication reviews in identifying and resolving drug therapy problems (DRPs) used the Medication Appropriateness Index (MAI) and the number of unresolved DRPs as outcome measures.[18] The definition of a DRP is 'an event or circumstance involving drug therapy that

actually or potentially interferes with desired health outcomes'.[131] The MAI measures the change in therapy appropriateness between admission and discharge and between admission and follow-up. It includes 10 implicit and explicit criteria to review the appropriateness of each prescribed medicine in terms of the indication, practical directions, drug–drug interactions, drug–disease interactions, duplication, duration and expense.[132]

The control group received the usual pharmacy service, which was a centralised service available by telephone, but did receive a detailed pharmaceutical review on admission, discharge and post-discharge. Any recommendations for identified DRPs in this group were only discussed with medical staff if they were serious or life-threatening.

The intervention group received a detailed pharmaceutical review on admission, discharge and post-discharge. Interdisciplinary discussions covered the recommendations for any identified DRPs and consumers received pharmaceutical counselling about the disease and the medicines after each review. A discharge medication plan was prepared after the discharge review and given and explained to the consumer. Telephone contact with the consumer occurred twice after discharge to discuss and solve any ongoing DRPs.

Table 1 shows the results for the DRPs and MAIs.

Table 1: Results for the control and intervention groups from a study on the effect of pharmacist-led medication reviews in identifying and resolving drug therapy problems[18]

	Control group	Intervention group	95%CI
DRPs	419 in 134 consumers	396 in 131 consumers	
Non-preventable identified DRPs	10.7 percent	13.6 percent	
Number of DRPs per consumer mean (SD)	3.1 (2.6)	3.0 (2.7)	
Number of DRPs that remained unsolved per consumer mean (SD)	2.3 (2.1)	0.4 (0.9)	1.5–2.1
Change in summated MAI score from admission to discharge mean (SD)	0.0 (2.3) *	−1.3 (3.0)	0.8–2.1
Change in summated MAI score from admission to follow-up mean (SD)	−0.4 (2.8) **	−1.4 (2.8)	0.6–1.9

Notes: CI: confidence interval, DRP: drug therapy problem, MAI: Medication Appropriateness Index, SD: standard deviation.

* The MAI score could not be calculated in one consumer, in the control group, who did not take medicines at first and second interview.

** The MAI score could not be calculated in four consumers in the control group and six in the intervention group who did not take medicines at follow-up.

In the intervention group but not the control group, both the preventable and non-preventable ADEs were primarily solved. In the intervention group, 50 DRPs were unsolved compared with 303 DRPs in the control group. This equates to 1.8 (95% CI: 1.5-2.1, $p < 0.001$) fewer unsolved DRPs per consumer, considering the adjusted effect of the intervention compared with usual care.

The majority of the DRPs found were estimated as minor (43.8 percent) or moderate (46.9 percent) in both control and intervention groups. In the control group, 12 DRPs were referred to the ward staff and/or consumers because of the potential to cause serious harm.

The trial design had many limitations. However, it did include consumer interviews as part of the assessment process, a component that is absent from the vast majority of trials.

Medicine reconciliation

Medicine reconciliation is a method of reducing errors and potential harm at transition points in the consumer's journey across the health system.[133] Using two sources of information about the medicines being taken is recommended so that the best possible and most accurate history is prepared. The primary source should be the consumer or their family, whānau or caregiver if possible because they know what the consumer is taking on a daily basis. The other, secondary source can be the GP (or other prescribers), the community mental health team, the community pharmacy or other health teams involved in care. Mental health transitions across the continuum are a source of potential harm for consumers, not least because of the lack of electronic systems that can exchange information between all providers – for example, primary care, community care, drugs and alcohol services or psychiatric inpatient or outpatient services. Consumers, in addition, can be non-adherent and electronic records can tell the wrong medication history.

Adherence to medicines is defined as the extent to which the consumer's action matches the agreed recommendations.[134] In effect, this means that the consumer may be taking more than, less than or none of the doses of medicine(s) prescribed. Around 50 percent of consumers in the general population are thought to be non-adherent to their prescribed medicines and often take complementary medicines that can interact with prescribed medicines.[135]

While doctors, nurses and pharmacy staff are able to reconcile medicines, pharmacists are often the providers of formal medicine reconciliation services. Studies looking at the discrepancies in medicine lists at each stage of the consumer's journey give an idea of the possible scale of the problem.[19,129,136] One published study on medicine reconciliation in UK mental health trusts provides background information on aspects of the service; for example, common sources of medicine information, who provides the medicine reconciliation service, different sources used for different information and which sources are used in different age groups.[137]

Looking at the transfer of medicines information from the GP to the mental health unit and back to the GP and the first prescription written by the GP post discharge, one UK mental health trust found discrepancies in 39 of 43 consumers' records over the course of the consumers' journey.[19] Only four consumers had no discrepancies when comparing the GP's list of medicines pre-admission to hospital with the hospital admission medicine list, the medicines dispensed on discharge, the discharge summary medicine list and finally the GP's first prescription post-discharge. The medicine, the dose or the frequency were all noted as

causing discrepancies. The study found discrepancies in 69 percent of the medicines on admission, in 12 percent of medicines comparing the discharge medicines dispensed and the discharge summary and in 43 percent of prescription items between the GP's first prescription and the medicines list written in the discharge summary (Table 2).

Table 2: Discrepancies found when comparing the medicine information at the majority of the transmission points in a consumer's journey[19]

Stage of medicine list	Percentage of medicines studied with a discrepancy
GP medication list provided on admission to unit compared with admission medicines prescribed	69
Between discharge medicines dispensed and the list in the discharge summary	12
Discharge summary and first prescription after discharge when discharge medicines were finished	43

Another study looking at consecutive discharges from a US adult state psychiatric hospital found 38 out of 163 consumers (23.3 percent) had at least one discrepancy between the medication administration record and the handwritten discharge plan.[138] Ten of these 38 consumers (26.3 percent) had more than one discrepancy. Among the discrepancies, 62.3 percent involved an omission of a medicine (more common for non-psychiatric medicines) from the discharge summary.

In contrast, 36.8 percent of the discrepancies were dosing differences. These were more common with psychiatric medicines than non-psychiatric medicines.

The study by Paton et al, which was part of the Prescribing Observatory for Mental Health UK QI Programme (POMH), involved 42 mental health trusts at baseline and 43 at re-audit (not all the trusts in each audit were the same).[137] The study collected basic data on the medicine reconciliation service provided in each trust, including policies, demographic data and data on the sources of information. The baseline audit used a common tool and trusts were asked to audit five consecutive admissions after consumers had spent at least seven days on the ward. The audit was used to ascertain which sources of medicines information had been checked within 24 hours, three days and one week of admission and the number, if any, of discrepancies identified from each source. The audit also checked the clinical record for documentation of sources, discrepancies and any mention of adherence.

Each trust was given its data benchmarked against national data at trust and clinical team levels. Data at clinical team level was benchmarked against local and national level data. Sixteen months later, re-auditing using the same tools was undertaken.

The proportion of consumers with discrepancies, when two sources of information were used, was 25 percent at baseline and 31 percent at re-audit. The number of consumers who had two sources of information checked, and the number of reconciliations that a pharmacist rather than other staff performed, increased between baseline and re-audit. The sources of information used varied depending on the age of the consumer: adult units more frequently used the consumer (736 out of 1,055, 70 percent) as a source than units for the elderly (209 out of 614, 34 percent). The most frequent source of information was:

- the consumer or carer (including family and whānau), where the information was about which medicines the consumer was taking
- the GP, for medicines prescribed for a physical illness
- the mental health team records, for depot antipsychotic medicines.

All the sources produced potentially significant discrepancies.

The documentation in the clinical record made no mention of adherence for 40–65 percent of consumers, while indicating non-adherence or poor adherence for 20 and 45 percent of consumers.

Table 3 gives some examples of discrepancies found in the audits.

Table 3: Examples of discrepancies found during the Prescribing Observatory for Mental Health UK QI Programme (POMH) study[137]

Result of discrepancy	Discrepancy
Likely to cause a problem in the short term	Wrong medicine prescribed, eg, aripiprazole instead of omeprazole
	Previously discontinued medicine prescribed at full treatment dose, eg, clozapine, methadone
	Omitted medicines, eg, low molecular weight heparin, phenytoin, goserelin
Likely to be a problem in the medium term if left undetected	Omitted medicines, eg, eye drops for glaucoma, antihypertensives, depot antipsychotics
	Previously discontinued medicines prescribed, eg, furosemide/frusemide
	Consumers who brought in medicines prescribed for someone else had them prescribed for them, eg, ezetimibe
Unclear but likely to be minor	Omitted medicines, eg, creams, analgesics, hypnotics
	Variations in timing or dose, eg, antipsychotics, antidepressants

Robinson's audit (20 consumers) looked at discrepancies between GPs' records of medication and those held at an elderly psychiatric day service in the United Kingdom where psychiatrists and GPs both prescribed medicines. It found 11 GP records (55 percent) differed from what the consumer was taking.[136] In eight consumers the difference was for psychotropic medicines only, while in two other cases the difference was for psychotropic and non-psychotropic medicines. The most common discrepancy was that medicines were not on the GP's medication list.

An intervention was introduced where a simple pre-formatted fax document was prepared for the day treatment service to send to the GP when a consumer had a change in medicines. The records were re-audited three months later, finding that eight cases (40 percent) remained with discrepancies. Notably lithium, antipsychotics and antidepressants that the day hospital had prescribed were not documented in the GP records.

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This study illustrates the difficulty in updating clinical records, particularly if no shared electronic record of all prescribed medicines is available. While a consumer might not adhere to the medicines prescribed, all prescribers need to know what has been prescribed and at what dose to allow them to safely change or add medicines or doses.

Chapter 8 covers other methods to reduce the risks at transitions of care.

5. Administration

Studies identify that errors are most common at the administration stage of the medicines management process (20–25 percent of all opportunities).[6,7] This is, in part, because the administration stage is the most frequent interaction related to medicines and the individual consumer. Administration methods on mental health wards can differ significantly from those on other types of ward. Two systematic reviews of medication administration error studies both reported omitted doses to be one of the most commonly observed problems on hospital wards throughout the world.[6,7]

A study of medication administration error[20] identifies four factors that independently predict error:

- interruptions – errors were 48 percent more likely to occur during interrupted medication rounds
- as required medicines – the risk of error increased by 15 percent for each as required medicine administered on a medication round
- total number of consumers on a ward at the time of a single medication round – no percentage of increase given
- total number of doses due on a medication round – no percentage of increase given.

Few published studies have looked at ways to reduce administration errors specifically in mental health practice. Various methods have been tried in acute hospital settings, such as the Five Rights* (or more), end-to-end electronic systems that link consumer identification to their medicine and their prescriptions for administration, electronic administration systems and dedicated administration rounds where the administrator cannot be interrupted. Some of these methods will have been implemented in the mental health care setting but no published papers comparing before and after could be identified other than those included in Appendix 7.

The three UK studies, in different mental health wards, identified that administration errors occur.[139,140,141] The three studies used different methods to reduce the number of errors: automated dispensing cabinet; QI project to reduce missed doses; and the introduction of trained health care assistants as administration round observers.

One further study considered the barriers to the safe administration of medicines in mental health settings using a mixed methods survey of mental health nurses and mental health nursing students.[142] A UK mental health trust carried out the survey. The authors identified seven themes: five focus on nurses and prescribers, and two on the consumer.

The five themes related to nurses and prescribers were:

- environmental distractions
- insufficient pharmacological knowledge
- poorly written and incomplete medication documentation
- inability to calculate medication dosage correctly
- work-related pressure.

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* The Five Rights are: right patient, right drug, right dose, right route, right time. For more information, see www.ihi.org/resources/Pages/ImprovementStories/FiveRightsofMedicationAdministration.aspx

The two consumer-focused themes were:

- poor consumer adherence to medication regimens
- cultural and linguistic communication barriers with consumers.

These themes are mirrored on general hospital wards. While technology could help to address some of the themes, others might benefit from a collaborative co-design approach to find a safer administration system for both staff and consumers.

Cottney's two studies were non-controlled and small.[139,140] The report on the introduction of an automated dispensing cabinet does not state how the medicines are supplied to the cabinet – whether as individual consumer supplies or as ward supplies – which could influence the associated medication administration errors.[139] The post-intervention results were collected two months after the cabinet introduction, which could have been during the period when staff were still adjusting to the use of new technology.

The second Cottney study used league tables to reduce the number of omitted doses. It shows that the number of omitted doses can be reduced but not whether that can be sustained over time.[140]

The Dickens et al paper indicates that nurses resisted the introduction of health care assistant observers on the administration round before implementation, because they felt their role was being eroded or that the health care assistants were there to check on the performance of the nurse.[141] The health care assistants were trained to be an observer to ensure that the nurse followed the Five Rights, while the clinical responsibility remained with the nurse. The study had no control group of wards that could establish whether the reduction in the number of errors observed represents a normal fluctuation in numbers of medication administration errors, but the post-intervention audit was conducted nine months after the health care assistant observers were introduced to reduce the halo effect. One further concern over the results is the different definitions used in the pre- and post-intervention results. At baseline, the result is expressed as a medication administration error for every 33 prescribed doses and in the post-intervention it is expressed as a medication administration error for every 116 administered doses. It is unlikely that this difference would have statistically affected the results.

