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RESEARCH ARTICLE

"LET'S GET PHYSICAL" – ESTABLISHMENT OF A REGIONAL METABOLIC MONITORING CLINIC'S IMPACT ON SCREENING

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ABSTRACT

Objective: The Royal Australian and New Zealand College of Psychiatrist (RANZCP) Clinical Practice Guideline for Schizophrenia and Related Disorders highlights the importance of regular monitoring of physical health in those with psychotic illnesses. This audit is a retrospective review of current practice at a regional community mental health team* with regards to identifying patients on anti-psychotic medications and monitoring those at risk of metabolic syndrome in comparison to the standards set by the RANZCP Guidelines for metabolic monitoring. It considers whether implementation of a dedicated metabolic monitoring clinic could improve monitoring in a regional psychiatric outpatient clinic. **Settings:** This audit was based on data collected from a single community mental health team which covers low socioeconomic suburban areas as well as a small aboriginal community. Patients seen in the outpatient clinic on anti-psychotic medications had a range of diagnoses including psychotic depression, chronic schizophrenia, and schizoaffective disorder.
Subjects and Methods: Patients from a single regional adult community mental health clinic ranging in age from 18-70 years old and on anti-psychotic medications were included in the study. A pre-intervention audit of monitoring of metabolic syndrome was performed on all such patients. A dedicated metabolic monitoring clinic was set up, including targeted improvement strategies to make monitoring more accessible in a clinic-based setting and post-intervention audit was then undertaken at 6-monthly intervals. **Results:** Implementing a metabolic monitoring clinic 3 days a week was associated with a significant improvement of 33% in rates of metabolic monitoring. **Conclusion:** The metabolic monitoring clinic led to improved screening and monitoring of metabolic syndrome in patients on psychotropic medications but standards remained lower than recommended. Ongoing psycho-education and incorporation throughout the service would likely facilitate extrapolation of these results over time. Further research into focussed strategies is required to improving monitoring to guideline concordant rates.

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INTRODUCTION

Antipsychotics are commonly prescribed for patients with schizophrenia and a wide spectrum of mental illnesses, leading to weight gain and metabolic dysfunction, as demonstrated in the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) study. Metabolic monitoring is becoming increasingly important in clinical practice since the consequences of anti-psychotic medications contribute to morbidity as well as quality of life years (Swartz *et al*., 2016). The metabolic risk associated with anti-psychotic medications is underlined by research comparing patients with schizophrenia who were antipsychotic naïve with control patients prescribed antipsychotics for extended periods. This research showed that there is no elevation in metabolic syndrome within the naïve cohort, suggesting an association with antipsychotic medications (Fleischhacker *et al*., 2013).

The International Diabetic Federation (IDF) defines metabolic syndrome as

A) Central Obesity → Waist Circumference [Men>94cm, Women>80cm]

AND two of the following

B) Raised Triglycerides >1.7mmol/L

Reduced High Density Lipoprotein [HDL] [Men<1.03/L Women<1.29mmol/L]

Raised Blood Pressure [SBP>130/DBP>85mmHg]

Raised Fasting Plasma Glucose [>5.6mmol/L or diagnosed Type 2 Diabetes].

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According to the literature, the prevalence of metabolic syndrome in adults with schizophrenia ranges between 20-60% (Happell *et al*., 2013). Dyslipidaemia, hypertension, obesity and type 2 diabetes are noted to be twice as prevalent in Schizophrenia than in the normal healthy population (Waterreus and Laugharne, 2009). Patients with schizophrenia have, on average, 3 times more intra-abdominal fat compared to controls matched with age, gender and lifestyle. The majority of commonly used antipsychotics add to this problem, increasing cardiovascular risk and resulting in cardiovascular being the most common cause of natural mortality in schizophrenia, accountable for 1 in 3 deaths, only superseded by suicide (Waterreus and Laugharne, 2009; Laursen *et al*., 2014). Patients with a mental health diagnosis have been shown to be at increased risk of early mortality due to poor physical health and comorbidities. Research suggests that patients with schizophrenia and bipolar affective disorder are already predisposed to metabolic abnormalities such as insulin resistance. These patients had higher levels of plasma glucose and hepatic insulin resistance than age and sex-matched controls, suggesting a direct link between hepatic insulin resistance and schizophrenia (Mitchell *et al*., 2013). Insulin resistance increases risk of cardiovascular disease, and leads to increased lipolysis, causing the release of excess free fatty acids (FFA) that are then formed by the liver into triglycerides (TG). The addition of antipsychotic medications increases that risk in previously neuroleptic naïve patients with schizophrenia. Psychotropic medications increase the risk of metabolic syndrome and this is further elevated in patients on multiple medications due to their individual side effect profiles. Studies of psychiatric units within Australia indicate high rates of metabolic syndrome of up to 69% (Waterreus and Laugharne, 2009). Despite widespread acknowledgement that early detection, lifestyle intervention and treatment may reduce this risk, monitoring of physical health in mental health services is inadequate (Plever *et al*., 2016). Systematic reviews have shown that despite the acknowledged high risk of cardiometabolic complications in patients with serious mental illness and the presence of recommendations it is an area where adequate standards are not always achieved (Mitchell *et al*., 2012). An Australian survey of psychiatric practice in 2016 showed that while 80% of responding practitioners stated that metabolic monitoring was important, less than 50% routinely checked fasting glucose or lipids in patients on antipsychotics (Laugharne *et al*., 2016). Reasons for lack of metabolic screening include time constraints especially given the number of patient to practitioner ratio, limited access to resources and lack of identified roles of each practitioner in relation to metabolic monitoring. However even in regions where there is awareness of the importance of metabolic monitoring and regular screening is performed, monitoring is not sufficient alone and must lead to appropriate interventions. The indication for this audit is that psychotropic medications are prescribed as part of daily practice in mental health services however the physical effects of being on long-term medications are not always monitored according to the RANZCP's recommended standard (Galletly *et al*., 2016). The standard was that metabolic monitoring should be completed at a minimum of 6-monthly intervals for all patients on psychotropic medications. The Maudsley Prescribing Guidelines, similar to the RANZCP guidelines, propose measuring fasting lipids, waist circumference and body mass index (BMI) at baseline, 3 months and then yearly, and plasma glucose being measured at baseline, 6 months and then yearly in this high-risk cohort (Taylor *et al*., 2001). Blood pressure needs to be constantly monitored during dose titration of psychotropic medications.

Aims

- Measure the current monitoring of metabolic syndrome in patients prescribed psychotropic medications
- Compare current clinical monitoring with the RANZCP guidelines
- Measure the impact of a dedicated metabolic monitoring clinic within a mental health community outpatient regional clinic by comparing observed frequency pre- and post-initiation to evaluate the outcome of quality improvement changes

Null hypothesis: There is no difference in observed frequency of metabolic monitoring screening pre- and post- initiation of the metabolic monitoring clinic within a regional community mental health clinic

Ethics Approval: Ethics approval was received by the local Regional Mental Health Research Committee.