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6. Monitoring

Many psychotropic medicines need monitoring to prevent adverse drug reactions from developing into serious co-morbidities or life-threatening events. Some medicines are monitored for therapeutic drug levels to check that they are not being under- or over-dosed or sometimes to check that the consumer is taking the medicine. Consumers on clozapine are routinely monitored for neutropenia and should not be dispensed clozapine unless the blood test results are available because of the risk of progression to agranulocytosis. This monitoring has been part of managing therapy with clozapine since it was registered and first prescribed. Clozapine-related agranulocytosis is still reported but monitoring reduces the risk by about 20 times.[22] Other clozapine adverse drug reactions can be serious and life-threatening but have not been subjected to the same strict monitoring requirements. The question is, can the level of blood count monitoring for clozapine be reached for other serious and life-threatening adverse reactions associated with the medicines used in mental health?

This chapter does not give details of the monitoring for all the adverse reactions required for all psychotropic medicines. Instead, it concentrates on monitoring where a QI programme or trials have been undertaken to improve monitoring.

6.1 Metabolic syndrome

Most trials and QI work on monitoring relate to the metabolic side effects of antipsychotic medicines. The risk factors for developing metabolic syndrome are complex and multifaceted, with lifestyle, ethnicity, genes and disease factors all affecting the likelihood of developing the syndrome. Examples of factors associated with developing metabolic syndrome are the illness and illness-related factors such as physical inactivity, cigarette smoking, poor diet and alcohol consumption.

However, treatment with antipsychotics is another factor contributing to the development of metabolic syndrome, not least because of the metabolic side effects, including weight gain.

A selective review looking at physical illness in consumers with severe mental illness considered the weight gain liability of psychotropic agents, including antidepressants, anticonvulsants/mood stabilisers and antipsychotics, in adults, adolescents and children.[23] The review led to the conclusion that no atypical antipsychotic agent is truly weight-neutral as a higher proportion of individuals taking any atypical antipsychotic experiencing greater than, or equal to, 7 percent weight gain compared with individuals taking a placebo. In addition, all atypical antipsychotics cause significant weight gain in first-episode consumers, or in those not treated with an atypical antipsychotic before. The paper divides the medicines used in mental health, including antidepressants and anticonvulsants/mood stabilisers, into those causing weight loss, relatively weight-neutral medicines and those causing weight gain. The approximate relative likelihood of metabolic disturbances with antipsychotic medicines is identified as:

- high: clozapine and olanzapine
- moderate: quetiapine
- mild: amisulpride, sertindole and risperidone
- low: aripiprazole, zisperidone and haloperidol.

Chlorpromazine (a typical antipsychotic) is rated as high based on limited data.[23]

Other reviews and studies confirm the relative likelihood of metabolic disturbance with atypical antipsychotics.[143,144,145,146,147]

A meta-analysis in 2013 tried to discover whether metabolic complications of schizophrenia are present in first-episode and unmedicated consumers in comparison with chronic schizophrenia consumers on long-term antipsychotic medication.[148] It considered 26 studies of first-episode schizophrenia consumers, 19 studies of unmedicated schizophrenia consumers and 78 studies of chronic schizophrenia consumers already on antipsychotic medication. The analysis concluded that there was a significantly lower cardiovascular risk in early schizophrenia than in chronic schizophrenia and that diabetes and pre-diabetes appear uncommon in the early stages, particularly in unmedicated consumers. The recommendation to clinicians was to focus on preventing initial cardiovascular risk because it is more difficult to reduce risk later. The analysis had various limitations; for example, some studies lacked complete data, some did not indicate whether consumers were prescribed first- or second-generation antipsychotics, and the overall quality of some of the studies was questionable.

A more recent small study, comparing consumers with schizophrenia (medication-free or medication-naive), their siblings and a control group, found that metabolic syndrome and metabolic disturbances were significantly less frequent in the control group. The consumer group was identified as high risk for developing metabolic syndrome, because of high blood pressure and abnormalities in lipid metabolism, before being exposed to antipsychotics.[149]

While many of the reviews and meta-analyses look at consumers who experience schizophrenia, some focus on those who experience bipolar disorder and major depression. One review looking at the incidence of metabolic syndrome and metabolic abnormalities in bipolar disorder found a significantly greater risk of metabolic syndrome in consumers taking antipsychotics compared with antipsychotic-free consumers (odds ratio = 1.72, 95% CI = 1.24–2.38). The first antipsychotic treatment episode had significantly lower risk than multi-episode.[150]

An English study in 24 general practices looked at body mass index (BMI) and glycaemia. It concluded that all consumers with a severe enduring mental illness, whether or not receiving neuroleptic treatment, should have their weight and metabolic parameters routinely monitored. Screening of 451 consumers with severe mental illness for dysglycaemia and dyslipidaemia found:

- 17.3 percent had a fasting glucose indicative of type 2 diabetes
- 6.5 percent had a fasting glucose that was in the impaired fasting glycaemia range
- BMI and fasting glucose had a positive univariate relationship
- in multivariate models adjusted for age, gender, smoking and blood pressure, each unit increase in BMI and triglycerides was independently associated with an increased risk of having type 2 diabetes.

Evidence indicated that consumers with a severe mental illness had lower screening levels than consumers with other chronic diseases, for example, diabetes or chronic kidney disease. In conclusion, the authors recommended at least an annual physical health check, and a focus on preventing initial weight gain for any consumer with severe mental illness.[25]

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In 2014, Te Pou completed an extensive review of physical health in mental health and/or addiction and interventions to improve the physical health of mental health consumers.[151] The review covers both international and New Zealand background studies and interventions that have been implemented to improve physical health in this population. It also includes unpublished interventions collected from New Zealand mental health services.

An updated evidence review, completed in 2017, includes New Zealand data on increased morbidity and mortality.[152]

Evidence-based guidelines recommend regular metabolic monitoring for consumers on continuing antipsychotic treatment. Reasons for failing to meet the guideline standards for monitoring are many and the shortcomings are consumer-, professional- and service-related.

Studies undertaken between 2000 and 2011 in five countries were included in a meta-analysis of monitoring for metabolic syndrome in people treated with antipsychotic medication.[24] The analysis includes 39 studies before explicit monitoring guidelines were introduced and nine studies looking at post-guideline monitoring. It revealed that monitoring was worryingly low and that, while guidelines can increase monitoring, most consumers still do not receive adequate testing. The levels of monitoring in the pre- and post-guideline studies were generally not on the same sample population and the other testing results are an indirect comparison of all the studies. In pre- and post-guideline studies that directly compared monitoring rates between the same sample population, only glucose data was sufficient for analysis. In this case, seven direct pre-post studies showed a significant 15.5 percent increase in glucose testing rates following guideline implementation. Table 4 shows the levels of testing across all the studies.

Table 4: Monitoring levels pre- and post-guideline implementation taken from Mitchell et al 2012[24]

Test	Monitoring levels in the 39 pre-guideline studies	Monitoring levels in the 9 post-guideline studies
Blood pressure	69.8% (95% CI 50.9–85.8)	75.2% (95% CI 45.6–95.5)
Triglycerides	59.9% (95% CI 36.6–81.1)	Insufficient data
Weight	47.9% (95% CI 32.4–63.7)	75.9% (95% CI 37.3–98.7)
Plasma glucose	44.3% (95% CI 36.3–52.4)	56.1% (95% CI 43.4–68.3)
Cholesterol	41.4% (95% CI 18.0–67.3)	Insufficient data
Lipid monitoring (total cholesterol, triglycerides, low- and high-density lipoprotein cholesterol)	22.2% (95% CI 16.4–28.7)	37.2% (95% CI 23.7–51.9)
HbA1c screening	Insufficient data	Insufficient data

Note: CI: confidence interval, HbA1c: glycated haemoglobin.

New Zealand mental health services in district health boards show variation in their metabolic monitoring policies for consumers' prescribed second-generation antipsychotic medication.[153] Fourteen of the district health boards have metabolic monitoring policies in place but only two of these are consistent with a literature-based guideline developed for the audit. Some policies have different monitoring required for different antipsychotics and the frequency of monitoring was inconsistent across policies. Four district health boards measure their rates of metabolic monitoring. There is no consensus on who is clinically responsible for monitoring. Eight of the 14 policies indicate, in some way, what should happen if consumers meet the criteria for metabolic syndrome.

It is important to monitor physical health parameters so that changes can be detected, but what happens when results indicate an issue then becomes a consideration. In the Netherlands, there is an extensive routine outcome monitoring (ROM) protocol for mental health consumers. A 2016 paper reported the results of a study looking at whether the clinical problems identified were detected and then used in the treatment of consumers.[154] A random sample of 100 consumers was selected and their ROM data used to calculate cardiovascular risk factors, psychosocial problems and the prevalence of positive and negative symptoms. The first treatment plan written after the ROM screening was used to assess whether the treatment problems that the ROM identified were mentioned or not. ROM measurements and the treatment plans for the same consumer showed substantial discrepancy. This discrepancy could occur in both directions: that is, the ROM data showed problems that the treatment plan did not mention but also the treatment plan did mention problems that the ROM data had not identified. It seemed that daily clinical practice worked independently of the ROM data, while ideally the two should be integrated. Any monitoring needs to be incorporated into clinical practice and abnormal results acted on for the monitoring to be effective.

A 2013 editorial in the *American Journal of Psychiatry*,[155] discussing the results of a study reported in the same edition, identified three strategies available to combat the weight gain caused by antipsychotic medication:

- healthy lifestyle interventions
- switching to an antipsychotic with a lower risk for weight gain
- adding medication that may lower bodyweight and/or lipid and glucose parameters.

Each strategy was estimated to reduce bodyweight by roughly three kilograms over three to six months.

The third strategy, particularly adding metformin, is well recognised and supported by evidence. Further support comes from the results of the Jarskog et al study that was published in the same edition.[156] This was the largest study, up to that time, to compare 16 weeks of 1,000 mg metformin twice daily with placebo in antipsychotic-treated adult consumers. The study inclusion criteria were wide, only excluding diabetics, and included a standardised healthy lifestyle intervention. A 3.0 kg weight loss (95% CI = –4.0 to –2.0) was associated with metformin, which was significantly greater than the small weight reduction of 1.0 kg (95% CI = –2.0 to 0.0) in the placebo group. The weight loss translated into a –0.7 greater BMI reduction compared with placebo. Metformin was also associated with significantly lower triglyceride and glycated haemoglobin (A1c) levels than placebo.

The evidence for the effectiveness of switching to an antipsychotic with a lower risk of weight gain is limited. The associated risk of relapse, or treatment discontinuation, should also be considered.

Some protocols and studies have gone beyond just increasing monitoring levels and incorporated the actions that should follow when an issue is identified. Work in New South Wales has looked specifically at a simple assessment and intervention framework rather than just the assessment, the positive cardiometabolic algorithm 2011.[157] Appendix 8 presents studies aiming to improve metabolic monitoring. One of these studies uses the New South Wales algorithm adapted for the United Kingdom.

Design, sustainability and study limitations

1. The Singaporean QI project nearly accomplished its aim of 100 percent monitoring compliance but constant reminders and input over the three months were required.[158] The multidisciplinary team, involving consumers, family, whānau and external customers (for example, laboratories), process mapped, used a fishbone diagram and then a Pareto chart to identify likely reasons for monitoring not happening. A number of plan–do–study–act (PDSA) cycles implemented changes to overcome the identified reasons. Whether the results are sustainable is unknown. The project did identify that a significant percentage of the consumers in the final audit had risk factors for metabolic syndrome and up to one-third met the criteria for metabolic syndrome. As a result, the department now has various steps in place for when consumers are found to have risk factors. Empowering the consumers to proactively self-monitor and request monitoring was one suggestion the authors made to sustain the result.

2. A care package aiming to monitor and maintain physical health was implemented and the uptake monitored with an audit in the Hallett and Hewison project.[159] A PDSA cycle was used to measure the success of the package, and the audit form used. The team made changes in response to their findings. The team learnt a lot from the first audit about engagement and communication with staff members. Not all the physical health leads had identified that it was important, or that they were expected to fill in the audit forms during the baseline audit. Greater collaboration and communication across the teams at each stage in the development process, along with smaller and more frequent PDSA cycles, might have resulted in a quicker improvement in the physical health monitoring levels and audit form completion. For example, if five consumers on each of the seven wards had been audited, it would have quickly identified that not all wards had scales and could not complete the monitoring, which includes weekly weighing. The paper did not report on whether a further re-audit had maintained the monitoring levels found in the post-audit.

3. In their collaborative work, Modi and Ledingham focused on GPs, junior hospital doctors and psychiatrists for improvement in monitoring.[26] The aim was to improve performance in cardiovascular health monitoring. The collaborative work started in primary care but was extended to secondary care when the researchers realised that some consumers had not attended primary care appointments for several years. While the interventions tested were good and did increase testing, discussion did not seem to occur across the boundaries between primary and secondary care or with other members of the health care team or the consumers to identify other interventions that might work across the transition of care. The sample sizes were very small and there was no re-audit of the

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inpatient sample to see if the interventions had increased monitoring. The study authors identified one major problem in all improvement work in the hospital setting: the continual need to educate a rotating junior doctor workforce. Any intervention based on education alone is therefore hard to sustain.

4. A QI programme, which involved an annual audit over six years, increased the documented metabolic screening in participating UK mental health trusts from one in ten people in 2004 (baseline pre-programme) to one in three people in 2012.[27] The four parameters being screened were blood pressure, BMI (or other measure of obesity), blood glucose (or glycated haemoglobin (HbA1c)) and lipids measured at least once a year. The number of trusts participating varied from 13 to 32 over the six years. Results for the individual trusts were varied: some trusts had 70 percent of consumers with all four aspects documented while others had 0 percent. Tools and reports were produced at a national level but some trusts developed their own action plans. Multivariable analysis showed that consumers with either a diabetes or dyslipidaemia diagnosis, or those on a depot or long-acting antipsychotic preparation as the only antipsychotic medicine, were more likely to have all four screening measures documented. Consumer participation, either in the planning or producing tools or during the programme, was not evident in the report. During the timeframe of the programme, other national initiatives to highlight the need for and incentivise monitoring began, which could have influenced the results.

5. Implementing the psychiatric inpatient physical health assessment sheet (PIPHAS) using collaborative principles identified some key learning for teams undertaking collaborative work.[160] For example, it is necessary to publicise an intended intervention to the intended users before distributing it; and interventions must be needed, well structured, effective and time-saving. Any auditing is time-consuming and access to the source of data must be organised in advance. An adequate sample size could be important because one PDSA cycle failed to pick up the need to add a breast examination section to the PIPHAS. However, finalising content and usability through repetition with a small sample size more often might also identify failings. No aim was identified – for example, to complete a set number of sheets as a percentage of admissions within six months – and there was no mention of a multidisciplinary team or consumer involvement in the work.

6. The work by Akyuz et al[29] in an assertive outreach service is ongoing, with new ideas being tested. The aims were to improve physical health monitoring to 80 percent of consumers in six months and offering health monitoring or supporting consumers to have it at least annually to 100 percent. The aims were met after seven PDSA cycles. Whether the gains in terms of monitoring can be sustained or spread to similar services is unknown.

7. The Kioko et al study[161] provided education and implemented a metabolic monitoring and screening tool using a before-and-after audit. It involved a small sample size and the post-intervention audit was undertaken one month after the implementation of the guideline. The tool implemented in the study was based on the State of Missouri's metabolic syndrome screening and monitoring tool.[162] The result could have been influenced by the halo effect. There was no indication of whether the monitoring level would be sustained. One important issue the study raises is that, in the post-intervention audit, the laboratory tests ordered increased to 88 percent of the sample but 26 percent of the tests ordered were not done, presumably because the consumers did not go for testing.

8. The QI programme by Abdallah et al[163] to improve the monitoring of consumers in care homes was successful in improving the percentage of consumers being monitored. The programme encouraged care homes to measure blood pressure, pulse and weight of the

consumers. Five out of eight care homes were doing this monitoring at the end of the programme. There is no indication of the sustainability of the improvement gains or whether the improvement work could be spread to other community rehabilitation teams and care homes.

9. The work by Greenwood and Shiers[28] improved monitoring in the five centres at the completion of the six-month QI programme but there was no further audit to see if the results had been sustained. The shared aim, across all five teams, was to achieve a 50 percent improvement in cardiometabolic monitoring in six months. Each of the five teams developed a project charter and driver diagram and had six months to implement small changes. The teams met the aim. The authors acknowledged that two of the teams benefited from gathering young service users (one from each centre) to work within the centre teams, but also in a service user team to contribute to the collaborative. The remaining three teams were not able to gain the same benefit, possibly because the young service users' team was only formed during the project. There were some clear learnings at the end of the programme.

10. The Queensland mental health service state-wide collaborative[165] improved physical health screening and maintained that improvement over a three-year period. All 16 service organisations remained committed to the collaborative. The paper does not describe the details of what each service organisation did to improve the rate of physical health assessments, but the topic and aims agreed collaboratively engaged each team to improve.

Monitoring has helped identify the metabolic problems in mental health consumers and improving monitoring has the potential to improve outcomes for individual consumers. Further work is needed to prove that improved monitoring leads to better outcomes for consumers.

6.2 Drug level monitoring

Lithium

Lithium level monitoring every three months is a requirement in the NICE guidelines. Other authorities recommend different timeframes. The British Association for Psychopharmacology recommends every six months and the Quality and Outcomes Framework (QOF) for UK primary care recommends that a consumer should have had a level within the previous six months. The QOF for lithium also includes thyroid and renal function monitoring.

The UK POMH developed two audit standards for lithium monitoring based on the NICE guidelines.[166] The first standard relates to baseline monitoring before a consumer is started on lithium: thyroid and renal function tests, and bodyweight, BMI or waist circumference. The second standard relates to tests during maintenance treatment with lithium: serum lithium every three months, renal and thyroid function every six months and bodyweight, BMI or waist circumference during the last year.

A report of the baseline audit in 2008 against the standards for 3,373 consumers in 38 mental health trusts sought to identify the level of monitoring. It considered lithium levels, thyroid and renal function in consumers prescribed lithium for less than a year and those

prescribed lithium for more than a year.[167] Results for consumers prescribed lithium for less than a year were:

- 84 percent had documented baseline renal function
- 82 percent had documented baseline thyroid function
- 37 percent had documented baseline bodyweight.

For consumers prescribed lithium for more than a year, the results were:

- 68 percent had two or more lithium level tests in the previous year (met QOF standard)
- 30 percent had four or more lithium level tests in the previous year (met NICE standard)
- 81 percent had renal function documented in the last year (met QOF standard)
- 55 percent had two or more renal function results documented in the last year (met NICE standard)
- 82 percent had thyroid function documented in the last year (met QOF standard)
- 50 percent had two or more thyroid function results documented in the last year (met NICE standard)
- 7 percent had none of the test results documented in the previous year.

The authors point out that there are very few lithium clinics, as well as very little electronic access to test results and only one of the trusts had a local database to remind clinicians about the tests being done. Primary care achieved higher monitoring levels than secondary care. This is probably a result of the QOF, which rewards primary care practices for the provision of 'quality care'.

A Patient Safety Alert, issued in 2009 by the National Patient Safety Agency (NPSA) and now archived, mandated primary care, mental health and acute health care organisations and laboratory staff to work together to put systems for lithium monitoring in place by 2010.[168] The NPSA also produced a consumer-held lithium therapy record book (known as the 'Purple Book') to help transfer information between care settings.

The report from the POMH included the results from the 2010 re-audit that included 3,647 consumers in 45 mental health trusts.[166] For the same trusts that took part in the baseline audit (ie, not including the additional 10 trusts that took part in the re-audit), the results for consumers prescribed lithium for less than a year were:

- 80 percent had documented baseline renal function
- 80 percent had documented baseline thyroid function
- 40 percent had documented baseline bodyweight.

For consumers prescribed lithium for more than a year, the results were:

- 29 percent had four or more lithium level tests in the year (met NICE standard)
- 55 percent had two or more renal function results documented in the last year (met NICE standard)
- 49 percent had two or more thyroid function results documented in the last year (met NICE standard)
- 32 percent had weight, BMI or waist circumference documented (compared with 27 percent at baseline)
- 11 percent had none of the tests documented in the previous year.

In addition, the Barnes and Paton paper reports that 10 percent of the baseline sample had the last recorded lithium level below the therapeutic threshold of 0.4 mmol/L.

The results in the re-audit had hardly changed from baseline even though the customised, benchmarked reports of the baseline results were sent to the trusts involved. This lack of change in practice could be because the reports were slow to reach or did not reach the clinical teams. Other reasons could be: no local system for phlebotomy, no direct access to the results (either physical examination or laboratory) when these are carried out in another health care setting, variable acceptance of the standards among clinicians (eg, community pharmacists were not supposed to dispense lithium if a consumer was not up to date with their monitoring but sudden withdrawal of lithium has a high risk of relapse) and consumers being unwilling to have frequent blood tests.

The Scottish Patient Safety Programme's mental health project is working on lithium and clozapine as part of the medicines management section.[169]

6.3 Consumer self-monitoring

Engaging consumers in monitoring their own physical health can potentially increase their buy-in not only to monitoring, but also to any interventions needed to improve their physical health. The use of health information technology for consumer self-monitoring has been shown to engage consumers in monitoring and in interventions to improve their health.

Introducing consumer-facing kiosks in four Veterans Affairs networks gave consumers the opportunity to weigh themselves and answer other questions about their current health.[30] The consumers received a printout report to take to their doctor that day, with space to track their progress. Additional information was included on the printout, as talking points, so that individuals were aware of what services were available and could ask to be referred to them. The kiosks prompted more and sooner engagement with intervention services and consumers accepted and liked them.

7.   Adherence and consumer information

Adherence to medicines, as prescribed, is known to be around 50 percent in people with chronic conditions.[32] This proportion does not seem to have changed in the last 50 years. Prescribed medicines are wasted and are ineffective if they are not taken. Further, the cost of wasted medicines is high. In England, for example, it is estimated to be around £300 million each year, and that figure is for medicines alone without counting the cost of doctor's visits, hospital admissions or extra tests that can be associated with non-adherence. The personal cost to the consumer is not just related to the cost of health care as non-adherence can also lead to increased morbidity and mortality.[170]

Why people are non-adherent varies. The three main reasons are:

- forgetting to take the medicine (66 percent)
- suffering unpleasant side effects (25 percent)
- feeling well and believing the medicine was no longer necessary (20 percent).

Consumers may be non-adherent by increasing the dose above the dose prescribed, such as when they double the dose of antidepressant on 'low' days or increase the dose of hypnotics as tolerance occurs.

Some people with severe mental illness believe they do not need medication. The medication adherence of people with mental illnesses can also be affected by alcohol or drug addiction. In addition, practical matters of access to and the cost of medicines can be a major reason why consumers who experience severe mental illness are non-adherent.

7.1 Interventions

A 2012 systematic review focused on consumer, provider, systems and policy interventions to improve adherence in the United States of America.[170] It found the strongest evidence for improving medication adherence for depression was for case management or collaborative care with in-person consumer education visits. Studies looking at interventions to improve adherence in other mental health conditions were not found. At a policy level, robust evidence indicated that interventions to reduce out-of-pocket expenses improved adherence across clinical conditions.

A 2013 review of adherence in bipolar disorder identified that factors affecting adherence were:

- consumer-related, for example, younger age, alcohol and drugs co-morbidity
- disorder-related, for example, severity of bipolar disorder, younger age at diagnosis
- treatment-related, for example, side effects of medicine, effectiveness.

The strategies identified as improving adherence were strengthening the therapeutic alliance, using psychological treatments and using psychoeducation programmes. The authors found it difficult to compare studies because of their different definitions for adherence and different methods to measure adherence. Further studies using standard definitions and methods of measurement are needed to confirm the factors and strategies relating to adherence in bipolar disorder.[171]

The Cochrane review in 2014[32] is less hopeful, stating 'methods of improving medication adherence for chronic health problems tested to date are mostly complex and not very effective, so that the full benefits of treatment cannot be realised'. The review identified one randomised controlled trial, with a low risk of bias, in consumers who experience schizophrenia or schizoaffective disorder.[33] The 110 consumers randomised to family supervised treatment (STOPS) received usual care with a key care supervisor, who was a family member living with the consumer for at least six months and providing support for the treatment. The supervisor received education and the consumers in this arm received free medicines. Consumers in the other arm received usual care and were left to their own means to obtain their medicines. Adherence was measured using a five-point self-report scale and using pill count data. The proportion of consumers with perfect adherence was higher at three months and twelve months in the STOPS arm, but not at six months. Symptoms measured by the Global Assessment of Functioning Scale and Positive and Negative Syndrome Scale were improved in the STOPS arm. The results could have been affected by the provision of free medication to the study arm.

Within mental health, a study has identified that up to 74 percent of consumers (who experience schizophrenia) in the sample stopped taking their medication after 18 months.[172] In addition, a case note review of 255 inpatient admissions found that 46 percent of people had 're-starting medication' as the reason for their admission.

A large UK study between 2004 and 2005 used multilevel modelling to investigate links between mental health ward features and high rates of medication refusal.[173] The patient–staff conflict checklist (PCC-SR), an end-of-shift nurse report on the frequency of containment and conflict events, was modelled to assess the association of medication refusal with medication-related conflict rates.

The results suggest that refusal of medication (both regular and as required (PRN)) is associated with:

- wards that have a restrictive focus – locking doors, using special observation, using time out
- staffing demographics – using non-regular staff (bank or agency)
- conflicts – smoking in non-smoking areas, refusing to see workers, refusing food or drink, refusing to get out of or go to bed. Such conflicts may have been related to the number of consumers who experience schizophrenia on the ward.

The study had many limitations, mainly because of the cross-sectional nature of the data set. However, some of the findings match the results of other studies. Further research is needed to confirm all the findings.

Research supports the view that a strong and positive therapeutic relationship is critical to promote medication adherence. When consumers participate in and share decision-making about the choice of medication and how and when they take it, this has a strong influence on adherence. An important part of this shared decision-making is talking to consumers about possible side effects, the signs they should look for and how they can manage side effects. As mentioned earlier, the Cochrane review identified only one randomised trial in consumers with a mental health diagnosis that had a low risk of bias. Other randomised trials have used a variety of methods to improve adherence.[34] Interventions tested include psychoeducation, motivational interviewing techniques, integration of the importance of antipsychotic use into a

relapse prevention and recovery model, electronic support and a pharmacy-based intervention consisting of easy-use packaging, refill reminders and medicine education.

Medicine education features in the Scottish Patient Safety Programme's [mental health project](#) with new patient information leaflets (PILs) designed for clozapine and lithium.[169] Consumer-friendly information leaflets are an important support tool to supplement education by health professionals. PILs designed for use in the mental health setting are available in the Waitemata District Health Board area. While not developed in New Zealand, and therefore lacking Māori and Pacific input, they are the best source of mental health medicine PILS currently available. However, they are not yet available nationally. The [Accident Compensation Corporation](#) has developed information, for health professionals and consumers, about the benefits and risks of anti-epileptic medicines taken during pregnancy.[174,175] It was prompted to undertake this initiative because of the number of cases in New Zealand of fetal anticonvulsant syndrome associated with those medicines.

7.2 Family or clinical intervention support

A three-arm randomised controlled trial[176] compared:

- culturally adapted multi-family group (MFG)-adherence (Ad) and treatment as usual (TAU) (three individual sessions, a one-day family workshop and 24 family sessions adapted for the Spanish-speaking Mexican consumers and families involved over 12 months)
- MFG-Standard (S) and TAU (three individual sessions, a one-day family workshop and family sessions for 12 months)
- TAU alone.

The study recruited 174 consumers who experience schizophrenia.

The MFG-Ad arm increased adherence (measured by consumer compliance interview) and increased the time to first hospitalisation, and consumers were less likely to be hospitalised against TAU. Against MFG-S, MFG-Ad had significantly better results at 18 months but not at 24 months – that is, 12 months after sessions stopped. As with the majority of adherence trials, bias was introduced because consumers agreeing to take part are more likely to be adherent than non-adherent. Further limitations were that many consumers dropped out after baseline, particularly those recruited as inpatients, and some categories of adherence (eg, partial and no adherence) were collapsed because of the low numbers in them.

Consumers with a diagnosis of schizophrenia were recruited into a multi-centre European trial from both adult inpatient and community psychiatric settings.[35] The intervention group received adherence therapy (brief individual cognitive behavioural approach) for eight weeks and TAU, or a health education intervention for eight sessions and TAU. There was no significant difference between adherence rates after 52 weeks. A risk of bias was introduced because of consumer selection – that is, consumers agreeing to be in the trial were more engaged and therefore more likely to be adherent.

A systematic review and meta-analysis by Gray et al found no difference in adherence behaviours and attitudes, but found that adherence therapy had significantly more positive effects on consumers' symptoms than TAU.[177] The review authors sought independent advice on whether the studies were biased or not because one of the authors was involved

in four of the six studies included in the review. Five randomised controlled trials comparing adherence therapy with TAU in consumers who experience schizophrenia or other psychosis were included, in addition to the study above. TAU in the different studies varied, partly because some studies were in community consumers and some in hospital consumers, so a direct comparison of the results is not possible. The studies used different methods or combinations of methods to assess psychiatric symptoms and adherence, which makes it difficult to compare results. One study, Anderson et al, had a high risk of bias, associated with a low sample size and follow-up directly after the intervention was completed.[178] The study by Maneesakorn et al involved very small numbers of consumers and had a medium risk of bias.[179] The Schulz et al study had a short follow-up duration and the Von Bormann et al study involved small numbers.[180,181] The studies by Gray et al and Chien et al had the lowest risk of bias among the six studies in the review.[35,36]

In their review of technology-based randomised controlled trials in mental health consumers, El-Mallakh and Findlay[34] found all the trials reviewed had a small number of consumers and measured the adherence during the trial or immediately at the end of the intervention. The methods used were: weekly telephone calls; daily text messaging; text messages sent by computer program, including a weekly 10-item early warning signs questionnaire to identify prodromal psychotic symptoms; and the use of an electronic pill dispenser that reminded consumers to take their doses and notified the pharmacist when each dose was opened.

8. Transitions

Transitions of care are sources of error and confusion in all sectors of medicine but particularly in the mental health service. Consumers can receive their mental health treatment and monitoring from the hospital team, the community mental health team, the community alcohol and drugs team and the primary care team. They can be referred to other specialities for treatment of associated diabetes and cardiovascular disease. Communication failures between primary care and mental health specialists are linked to worse outcomes.[37] Discrepancies between records of medicines being taken by consumers are discussed under 'Medicine reconciliation' in section 4.2. Problems exist in terms of access to up-to-date medicines lists across community and inpatient mental health services, not just between primary care and mental health teams. Not all inpatient services can access community mental health or community alcohol and drugs records.

8.1 Other interventions to improve communications between teams

Other than studies focused on medicine reconciliation, three other initiatives to improve communication in the care and treatment of mental health consumers were found.

A Veterans Affairs academic community-based clinic with co-located primary care physicians and psychiatrists undertook an evidence-based QI initiative to identify the barriers to communication and recommend changes for improvement.[37] A working group of clinicians and managers, an IT specialist and a QI researcher considered the barriers through process mapping and fishbone diagrams, refining both through group discussion and focus groups (including a consumer group). Other barriers, such as culture, were explored by interviewing clinicians who had previously worked at the clinic. The single biggest communication barrier was identifying which providers belonged in the consumer's care team. This was particularly true for primary care because psychiatric resident doctors could change weekly. A contributing factor was a lack of respect for each other's roles and abilities. Local teams worked on introducing small changes for six months and learnt from qualitative findings. Each site nominated one young consumer to be part of not only the local team but also a peer support group who met regularly to share experiences. A shared aim of 50 percent improvement was agreed. The initial rate, when the aim was set, was 10 percent on average for comprehensive cardiometabolic screening. PDSA cycles were based on interventions found by looking at the process mapping and fishbone diagram and were agreed by the working group as those likely to be successful. The interventions were based on joint treatment planning and joint case conferences. The rate of screening reached the level set in the aim after six months but was not 100 percent. The universal issue was: who was responsible for the tests and the ineffective communication of results between mental health and primary care, and vice versa, so that either provider knew that tests were outstanding. Learning and repetition of the methodology increased confidence and competence.

The project built an appreciation of the value of consumer contributions to any service change plans. The communication with outside teams, such as health promotion or smoking cessation, was still weak or non-existent.

A project using medicines management coordinators in Texas enrolled 325 hospitalised consumers (diagnosed with schizophrenia, schizoaffective or bipolar disorder) either before discharge or at the first clinic appointment.[38] A comparison group was enrolled in a different

outpatient clinic. The coordinators were either nurses or case managers. The coordinators prepared full case histories, including past medication, appointment keeping and estimates of adherence. Working with consumers, they organised appropriate clinic appointments, ensuring travel would not be an issue, and met with the consumers at their outpatient appointments. There the coordinators were assessing the consumer's clinical status, medication, side effects, compliance issues and any other issues, combined with medication education, with the aim of improving guideline implementation and reducing hospital and crisis admissions. The study encouraged consumers to engage earlier and more frequently with outpatient treatment but did not reduce their re-hospitalisation or use of crisis or emergency services.

A QI initiative in a London mental health trust aimed to improve the quality of on-call handover at the three hospital sites.[39] A baseline survey found that 69 percent of staff had been involved in incidents in the previous six months where handovers had not occurred while on-call. Each site had different on-call arrangements for junior doctors and all used senior nurse assessors overnight. Through two PDSA cycles, a handover protocol was implemented and then adapted, the on-call arrangements at one hospital were changed and the same was planned for the third hospital. Success was measured by satisfaction surveys. A factor that was instrumental to success was using the senior nurse assessors and junior doctors who provided the on-call service as team members to develop and implement the protocol. Senior doctors and managers provided necessary input and buy-in to allow on-call arrangements to change and encourage use of the handover documents. A repeat survey of on-call staff at the end of two PDSA cycles found that 35 percent of respondents had been involved in incidents on-call where handovers had not taken place. The majority of the respondents involved in the incidents were from one hospital where the simplified on-call structure had not been implemented, which caused difficulties for both the on-call doctors and the hospital switchboard. The project did not measure the sustainability of the handover process but education on the process at junior doctor induction and reminders from senior staff were thought likely to maintain use of the process.

9.   Child and adolescent mental health care

When young people with first episode psychosis start antipsychotics, they can experience weight gain and obesity, hyperlipidaemia, insulin resistance, hypertension and metabolic syndrome. Often these side effects develop rapidly, within 12 weeks of starting antipsychotic therapy.[40] The first year of antipsychotic treatment is a critical period for weight gain and metabolic changes.[182] Inappropriate weight gain, obesity, hypertension and lipid and glucose abnormalities developing during childhood and adolescence are particularly problematic because they predict adult obesity, metabolic syndrome and cardiovascular morbidity and malignancy. The risk factors for developing metabolic syndrome are complex and multi-faceted. Lifestyle, ethnicity, genes and disease factors all affect the likelihood of developing metabolic syndrome.

The observations in Chapter 6 about monitoring guidelines and whether clinicians adopt them into practice apply equally, or perhaps more importantly, in relation to child and adolescent consumers prescribed antipsychotics.

Some outcomes for children with mental health problems remain suboptimal. The reasons include 'access to care, failure of the systems and providers to adopt established quality improvement strategies and interventions with proven effectiveness'.[183]

Many organisations have developed monitoring guidelines, but not all of them implement those guidelines or gain full clinical compliance. One important issue in the success of monitoring guidelines in practice is establishing who in the clinical team is responsible for the monitoring and for acting either when monitoring is not done (not all consumers will be compliant with appointments) or acting when a need is revealed.[41] For children and adolescents prescribed an antipsychotic, starting monitoring early is particularly important and it needs to be clear whether mental health or primary care is responsible. Regarding monitoring, Eapen et al recommend:

- only prescribing antipsychotics to young people with psychosis when regularly monitoring weight and BMI
- monitoring weight every one to two weeks for the first eight weeks after the consumer starts an antipsychotic and then no less than three monthly for the first year
- always recording results in the clinical record, ideally charting them
- having a psychiatrist-led review if monitoring shows evidence of rapid weight gain (for example, 7 percent within three months) or rapid development of abnormal lipids, blood pressure, or glucose.

Ideally a healthy lifestyle programme should be available for children and adolescents started on antipsychotics. A prevention approach in this population is especially important. An Australian algorithm for adolescents, developed by Curtis, Newall and Samaras and published by the New South Wales Health Education and Training Institute, details the required monitoring along with the actions required if abnormal results are found.[184]

A 2017 systematic review of strategies to improve mental health care for children and adolescents concludes that generally only one study ever tested any one strategy.[183] Therefore, the authors did not have a high degree of confidence about the efficacy of any single strategy. The review looked at implementation strategies focused on evidence-based practice interventions. The evidence-based practice identification process was based on the

National Registry of Evidence-based Programs and practices from the Substance Abuse and Mental Health Services Administration (now phased out and replaced with an evidence-based practices resource centre).[185] Interventions focusing solely on improving health outcomes were not included. Only implementations in the outpatient setting serving children and adolescents with mental health problems were considered. Three key questions (KQ) were asked:

> KQ 1: What is the effectiveness of QI, implementation, and dissemination strategies employed in outpatient settings by health care practitioners, organisations, or systems that care for children and adolescents with mental health problems to improve:
>
> a. Intermediate consumer, provider, or system outcomes?
>
> b. Consumer health and service utilization outcomes?
>
> KQ 2: What are the harms of these mental health strategies?
>
> KQ 3: Do characteristics of the child or adolescent or contextual factors (eg, characteristics of consumers, practitioners, organisations, or systems; intervention characteristics; setting; or process) modify the effectiveness, or harms of strategies to improve mental health care and, if so, how?

The review found 19 studies with 18 strategies addressing KQ1. One study addressed KQ2 and four KQ3 as well. No study addressed moderators of harm. Only one study was rated as having a low risk of bias. Most studies used cluster design. The usual care arms in studies often lacked detailed information to be able to compare to the intervention.

The strongest evidence for success for KQ1 was in a study of pay for performance. In this randomised study, therapists were twice as likely to demonstrate implementation competence in the pay for performance arm.

The strength of evidence that other strategies improved some outcomes was low. Examples of these strategies are: training or providing electronic tools to improve adherence to evidence-based practice; enhancing organisational climate and culture to improve morale; training nurses to educate parents about evidence-based practice to improve access to care, treatment engagement and therapeutic alliance; giving weekly feedback to clinicians about consumers to improve consumer functional status; and training clinicians about medication monitoring and identifying mental health problems in consumers to improve service use.

Strategies that consistently provided insufficient evidence or evidence of no benefit across all reported outcomes were: educational strategies alone; and educational material and outreach components only.

A study in British Columbia, Canada[186] investigated the barriers and facilitators to implementing a metabolic monitoring protocol for antipsychotic-treated youth in community mental health teams and in hospital. It identified the following barriers.

- Staff had concerns that warning consumers about possible side effects would reduce their adherence.
- Not all staff knew what tests needed to be done when.

- It was not clear who had responsibility for physical health monitoring within teams or across boundaries.
- Not all community mental health teams had examination rooms available to monitor physical health parameters, such as weight and waist circumference.
- Not all community health teams had the equipment needed to do all the physical health checks.
- Teams did not always share laboratory results with primary care.
- Primary care, hospital and community mental health teams had no shared, clear understanding about responsibility for actions related to abnormal results.

Some studies have looked at lifestyle interventions to decrease the risk of metabolic syndrome development and have had mixed results.

One Australian study focused on preventing the initial weight gain caused by antipsychotic treatment to reduce the heightened cardiometabolic risk.[42] In this prospective controlled study, specialist clinical staff delivered a 12-week individualised intervention in first episode psychosis youth and young adult community services. Both intervention and control groups received standard care (as per guidelines) but the intervention group had dietetic support (dietician), health coaching (clinical nurse consultant), an exercise programme (exercise physiologist) and support from youth peer wellness coaches. The support included shopping and cooking advice – not just on healthy eating – and access to a supervised gym. Study group consumers who gained more than 5 kilograms were referred to medical staff for medication review. In the small sample sizes, weight gain in the intervention group was significantly reduced compared with the control.

10. Other initiatives

10.1 National programmes

The Scottish Patient Safety Programme's [mental health](#) work, mentioned previously, includes a medicines management workstream.[169] A driver diagram has been developed and work is under way in the following areas of medicines management: as required psychotropic medicine; medicines reconciliation; safer administration processes; consumer, staff and carer education; and high-risk medicines.

The Australian Commission on Safety and Quality in Health Care does not have an active workstream focused on medicines management in mental health but did commission a report on medication safety in mental health.[187] The Australian Commission has developed a clozapine titration chart as part of its suite of national medication charts and a complementary audit form to measure how the chart is used. Medication safety is included in the National Standards for Mental Health Services that the Australian Commission developed.[188]

10.2 Education and training initiatives

One UK mental health trust had a training programme for core and advanced psychiatry trainees to become involved in QI, which has led to the wider mental health team engaging with this methodology to explore new ideas for service delivery. The programme for trainees generated interest from senior psychiatrists so another course was started for senior staff. Trainees were encouraged to undertake QI projects and to involve the multidisciplinary team. This led to the knowledge that the multidisciplinary team members needed QI training. When projects were coming to an end and the trust was planning to spread the initiative across the organisation, it realised that senior management would need to be on board to facilitate implementation and sustainability of any successful changes. Connections are being established with consumer groups and local patient safety programmes to help trainees define problems to tackle and to find ideas to test.[189]

England has developed a continuous QI tool for commissioners of mental health education and training to consider key aspects of the courses provided. The tool was developed in response to a realisation that not all courses were aligned to national policy. In addition, the course design, development and delivery often lacked involvement with consumers and carers, including family and whānau. The implementation phase for the tool generally found content and consumer input to be adequate. The sample of courses contained some bias, with courses chosen because they were either the best examples or were under review. The authors identified some particular areas that course commissioners should give serious thought to and for which the tool provides guidance. The areas are: consumer and carer (including family and whānau) involvement and the assessment of programme impact.[190]

Nova Scotia, Canada developed, implemented and evaluated the [bloom programme](#) as a mental health and addictions community pharmacy partnership.[191] Training was given to participating community pharmacists to help them improve the health and quality of life of individual consumers with mental health and addiction problems. The pharmacies acted as resource centres for their local communities, highlighting local services, support and resources. Providing outreach education to local mental health and addiction communities was included. A key element of the programme was partnering with individual

consumers and their health care team to reduce side effects, minimise drug interactions and maximise effectiveness.

10.3 Changing attitudes around mental health

GPs often see consumers with mental and physical health issues and can identify training in mental health care as a priority. Work in British Columbia, Canada found training in mental health care was a priority and 'a team from a local urgent mental health clinic observed that the diagnoses of various mental health conditions were frequently missed in family physician referrals'. Family physicians appeared not to fully engage their consumers as partners in care. A province-wide QI effort used training tools in cognitive behavioural skills to encourage family physicians to engage consumers as partners and to encourage self-management as an alternative to medication in some consumers. A trained team supports the training and office implementation of the QI training modules. Family physicians are reimbursed for the training. Nearly half of the province's family physicians had been trained or were in training when the study was reported. The family physicians reported high to very high success in implementing self-management in their practice and considered this approach had a positive impact on their consumers. The study did not measure consumers' perceptions of the initiative's acceptability or whether practice had changed. It measured a decrease in the stigmatising attitudes of the family physicians using an opening minds survey[192] for health professionals.[193]

10.4 Consumer involvement in mental health service planning and measurement

Previous chapters have covered the importance of involving consumers, families, whānau and carers in planning, developing and measuring services. Many of the studies reviewed did not involve consumers, families and whānau or did so only in a minimal way. Many organisations partner with consumers to co-design or review services, and to involve them in collaborative, and research projects. Within mental health, it can be important to partner with family, whānau and support people as well. An Open Forum in 2017, concerned with bringing recovery and consumer views into the mainstream of mental health quality measurement, challenges the sector on how this might be successfully achieved.[194]

Medicines management cannot be safe and effective if the consumer, family and whānau are not engaged in whether and why medicines are needed. They must clearly understand the positive and negative or side effects of each prescribed medicine and how to identify those.

Engaging consumers and their family and whānau in consumer care and treatment, in the way services are provided and in communicating their experience of receiving the services, for quality improvement, can maximise satisfaction and outcomes for the consumers and their loved ones. In addition, it can help make those services safer for clinicians to work in.

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Appendix 1: Medication incident and adverse drug event studies published between 1 January 2000 and 1 January 2011

Author and publication year	Consumer population	Type of study	Prescribing result	Monitoring result	Dispensing result	Administration and/or transcribing result
1. Nirodi and Mitchell 2002.[63.]	Two psychiatric inpatient units. (UK)	Record review, 112 cases (hospitalised for dementia or functional psychiatric illness).	Reviewed 153 prescriptions for functional psychiatric illness and 167 prescriptions for dementia. Prescribing habits varied; for example, unit A prescribed more benzodiazepines and hypnotics than unit B. 16.1 percent prescriptions illegible. Quality inferior in consumers with dementia compared with those with functional psychiatric illness. Prescribing quality of as required (PRN) medicines significantly lower (notations of frequency, dose and indication) than regular medicines in both groups.	N/A	N/A	N/A

2. Grasso et al 2003.[64]	103-bed state psychiatric hospital. (USA)	Medication incident reports and record review.	11 percent of the total of medication errors reported or identified by record review.	N/A	1 percent of total, based on reports that were called for from pharmacy and nursing staff.	Of the total of medication errors reported or identified by record review, 66 percent related to administration and 23 percent to transcribing.
3. Paton and Gill-Banham 2003.[65]	12 mental health trusts. (UK)	Pharmacist intervention reports.	579 interventions recorded, both prescribing and administration. 27 percent clerical, 38 percent clinical, 12 percent other and 4 percent drug information queries.	N/A	N/A	See prescribing.
4. Haw and Stubbs 2003.[66]	400-bed psychiatric hospital. (UK)	Pharmacist intervention reports.	311 errors in 260 prescribed items. 12.5 percent errors in decision-making (included 5.1 percent no Mental Health Act authorisation pre-prescribing) and 0.8 percent incomplete prescription.	N/A	N/A	N/A

5. Ito and Yamazumi 2003.[67]	85 psychiatric units. (Japan)	Potential ADEs reporting scheme over a two-month period.	N/A	N/A	N/A	221 reports of potential ADEs, 35.7 percent wrong drug administered, 64.3 percent various other administration errors. 24.9 percent intercepted before reaching consumer.
6. Stubbs et al 2004.[68]	500-bed psychiatric hospital. (UK)	Pharmacist intervention reports.	211 errors in 188 prescribed items. 23.7 percent errors in decision making, 76.3 percent errors in prescription writing.	N/A	N/A	N/A
7. Maidment and Thorn 2005.[69]	National Health Service (NHS) mental health trust. (UK)	New electronic incident reporting system, 12 months of reports.	One error and one near miss.	One error.	4 errors and one near miss.	47 errors and 3 near miss (7 errors and one near miss classified as other).
8. Haw et al 2005.[70]	450-bed psychiatric hospital. (UK)	Incident reports.	N/A	N/A	N/A	123 reports over 3.5 years. 112 errors (includes 4 near misses).

9. Rothschild et al 2007.[71]	Academic psychiatric hospital. (USA)	Medication incident reports, ADE study and pharmacist intervention reports. 1,871 admissions with 19,180 patient days.	Medication errors: 68 percent prescribing related (excluded those with little or no risk of harm). ADE study: 191 of 1,559 consumers, 25 (13 percent) preventable and 166 (87 percent) non-preventable.	N/A	None	Medication errors: 10 percent administration errors and 20 percent transcription errors (excluded those with little or no risk of harm).
10. Shawahna and Rahman 2008.[72]	Psychiatry department, hospital. (Pakistan)	Chart review.	33 prescribing errors in a total of 84 prescription items (39.3 percent of prescription items).	N/A	N/A	N/A
11. Haw and Cahill 2011.[73]	Specialist psychiatric hospitals. (UK)	Medication incident reports over a two-year period.	30 of 446 incidents reported.	N/A	20 of 446 incidents reported.	396 of 446 incidents reported.
12. Sirithongthavorn et al 2009.[74]	Tertiary paediatric outpatient psychiatric care hospital. (Thailand)	Chart review.	68 of 180 medication errors in 7,444 prescriptions were identified at the prescribing stage (0.9 percent of prescriptions).	N/A	17 errors in 7,444 prescriptions (0.2 percent of prescriptions).	86 errors in 7,444 prescriptions (1.1 percent of prescriptions).

Appendix 2: Medication incident and adverse drug event studies published between 1 January 2011 and 1 January 2018

Author and publication year	Patient population	Type of study	Prescribing result	Monitoring result	Dispensing result	Administration and transcribing result
1. Jhangee et al 2012.[75]	Psychiatry outpatient department. (India)	Chart review.	1,131 errors in 648 prescriptions (175 per 100 prescriptions).	N/A	N/A	N/A
2. Soerensen et al 2013.[76]	Three psychiatric wards, n = 69. (Denmark)	Chart review (included both inpatient computerised physician order entry and discharge summaries) and direct observation, visits to ward to collect dispensed medicines for identification (dispensed by nursing staff for administration to consumers).	23 percent errors in opportunity for error in the discharge summary and 4 percent errors in opportunity for error in computerised physician order entry.	N/A	N/A	42 percent errors in opportunity for administration error (95 percent of these were lack of identity control). Nurses 'dispensed' medicines for administration on the wards: 3 percent in opportunity for error in direct observation but 13 percent in unannounced control visit (ie, visits to ward to collect dispensed medicines) – most related to one nurse assistant.

3. Keers et al 2014.[3]	Three mental health trusts (>50 wards). (UK)	Chart review over 10 days. Medication reconciliation on admission to check accuracy of inpatient chart, leave and paper discharge prescription.	288 prescribing errors in 4,427 prescription items. Error rate of 6.3 percent (seven items were affected by two prescribing errors). Error rates for orders prescribed on admission 10.7 percent; during stay 6.5 percent; leave 4.5 percent; discharge 6.5 percent and rewritten 2.5 percent. Admission errors were mainly omitted medicines.	N/A	N/A	N/A
4. Cottney and Innes 2015.[20]	Mental health hospital trust. (UK)	Direct observation of medicine rounds.	N/A	N/A	N/A	139 errors in 4,177 opportunities. 3.3 percent per opportunity or 0.81 errors per medicine round.

| 5. Keers et al 2015.[4] | Three mental health trusts; acute adult and later life in-patient units, 25 wards. (UK) | Review of newly written discharge prescriptions. | 54 of 274 discharge prescriptions contained one or more prescribing errors (20.8 percent). One in 20 prescribed or omitted items contained at least one prescribing error (5.1 percent). A common error, 43.4 percent, was failing to indicate, or incorrectly indicating, who was responsible for continuing care: the GP or the hospital. 68.8 percent of eligible discharge prescriptions erroneously lacked information on medicines discontinued during hospital admission. | N/A | N/A | N/A |
| 6. Hema et al 2015.[77] | Psychiatry department of hospital, inpatient and outpatient. (India) | Chart review. | 59 errors in 47 inpatients and 13 errors in 12 outpatients (52.2 percent of inpatients, 100 percent of outpatients). | N/A | N/A | N/A |

7. Ayani et al 2016.[78]	Tertiary care teaching hospital; psychiatric ward and psychiatric hospital, 448 inpatients and 22,733 patient days. (Japan)	Chart review.	134 of 398 medication errors identified were at the prescribing stage (34 percent). 86 of 186 potential ADEs (near misses) were at the prescribing stage (46 percent).	155 of 398 medication errors and preventable ADEs identified were at the monitoring stage (39 percent). 126 of the 166 preventable ADEs were at the monitoring stage (76 percent).	N/A	67 of 186 potential ADEs identified were at the administration stage (36 percent).
8. Scott et al 2016.[5]	Psychiatric hospital. (UK)	Chart review.	288 prescribing errors in 231 newly written or omitted items in a total of 5,127 newly written or omitted items (4.5 percent).	N/A	N/A	N/A
9. Abduldaeem et al 2016.[79]	Two acute mental health wards in mental health trust. (UK)	Direct observation.	N/A	N/A	N/A	153 errors in 317 opportunities for error (48 percent).

Appendix 3: Current national mental health clinical guidelines (English language)

Publisher	Title	Publication date
National Institute for Health and Care Excellence (NICE),[80] UK.	Psychosis and schizophrenia in adults: prevention and management.	February 2014 (last updated March 2014).
National Institute for Health and Care Excellence (NICE),[81] UK.	Psychosis and schizophrenia in children and young people: recognition and management.	January 2013 (last updated October 2016).
National Institute for Health and Care Excellence (NICE),[82] UK.	Depression in adults: recognition and management.	October 2009 (last updated April 2016).
National Institute for Health and Care Excellence (NICE),[83] UK.	Depression in children and young people: identification and management.	September 2005 (last updated September 2017).
National Institute for Health and Care Excellence (NICE),[84] UK.	Bipolar disorder: assessment and management.	September 2014 (last updated February 2016).
National Institute for Health and Care Excellence (NICE),[85] UK.	Antenatal and postnatal mental health: clinical management and service guidance.	December 2014 (last updated August 2017).
Canadian Psychiatric Association.[86]	Canadian physical health and drug safety in individuals with schizophrenia guidelines.	September 2017.
Canadian Psychiatric Association.[87]	Canadian guidelines for the pharmacological treatment of schizophrenia spectrum and other psychotic disorders in children and youth.	August 2017.
Canadian Psychiatric Association.[88]	Canadian guidelines for the pharmacotherapy of schizophrenia in adults.	September 2017.
Canadian Psychiatric Association.[89]	Canadian treatment guidelines for individuals at clinical high risk of psychosis.	September 2017.

Canadian Psychiatric Association.[90]	Canadian schizophrenia guidelines: schizophrenia and other psychotic disorders with coexisting substance use disorders.	September 2017.
Royal Australian and New Zealand College of Psychiatrists (RANZCP).[91]	Clinical practice guidelines for the management of schizophrenia and related disorders.	May 2016.
Orygen (the National Centre for Excellence in Youth Mental Health),[92] Australia.	Australian clinical guidelines for early psychosis (in children).	June 2016.
European Psychiatric Association (EPA).[93]	EPA guidance on the early intervention in clinical high-risk states of psychoses.	March 2015.
Scottish Intercollegiate Guidelines Network.[94]	Management of schizophrenia.	March 2013.
Scottish Intercollegiate Guidelines Network.[95]	Management of perinatal mood disorders.	March 2012.
Canadian Agency for Drugs and Technologies in Health.[96]	Optimal use recommendations for atypical antipsychotics: combination and high-dose treatment strategies in adolescents and adults with schizophrenia.	December 2011.
American Psychiatric Association.[97]	Choosing Wisely recommendations.	April 2015.

Appendix 4: Studies implementing a guideline, pathway or algorithm

Author and publication year	Study population	Guideline, pathway, algorithm implemented	Measurement	Results
1. Chong et al 2006.[102]	First episode psychosis consumers, tertiary Institute of Mental Health. (Singapore)	Algorithm introduction that emphasised single antipsychotic use and short-term use of a benzodiazepine for disturbed behaviour early in treatment rather than increasing antipsychotic dose. No additional information on how it was introduced.	Antipsychotic prescribing for consumers going into an early psychosis intervention programme (EPIP) at baseline, and 3 months with a comparator group pre-algorithm introduction at baseline and 3 months (historical records).	• Baseline: comparator group 22.7 percent of 68 consumers, EPIP 4.8 percent of 483 consumers on multiple antipsychotics. • Three months: comparator group 25 percent, EPIP 5.6 percent on multiple antipsychotics.
2. Reilly et al 2007.[16]	Area mental health service. (Australia)	Implementation of a first presentation psychosis clinical pathway. • Project started in 1999 and guideline and pathway developed, not sustained. • Restarted in 2002 with a measurement plan and the addition of an algorithm and guideline review. Moved to PDSA cycles. • August 2002 training given and changes needed following feedback. • March 2003 implemented.	None completed. • Evaluation phase did not happen because of staff losses.	

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		- August 2003 feasibility evaluation identified difficulties with using the new forms, which were too complex and duplicative, and many staff had moved on since the training or felt they had not been trained to use the new forms. Psychiatrists reluctant to accept the new guideline and pathway. - October 2003 abbreviated clinical pathway agreed; facilitated review and audit and complemented by a medication algorithm. - Implemented in November and December 2003.		

| 3. Steinacher et al 2012.[17] | 114 schizophrenia consumers on two open psychiatric wards. (Germany) | Prospective before-and-after study of clinical treatment pathway implementation, using different methods on each of two similar wards.

Implementation on ward A:
• training sessions and informational meetings for staff
• in-house computer system and print access to guideline
• staff member was the chief reference for pathway implementation in every team meeting ('passive dissemination').

Implementation on ward B:
• training and meetings as on ward A
• computer and print access to guideline as on ward A
• checks of predetermined management variables performed on certain days
• treating physicians given written feedback on audit results (in person if needed) whenever the check revealed deviation from the pathway ('active dissemination'). | • Baseline June 2003: ward A, n = 22; ward B, n = 30.
• Implementation June 2004.
• Remeasure June 2005: ward A, n = 26; ward B, n = 36.

Indicators related to medicine treatment:
1. Pregnancy testing prior to drug therapy.
2. Frequency of ECG monitoring.
3. Therapeutic drug level monitoring day 35.
4. Antipsychotic monotherapy day 35.
5. Treatment in the 300–1,000 mg chlorpromazine equivalent dose range or less than 500 mg as initial treatment with a second-generation antipsychotic, day 35, to determine:
(a) underdosing
(b) overdosing. | Indicators:
1. Ward A, 33 percent to 50 percent.
Ward B, 78 percent to 100 percent.
2. Ward A, 34 days to 24 days.
Ward B, 33 days to 29 days.
3. Ward A, 33 percent to 38 percent.
Ward B, 15 percent to 69 percent.
4. Ward A, 71 percent to 55 percent.
Ward B, 39 percent to 50 percent.
5a. Ward A, 29 percent to 50 percent.
Ward B, 15 percent to 7 percent.
5b. Ward A, 0 percent to 8 percent.
Ward B, 23 percent to 14 percent.
The improvement was statistically significant for indicator 1 on both wards and indicator 3 on ward B only.
Some evidence from patient, doctor and nurse assessment of lower treatment efficacy. |

4. Bedard et al 2016.[103]	Regional early intervention in psychosis community care in a rural area using a hub (urban central organisation) and spoke approach. Population density 2.2 per km^2. (Canada)	QI project to standardise services and documentation through care-path implementation: • a care path, used by another early psychosis intervention programme, was adapted for local use to provide a best-practice guide to users in the rural spokes of the service • all clinicians (nurses, social workers and other unregulated health care professionals) received intensive training about the care path • ongoing feedback was encouraged to identify process problems and challenges.	• Baseline audit of consumers' progress notes. • Audit of care path forms for evaluation against some of the care path's best practice interventions. • Length of time between referral/screening and first appointment. • Number of in-person consumer contacts over the first three months. • Evidence of assessed impact on family. • BMI, weight, waist circumference and blood pressure (BP) measurements taken. • Face-to-face consumer contacts assessed five parameters. • Individualised care plans, signed by consumer. • Evidence of family involvement in treatment. • Relapse prevention plans in file. • Psycho-education provided to consumer and family members.	Baseline audit: • evidence of assessed impact on family, 27.1 percent • assessment of substance use, 43.6 percent. Post-implementation audit: • evidence of assessed impact on family, 41.9 percent • assessment of substance abuse, 57.4 percent. Five other comparisons approached a statistically significant change. Three comparisons were in the expected direction: stress assessment; and stress psychoeducation and lifestyle psychoeducation to consumers and family. For two comparisons – the number of consumers with an individualised care plan, and length of time to first appointment – statistical significance was almost reached, but in the opposite direction to that hypothesised.

Appendix 5: Projects or studies undertaken to reduce polypharmacy prescribing

Author and publication year	Study population	Type of study	Interventions	Results
1. Thompson et al 2008.[118]	19 psychiatric units, each with two or more wards. (UK)	Cluster randomised controlled trial. The control and intervention units were matched for bed numbers; 9 units were allocated to control and 10 to intervention.	1. 30-minute outreach or 'academic-detailing' approach. 2. An educational workbook for doctors and nurses using specific cognitive techniques to challenge polypharmacy with alternative treatments. Workbook completion was recognised by continuing education certificates. Booster pamphlet sent 8 weeks after workbook distribution. 3. Medication chart reminder stickers applied by pharmacists if multiple antipsychotics prescribed. These were reviewed weekly and removed if only one antipsychotic prescribed. After baseline data collection, control and intervention units were given a guideline on antipsychotic prescribing by the usual staff communication route.	Outcome measures: 1. antipsychotic polypharmacy prescribing rate for each unit 2. a questionnaire measuring nurses' and doctors' beliefs about polypharmacy. Results: 1. the odds of being prescribed multiple antipsychotics on mental health wards, compared with a single intervention consisting of a guideline, was reduced by 43 percent (OR 0.43, 95% CI 0.21–0.90, $p = 0.028$) 2. beliefs changed significantly on both factors: antipsychotic polypharmacy (coefficient = -0.89, $p = 0.01$) and rapid tranquillisation (coefficient = –0.68, $p = 0.01$) specifically targeted by the workbook. Measurement did not continue beyond the six-month trial period so sustainability was not measured. The effect was relatively modest and between-unit variation in the rates of polypharmacy was considerable.

2. Baandrup et al 2010.[119]	Outpatients with schizophrenia in two municipalities. (Denmark)	Controlled quasi-experimental study.	1. Guideline dissemination and targeted education. 2. Pop-up on electronic prescribing system when a second antipsychotic prescribed.	The interventions did not reduce antipsychotic polypharmacy. Attendance at education sessions was variable because of time pressure and staff turnover during the study period was high. Low staffing resulted in reduced patient visits, which could potentially reduce the ability to reduce doses and stop polypharmacy.
3. Gören et al 2010.[120]	Two hospitals in the Cambridge Health Alliance, four adult acute psychiatric inpatient units. (USA)	QI programme to reduce antipsychotic polypharmacy on discharge prescriptions.	1. Educational seminars for nurses and doctors with four aims: open a dialogue about goals and concerns with the QI programme; address evidence base supporting the programme; obtain clinician buy-in; and allow nurses and psychiatrists access to the same information on programme purposes and methods. 2. Monthly dashboard with prescriber-specific feedback and comparison with unidentified peers on antipsychotic prescribing. Dashboard indicated if there was an appropriate cause for two antipsychotics or not. 3. Chief of service met all psychiatrists quarterly to discuss programme concerns, progress etc.	Outcome measures: 1. percentage of consumers prescribed two or more antipsychotics at discharge 2. percentage of consumers prescribed three or more antipsychotics at discharge. Results: • Baseline data: 66.1 percent (n = 257) on one antipsychotic • Outcome measure 1: Intervention 1: 33.9 percent (132 of 389) on more than one antipsychotic reduced to 21.8 percent (44 of 202) Intervention 2: reduced to 12.2 percent (18 of 147) • Outcome measure 2: Intervention 1: 5.9 percent reduced to 2.5 percent Intervention 2: reduced to 0 percent.

4. Patrick et al 2006.[121]	State psychiatric hospital, 570 beds, 14 psychiatrists. (USA)	Performance improvement initiative.	**Intervention 1** • After baseline data collection, there were case discussions, consultations with psychiatrists and psychopharmacology education sessions. **Intervention 2** • The chief of psychiatry met with each psychiatrist illustrating their prescribing compared to data of their anonymous peers. • Each psychiatrist was asked to reduce antipsychotic polypharmacy by 10 percent.	• From baseline in May 2001 to November 2001 following first intervention there was no decrease in polypharmacy • From November 2001 to August 2002 there was a decrease in antipsychotic polypharmacy from 42 percent to 31 percent of consumers (χ^2 = 8.2, df = 1, p < 0.004) • Of the 14 psychiatrists; 13 reduced their antipsychotic polypharmacy prescribing and 8 met the 10 percent reduction target.
5. Constantine et al 2013.[122]	Florida Medicaid program, prescribers of psychotherapeutic medicines across Florida. (USA)	Performance improvement programme. Developed guidelines and associated indicators using a collaborative process. Used pharmacy dispensing data to identify practices and prescribers for targeted interventions.	Interventions: 1. guideline dissemination 2. letter mailed to prescribers detailing prescribing pattern for individual consumers with the evidence for the guideline recommendations 3. academic detailing face-to-face meetings between pharmacist and prescriber 4. psychiatric consultation, face-to-face consultation with board psychiatrist. The interventions received depended on performance against indicators and went up in intensity depending on whether prescribing changed.	A small number of prescribers triggered review against the indicators. The most frequent indicator triggered in adults was the use of two or more antipsychotics for more than 60 days; 8 times more frequent than any other indicator. In children, the use of high-dose stimulants, antidepressants, antipsychotics and/or mood stabilisers was the most common indicator triggered. The use of two or more antipsychotics for more than 45 days was a close second. Many of the prescriptions that triggered the indicators were written by doctors and, particularly in adults, by doctors who were psychiatrists with many years' experience. The project team concluded that not all prescriptions that triggered the indicators are of poor quality. It was noted that information on the nature of the consumers being treated was needed to further

		Further QI initiatives resulted.	QI initiative: • a specialist paediatric psychiatry telephone consultation line for prescribers with questions about their consumers.	decide whether all the prescribers initially identified needed intensive intervention. The results of the programme in terms of antipsychotic polypharmacy or high-dose treatment reduction were not described.
6. Finnerty et al 2011.[123]	Mental Health Network, New York, 20 acute psychiatric hospitals. (USA)	Series of interventions to reduce antipsychotic polypharmacy.	Phase 1: 1. introduction of a web-based application supporting clinical decision-making and QI, the psychiatric services clinical knowledge enhancement system (PSYCKES) 2. a policy requiring approval by the New York state office of mental health's medical director to prescribe more than two antipsychotics to a consumer. When PSYCKES was implemented, the chief medical officer (CMO) released an antipsychotic polypharmacy policy, which required clinical directors to introduce procedures to review and approve requests to add a third antipsychotic to a regimen. Written approval required by CMO in addition. Cross-tapering with overlap up to 60 days allowed. Phase 2: 1. hospital leaders received quarterly feedback from the office of the medical director identifying specific consumers on polypharmacy	Phase 1. Prevalence of antipsychotic polypharmacy (more than two antipsychotics) reduced 43 percent from 16.9 to 9.7 per 1,000 inpatients. Phase 2. Prevalence reduced by an additional 60 percent to fewer than 3.9 per 1,000 inpatients. Phase 3. Prevalence remained low six months into phase 3 at 3–3.1 per 1,000 inpatients. At 12 months, 5.4 per 1,000. At 24 months, 5.6 per 1,000. At 36 months, 9.2 per 1,000.

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			2. antipsychotic polypharmacy had to be a standing agenda item at management meetings. Phase 3: 1. PSYCKES continued and other interventions stopped. PSYCKES shows medication histories, flags practices outside recommended guidelines and links individual consumers' data guideline-derived measures of adherence to evidence-based practices. Quality indicators summarise performance on polypharmacy at state, hospital, ward and prescriber levels.	
7. Hazra et al 2011.[13]	Centre for Addiction and Mental Health, all inpatient wards and ambulatory clinics. (Canada)	Ongoing double-blind placebo-controlled study, in consumers with schizophrenia on antipsychotic polypharmacy (excluded as required antipsychotic and cross-titration prescriptions).	Concurrent interventions: 1. pharmacists identified polypharmacy from the pharmacy database and called the prescriber with a scripted message, advising of an ongoing prospective study to examine the safety of reducing to monotherapy 2. research staff held weekly education sessions with multidisciplinary teams, balanced discussions on the unknown efficacy and safety of maintaining consumers previously stabilised on two antipsychotics.	Three-fold decrease in polypharmacy: • 18.3 percent (118 of 648) in 2006 to 6.6 percent (51 of 778) in 2008. The use of three antipsychotic combinations decreased: • 5.3 percent (2006) to 0 percent (2008).

8. Finnerty et al 2014.[124]	Multi-state Medicaid Centres. (USA)	Multi-state policymaker and researcher QI collaborative MEDNET.	Four aims identified: 1. develop antipsychotic measures and a common Medicaid data platform (9 measures developed) 2. convene a multi-state QI consortium and support implementation of state QI plans to improve performance (six states retained) 3. support each state to successfully develop and implement QI plans to improve practice on its chosen measures 4. disseminate MEDNET activities and outcomes.	Outcomes: 1. nine measures were developed and are being used (after some adaption following introduction); some have been adopted at a national level and some by other states 2. six states remained in the consortium 3. these six have successfully developed and implemented QI programmes. The results for these are not yet available 4. the programme has been involved in national discussions about using the measures introduced and two further states have joined since the start. Difficulties encountered: 1. states accessed technical assistance more than expected and a change in the wording in some of the measures was needed once they were being implemented at state level 2. access to and use of data both by the programme and at state level took longer to negotiate than anticipated. Privacy concerns about using the data at state level had to be overcome so that the data could be used to support QI initiatives.

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| 9. Plever et al 2016.[125] | 16 acute inpatient services, Queensland. (Australia) | Clinical collaborative using breakthrough series improvement model.** | • Chose schizophrenia treatment as target after available state data demonstrated substantial variance in average length of stay (ALOS) and 28-day readmission rates, and it was felt there was a marked variation in prescribing practice across the state.
• Teams learnt about methodology, developed clinical indicators (with numerators and denominators), shared service improvement ideas and set parameters for therapeutic dose ranges over a two-year period.
• Three peer groups were established based on the number of beds in a facility.
• Clinicians were able to compare their performance against state wide peers.
Other initiatives were developed in response to services being outliers to the indicators.
State-wide interventions:
1. consumer handbook
2. flow chart based on the RANZCP clinical practice guidelines.
Locally:
1. data collection methodology and reporting
2. other initiatives not detailed. | For the first two years of the collaborative: data collected from electronic source, for two-time periods (1 and 2): October 2005 to August 2006 and September 2006 to May 2007; except for psychosocial indicators, which were done by two manual audits.
ALOS: stable for both time periods at 21 days:
1. six sites demonstrated special cause variation with three sites having longer than expected ALOS
2. most sites within upper and lower control limits; one of the two sites that remained outside the control limits was due to the disproportionate influence of 9 cases on ALOS.
28-day readmission rate: mean remained at approximately 20 percent between the two time periods:
1. four outliers ie, above or below the control limits (discussed at collaborative forum and variance in recording practice)
2. all sites within control limits.
Antipsychotic polypharmacy at discharge
Average percentage of consumers prescribed two or more antipsychotics at point of discharge:
1. 8.7 percent, three sites showed special cause variation, only one showed a higher than expected polypharmacy rate
2. 10.6 percent, majority of sites within the upper and lower control limits. |

				Psychoeducation:
				1. 73 percent of consumers and 51 percent of their families and carers received education about their illness
				2. 74 percent of consumers and 52 percent of their families and carers received education about their illness.
				Care plans:
				1. 76 percent of consumers have a care plan but only 5 percent signed
				2. 88 percent have a care plan but only 4 percent signed.
				Discharge plan sent to the follow-up care provider at discharge
				1. 78 percent
				2. 84 percent.
				Mean time between discharge from an inpatient facility and first face-to-face appointment with a mental health provider from the same service:
				1. 8.25 days
				2. 7.32 days.

** Institute for Healthcare Improvement. 2003. *The Breakthrough Series: IHI's collaborative model for achieving breakthrough improvement.* IHI Innovation Series white paper. Boston: Institute for Healthcare Improvement. URL: www.IHI.org (accessed 29 January 2019).

Appendix 6: Quality improvement programmes to reduce high dose and polypharmacy antipsychotic prescribing

Author and publication year	Study population	Type of study	Interventions	Results
1. Paton et al 2008.[115]	32 NHS mental health trusts, 218 general acute psychiatric wards and intensive care units. (UK)	QI programme.	Participating hospitals' project teams invited to attend an introductory seminar to discuss and review the aims, objectives and methodology. Baseline survey results with benchmarked data disseminated to participating hospitals. Nine interventions were recommended to participating teams (unable to access these). Re-audit after 12 months.	• Combined antipsychotic prescribing: baseline 43 percent; re-audit 39 percent. • Prevalence of high-dose: baseline 36 percent; re-audit 34 percent. The audits identified that as required prescribing of antipsychotics was the main reason for high-dose and combined antipsychotic prescribing.
2. Mace and Taylor 2015.[126]	Inpatient NHS mental health trust. (UK)	Six-year QI programme. A baseline survey, two surveys conducted during the QI programme and final survey.	Baseline survey: results disseminated at management and clinical levels. Intervention phase 1: 1. March–October 2006: agreement with trust clinicians on restrictions on the use of as required medicines, ie, not to be routinely prescribed and any as required antipsychotic prescriptions to be reviewed at least once a week. Approved by trust executive and disseminated throughout the trust. Prescribers reminded about the detail needed on as required medicine prescriptions.	Aim was to reduce high-dose antipsychotic prescribing and antipsychotic polypharmacy. Antipsychotic polypharmacy was defined as the prescription of two or more antipsychotic drugs, either regular or as required. Target introduced January 2009, reducing to below 20 percent by the end of 2009: • antipsychotic polypharmacy, 57 percent versus 16 percent ($p < 0.0001$) between baseline and final survey (more than 200 consumers in each survey)

			2. April 2006–January 2007: all prescriptions with high doses or combinations of antipsychotics were reviewed by prescribers and pharmacists, to find alternative treatment options. If the prescription was deemed necessary, then the reasons for continuation and a plan for additional monitoring were recorded in the notes. Intervention phase 2 March to December 2007: 1. As for points 1 and 2 in phase 1, but with reports to relevant staff. Reports compared prescribing across the trust and compared between wards with a similar consumer demographic. Intervention phase 3: 1. As for point 1 in Phase 2. 2. January 2009: target agreed between pharmacy and the trust's executive to reduce the rates of prescribing high doses and combination antipsychotics on individual units to below 20 percent by the end of 2009. 3. February 2009 – December 2011: prescriptions examined on units with disproportionately high rates of prescription of either high doses or combinations of antipsychotics. 4. April 2009: trust inpatient prescriptions were updated to include a warning that all as required medicines must be reviewed at least once a week.	• reduction in the rates of prescribing high-dose antipsychotics, 58 percent versus 10 percent ($p < 0.0001$).

Appendix 7: Studies on administration methods in mental health settings

Author and publication year	Study population	Type of study	Interventions	Results
1. Cottney 2014.[139]	Acute ward (21 beds), mental health hospital. (UK)	Observational study, before and after the introduction of an automated dispensing cabinet. All administration done at a central point with consumers coming to that point.	Introduction of an automated dispensing cabinet: • installed in a non-clinical area while all ward staff received one-to-one training on how to use the device • two-month run-in time before remeasuring the administration error rate.	Baseline (60 medication rounds observed): • error per opportunity rate of 8.9 percent • clinical significance of the errors: 40 percent negligible, 60 percent minor • average of 2.94 minutes to administer each dose of medicine. Post intervention (60 medication rounds observed): • error per opportunity rate of 7.2 percent • clinical significance of the errors: 1.5 percent negligible; 72 percent minor and 1.5 percent serious • average of 2.37 minutes to administer each dose of medicine. The reduction in the error rate following the introduction of the automated dispensing cabinet was not statistically significant. It was principally associated with reducing the errors that had negligible clinical significance. The time spent on the administration of each dose was reduced.

| 2. Cottney 2015.[140] | Mental health care trust, care of older people wards (six). (UK) | QI project to reduce missed doses of medicines. | Discussion with nurse managers revealed that not all staff knew about the number of missed doses that were occurring. Pharmacists collected the data over six weeks for the baseline measurement. Four PDSA cycles illustrated the issue, but each ward's staff identified the reasons and how to change practice to reduce the number of missed doses:

• PDSA 1: league table created and sent to each ward and each nurse, prize for the ward with the fewest omitted doses
• PDSA 2: table adapted to show whether the results were up or down from the previous week, prizes continued
• PDSA 3: table continued, poster introduced, one for each ward, showing how many doses missed in the last fortnight and how many weeks since a dose was last missed
• PDSA 4: added a line graph to each ward's poster to show how the rate was going week to week. | Baseline:

• 1.07 percent of all doses of medicine that were prescribed to be administered were unintentionally omitted.

Control charts show special cause variation at two points:

• after PDSA 1
• after PDSA 4.

After PDSA 4:

• 0.07 percent of all doses of medicines that were prescribed to be administered were unintentionally omitted. |

| 3. Dickens et al 2006.[141] | 66-bed inpatient unit for adolescents and young adults with learning disability and often with mental disorder, challenging behaviour or forensic history as well. (UK) | Pre- and post-intervention chart review. | After review of medication administration errors (MAE), what could have prevented them, and a consultation period with nursing staff to identify possible interventions, the agreed intervention was to have a competently trained health care assistant, as an observer, to check the Five Rights on the administration round.

Retrospective chart review used to identify MAE; failure to record, wrong time, wrong dose, details of PRN administration not recorded. | Baseline:
• MAE rate 2.92 percent, about one MAE for every 33 prescribed doses.
Nine months after introduction of health care assistant observers:
• MAE rate 0.85 percent or approximately one MAE for every 116 administered doses of medication.
Statistically significant decrease in the overall MAE frequency between pre- and post-change audit periods in errors of omission and wrong time. Many of the remaining errors were associated with topically applied creams and lotions. |

Appendix 8: Improving monitoring to reduce the risk of developing metabolic syndrome in adults

Author and publication year	Study population	Study type	Interventions or improvement strategies	Results
1. Peh 2008.[158]	Outpatient clinic at a general hospital psychiatric unit. (Singapore)	Clinical practice QI programme following IHI methodology.	Multidisciplinary team of psychiatrists, medical officer, nurses and pharmacist initially spoke with consumers, their relatives and internal customers (doctors, nurses, pharmacist, laboratory and reception staff). Process mapping was done, and a fishbone diagram created. A Pareto chart of likely causes for no monitoring was drawn up. PDSA cycles were used to rectify the likeliest reasons and identify further improvements. Initial interventions: • weighing scales, measuring tape and height and BMI charts were made available in each consulting room • a monitoring protocol was created • doctors briefed on monitoring required • pharmacy checked that monitoring was done before dispensing. Later interventions: • a list of consumers on atypical antipsychotics (pharmacy generated) was made available • factsheet for consumers and doctors	Baseline audit of 20 consumers: • 10 percent BMI, no waist circumference • 35 percent BP • 25 percent fasting blood glucose and fasting lipid profile. Run charts showed a steady increase in monitoring over three months. End of project audit of 50 consumers: • nearly 100 percent BMI, 90 percent waist circumference • nearly 100 percent BP • nearly 100 percent fasting glucose and lipid profile.

			• referral form for nurses to carry out monitoring if doctors had time constraint • monitoring compliance by pharmacy did not work so case note review was used instead.	
2. Hallett and Hewison 2012.[159]	Medium-secure mental health unit. (UK)	QI PDSA cycle with audit.	Unit developed a care package to monitor and maintain physical health: • healthy lifestyle coordinator role • designated nurses on each ward as physical health leads • regular meetings with stakeholders to raise awareness and report progress. Auditing done on individual wards but not across unit; designed an audit form to use across the whole unit. Objectives of the project: 1. track current levels of physical health monitoring undertaken by nurses 2. raise awareness of the monitoring procedures 3. provide data to inform action to improve completion rates for monitoring if necessary 4. use the PDSA cycle. Plan: • introduced form at team meeting and emailed the form to all physical health leads a month before the audit. Do: • did the audit.	Baseline audit: • only one of seven wards had 100 percent compliance with monitoring. The greatest variation (from 0 to 100 percent) between wards was for nutritional status assessment. Repeat audit, three months later: • overall compliance rate increased by 42 percent • some forms completed on every ward • there were some discrepancies between results for baseline and repeat audits because of changing the forms so that different answers were recorded, for example how refusal was documented.

			Study:	
			• analysed the results of the audit.	
			Act:	
			• simplified monitoring form	
			• communicated about the completion of the forms	
			• made available the package of the forms and completion notes	
			• ordered scales for every ward	
			• designed transfer checklist so observation chart (temperature, blood pressure and pulse) would go with the consumer if they transferred wards	
			• clinical lead for physical observation spoke with each physical health lead to make sure they knew how to complete the forms	
			• introduced the audit topic at the monthly team meetings to foster ownership and give staff a chance to input.	

| 3. Modi and Ledingham 2013.[26] | Primary and secondary care. (UK) | QI using PDSA and before-and-after clinical record audit. Initial audit in primary care identified a group of chronic non-attendees and that GPs did not fully understand who was responsible for the testing. | Baseline results discussed with practitioners and psychiatrists: identified three factors: 1. consumer – for example, non-attendance 2. health professional – multiple guidelines and inadequate knowledge 3. system factors – whose responsibility is monitoring, inadequate communication of results between services. PDSA 1: • producing an alert-box system on the electronic notes as a reminder • letters to consumers requesting an appointment for a cardiovascular health check • encouraging community mental health team to perform cardiovascular health checks, train to perform venepuncture, and communicate results to GPs. Inpatients Discussions with psychiatrists and junior doctors to identify the day that testing was most likely to happen and why it might not happen, ie, admission day most likely but consumer can be acutely unwell. PDSA 2: • ward doctors to generate a column on the consumer list to record indicators of cardiovascular health and highlight outstanding results • add another box on the discharge form containing the cardiovascular indicators to prompt sending results to primary care. | **Baseline audit** Primary care rural, n = 28: 1. 25 percent serum total cholesterol measured 2. 46 percent BMI measured. Primary care urban, n = 38: 1. cholesterol, not measured 2. 56.2 percent BMI measured. Secondary care, n = 28: 1. 42 percent cholesterol level 2. none for BMI 3. BP, 84 percent 4. alcohol history taken, 84 percent 5. blood glucose or HbA1c, 40 percent. **Re-audit** 15 months after the baseline audit. Primary care rural, n = 67: 1. 54 percent serum total cholesterol 2. 45 percent BMI. Primary care urban, n = 37: 1. cholesterol, not measured 2. 73 percent BMI. Secondary care: No re-audit. |

| 4. Barnes et al 2015. [27] | NHS mental health trusts, adult, assertive outreach, community psychiatric services. (UK) | Six-year annual audit-based QI programme involving 21 trusts (1,966 consumers) in 2006 and 32 trusts (1,591 consumers) in 2012.

Outcome variables:

• no evidence of metabolic screening in the past year
• some evidence of metabolic screening.

Documentation of test results for all four aspects of metabolic screening. | Questionnaire sent to all participating trusts in 2006 asking them to identify the potential barriers to and facilitating factors for screening. The feedback was used to generate the change interventions:

1. customised reports generated after each audit, sent to each trust with benchmarking between clinical teams in a trust and against other trusts
2. poster available to all participating trusts indicating: the normal range for test results; the borderline high results that would warrant lifestyle advice and/or additional monitoring; and threshold levels of elevated results that should prompt referral for review by a GP or medical team
3. a lifestyle management pack developed with resources for staff and consumers relating to aspects of physical health, such as diet, exercise, stopping smoking. In addition, consumers had a physical health check reminder card.

Many of the participating trusts also had undertaken local action plans. | An audit in 2004 identified that just over 1 in 10 consumers had all four aspects completed and documented in the clinical record.

In 2012 just over 1 in 3 consumers had all four aspects documented in the clinical record.

Great variability between trusts: some had 70 percent of consumers with all four aspects documented while others had 0 percent.

Confounding factors may have been:

• 'pay for performance' scheme under commissioning for quality and innovation framework
• GPs incentivised since 2004 under the Quality Outcomes Framework to offer annual physical health care monitoring for people with severe mental illness (finished in 2014).

Barriers identified were:

• lack of basic equipment, for example, tape measure, scales
• lack of confidence about what to do if a consumer had abnormal results
• uncertainty about whose responsibility screening was, such as who in the psychiatric team or someone in the primary care team. |

| 5. Pettipher and Ovens 2015.[160] | Inpatient acute mental health service. (UK) | Collaborative project with a before-and-after audit against six standards with expected compliance rates (100 percent unless consumer refuses). | Junior doctor focus group agreed that a psychiatric inpatient physical health assessment sheet (PIPHAS) would be useful.

• PDSA 1: Working with colleagues about PIPHAS content and usability. Poor feedback rates but sensible suggestions for change. Form content changed and restructured.
• PDSA 2: Tried on five of the next inpatient admissions (not added to medical record and anonymous). Identified it took a long time to complete. Changed form by adding tick boxes.
• PDSA 3: Form added to trusts' 'new admission pack' for consumers, making access easier than printing one for each admission. | Baseline audit, n = 111:
1. 78 of 111 (70.3 percent) had physical examination on admission, with another 7 having examination within 48 hours
2. 26 of 111 (23.4 percent) had no physical examination.

Not all aspects of the examination were completed, eg, 32 of 85 had BMI recorded in full.

Post intervention audit, n = 100:
1. 28 of 100 had completed PIPHAS forms, so physical examination on admission
2. 47 of 72 without PIPHAS form had a physical examination on admission.

Physical examinations not complete in both sets. PIPHAS form increased the percentage of consumers who had the different components completed, eg, the BMI was recorded in 71.4 percent using PIPHAS but only 38.9 percent in non-PIPHAS. |

6. Akyuz et al 2016.[29]	NHS mental health trust, adult assertive outreach service (most deprived borough in UK). (UK)	QI with PDSA cycles. Aims: 1. improve the physical health monitoring of consumers to 80 percent by May 2015 (six months from start) 2. offer or support consumers to have the health monitoring measures at least annually to 100 percent.	• PDSA 1: Weekly team meetings to discuss and record bloods and ECG done on any consumer. • PDSA 2: Presented data on physical health monitoring every four weeks at team meeting. • PDSA 3: Allocated consumers to support workers and care coordinators, who took them to hospital for ECG and blood tests. • PDSA 4: Booking joint GP review for consumers with complex physical health needs to increase collaboration. • PDSA 5: Care coordinator to pick up on any missing tests pre-review. • PDSA 6: Consumers able to measure their own height, weight and BP using physical health monitoring pod machines. • PDSA 7: Group results on spreadsheet by chosen care coordinator.	After PDSA cycles 1–4, about 50 percent improvement in all categories. Aims: 1. by June 2015, reached aim of 80 percent for weight, BP and blood tests. ECGs only reached 77 percent but increased from baseline of 39 percent 2. by July 2015, 100 percent of consumers were offered health monitoring. Other benefits identified: • allowed identification of consumers at particular risk; for example, smokers, overweight or obese, diabetics who needed targeted interventions • the consumers liked the pod.
7. Kioko et al 2016.[161]	Adult consumers on second-generation antipsychotic medication in an outpatient mental health facility. (USA)	Before-and-after intervention audit.	Intervention: Education on and implementation of a metabolic monitoring and screening tool based on the State of Missouri Department of Mental Health's Tool.[162]	Baseline audit (50 randomly selected charts): • laboratory tests: not ordered 34 of 50, not done 5 of 50, done 11 of 50 • vital signs: not done 12 of 50, done 38 of 50. Post-intervention audit (50 randomly selected charts): • laboratory tests: not ordered 6 of 50, not done 13 of 50, done 31 of 50 • vital signs: not done 9 of 50, done 41 of 50.

8. Abdallah et al 2016.[163]	Adult consumers under a community mental health team resident in care homes. Exclusions: consumers receiving clozapine and those receiving long-acting antipsychotics in the outpatient clinic. (UK)	QI with PDSA cycles. Aims: 1. increase response rate from GPs on questions about physical health monitoring and current status to 89–90 percent pre-review meeting (health professionals with carers and consumers) 2. ensure monitoring is 100 percent adherent to local and national guidelines 3. engage 25 percent of care homes in physical health monitoring by January 2015.	Original improvement strategies identified by team: • reviewing GP letter format to make it clear what information was needed and make it easier to respond • using review meetings and new letter format as reminders about physical health monitoring • consumer and health professional education • basic monitoring of blood pressure, pulse and weight could be done in care homes. PDSA 1: • change format of GP letter (this also goes to the consumer) and ask for feedback on letter format • ask care homes to do physical health monitoring. PDSA 2: • follow-up letter to GP with call to confirm receipt • ask more care homes to do physical health monitoring. PDSA 3: • attach NICE and Maudsley guidelines to the GP letter. PDSA 4: • engage consumers in monitoring own health at consumer forum in one care home • ask more care homes to do physical health monitoring.	Performance against aims: 1. GP letter response rate, 67.7 percent 2. percentage of people tested as listed below (baseline results in brackets). Blood work up: • FBC, 100 percent after cycle 1 (from 50 percent) • urea and electrolytes, 100 percent after cycle 1 (from 47 percent) • fasting blood glucose, 100 percent after PDSA 1 (from 42 percent) • LFTs, 100 percent after PDSA 2 (from 34 percent) • HbA1c, 100 percent after PDSA 2 (from 19 percent) • blood lipid levels, 75 percent after cycle 3 but dropped to 67 percent by PDSA 5 (from 25 percent) • prolactin level, 56 percent on PDSA 5 (from 4 percent). Physical health • BP, 68 percent (from 10 percent) • weight, 68 percent (from 0 percent). • Pulse 55 percent (from 0 percent). 3. Five of eight care homes measuring BP, pulse and weight.

			PDSA 5:	
			• engage consumers in the need for physical health monitoring whenever meeting with them individually.	
9. Greenwood and Shiers 2016.[28]	Five community-based early intervention for psychosis services in northwest England. (UK)	QI work after initial audit against standards developed by participating teams (based on Lester Positive Cardiometabolic Health Resource*). Regional learning events were held and each team had regular site visits by the central team (AQuA). Each trust: 1. developed a project charter and driver diagram 2. had six months to implement small changes 3. learnt from qualitative findings. As a result, a shared aim and shared interventions across the trusts were put in place.	Individual trust initial interventions unknown. Shared aim: 50 percent improvement in comprehensive cardiometabolic screening in six months. Interventions: 1. appointed group of five young consumers (one for each site) to be peer support people for young consumers. This group met as a team regularly to share experience 2. data entry for re-audit to be exclusively electronic.	500 service users. Baseline audit: 10 percent (on average) consumers had a comprehensive cardiometabolic screening. Re-audit: after six months, risen to 60–80 percent. Learning: • it took repetition of the processes, eg, implementing small changes, before teams were confident and competent • teams started with no appreciation of the value of consumers or carers in their work but ultimately appointed the peer support team • the universal issue for trusts was whose responsibility was testing – primary care or mental health • accessing results in both sectors was problematic and secondary not linked to primary system • if secondary care system did not recognise physical health monitoring, there was no coding system to flag they were required • the quality and clarity of letters from mental health team to GPs needed improvement

				• links to both health promotion and smoking cessation teams were generally weak or non-existent.
10. Plever et al 2016.[165]	16 adult, community mental health service organisations. (Australia)	Collaborative to improve the physical health in people with schizophrenia, with topic and clinical indicator chosen at a mental health clinical collaborative Queensland forum. Clinical indicator: number of open service episodes of adult consumers with a diagnosis of schizophrenia spectrum disorder with a physical health assessment recorded out of the total number of open service episodes of adult consumers with a diagnosis of schizophrenia spectrum disorder in a six-month period.	Measurement was done in six-monthly periods; first six months was baseline. Four state-wide forums with invited senior clinical staff: the goals and aims were established collaboratively. Data was collected from the Queensland Health information system. A metabolic monitoring form (MMF) or community physical or metabolic assessment (POS) had to be entered into the system for data to be counted. All service organisations received reports detailing number of MMFs or POSs completed as well as completion rates of individual fields on the MMF. Reports allow clinicians to review their own performance at both service and team levels.	Baseline January 2012: average 12 percent (range 2.7–30.5). Final six months December 2014: average 58 percent (range 33.2–72.1). Targets were set for each six-month period; started at 30 percent for first four periods and then increased to 45 percent and finally 55 percent. One in 16 met the target in the first six months but 12 in 16 met the target in the last six months. In all 16 service organisations, the proportion of physical health assessments has risen significantly with time (*p* value <0.05).

* Lester H, Shiers DE, Rafi I, et al. 2012. *Positive Cardiometabolic Health Resource: An intervention framework for patients with psychosis on antipsychotic medication*. London: Royal College of Psychiatrists. Now been updated and adopted by NHS England and Public Health England (Lester resource 2014 update).[164]

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