MATERIALS AND METHODS

This study was a single-centre, retrospective clinical audit of 134 adults with a mental health diagnosis on antipsychotic medications at a community mental health clinic. The catchment area encompasses a culturally diverse population including those of Aboriginal and Torres Strait Islander (ATSI) backgrounds which makes up 10% of the patient population. The clinic receives patient referrals from the Acute Care Team (ACT) or inpatient unit who are then assigned a case manager from the multidisciplinary community team which encompasses nurses, social workers, occupational therapists and psychologists in addition to having 3-monthly reviews by a psychiatrist. The aim of the audit was to measure the effect of establishing a mental health nurse-led metabolic monitoring clinic with a six-month audit cycle over a period of 3 cycles. All audit data, both before and after the clinic was established, was entered into a pre-defined excel spreadsheet. Items were audited according to whether each parameter from the IDF definition had been measured in the 6-month period as derived from the standardised guideline. The initial audit was performed between 1st March 2016 and 1st September 2016 whereby all records of the patients under the care of the community team during that period were reviewed alongside the metabolic monitoring spreadsheet. Data on metabolic monitoring/screening in the preceding 6 months was extracted from each file. An MDT discussion was held to analyse barriers to performing monitoring within the clinic and this was used to then implement targeted improvement strategies. It was identified that there was a lack of awareness of the associated risk of metabolic syndrome in patients on antipsychotic medications as well as inaccessibility of equipment in order to measure necessary parameters. Changes included provision of appropriate monitoring equipment, interactive educational events, reminders and prompts, and embedding processes for monitoring within the team structure in order to improve the number of active interventions offered to patients by clinicians. The intervention was developed based on the RANZCP guidelines and the Australian consensus statement(12). A clinical nurse 'metabolic champion' from the multidisciplinary team was trained for the purpose of running the metabolic monitoring clinic for three days a week to

coincide with medical reviews. The 'metabolic champion' was responsible for overseeing that metabolic screening of the following parameters were completed every 6 months

Physical monitoring: Height, weight, BMI, waist circumference, blood pressure.

Metabolic bloods: fasting glucose, fasting lipid profile.

The dates of the most recent metabolic measurements and bloods were entered into the specifically designed spreadsheet [Table 1]. A month before patients were due for metabolic screening, case managers were reminded to provide a pathology form to the patient along with a clinic appointment and the 'metabolic champion' would follow this up if not completed. The same monitoring equipment was utilised throughout the audit with standardised procedures for measurements of waist circumference, which was measured horizontally at the midpoint between iliac crest and lower rib border, and blood pressure was measured after the patient had been seated for a 10-minute period. Blood tests were performed at local phlebotomy clinics and results were entered by the 'metabolic champion' into each patient's mental health record. If bloods or physical measurements were outside normal parameters, the psychiatrist and GP were notified. Results were discussed with the patient during a medical review and if medication to address metabolic syndrome was required, the GP was informed. Metabolic monitoring status also became a criterion of the weekly case review meetings where each patient would be discussed every 12 weeks to highlight any issues or identify any barriers to monitoring. A PowerPoint presentation was created based on the pre-intervention data. Guidelines were then distributed to all members of the MDT via teaching sessions facilitated by the doctors as a means of reinforcing the long-term consequences of metabolic syndrome, pathophysiology of the disease and the biological and lifestyle changes as recommended in the guidelines. This information was also sent out to all GPs in the local area as well as the indigenous community hospital. All patients referred to the community team during the pre- and post-intervention time frame were audited. After the intervention was initiated in September 2016, a further 2 audits were conducted post-intervention between 2nd September 2016 to 1st March 2017, and 2nd March 2017 to 1st September 2017 with the same format repeated at each audit point. Metabolic monitoring was defined as 'completed' during the audit period when all recommended monitoring parameters defined by IDF were measured within the 6-month period as per RANZCP guidelines (Galletly *et al*., 2016). This outcome measure applied to all patients of the community clinic on psychotropic medications. Comparison of completed metabolic screening was performed amongst patients on clozapine and those on other psychotropic medications but this data was only available from post intervention audit.

RESULTS

Within the community mental health clinic all 134 patients were included in the pre-intervention audit as all patients were on psychotropic medications. The most common diagnoses were schizophrenia (40%), schizoaffective disorder (16%) and bipolar affective disorder (12%). During the subsequent post-intervention audits, 117 patients between the age group 24-70 years old were under the care of the community mental health team. Some patients were new referrals and some of the patients included in the pre-intervention audit had been discharged to GP care. There was no difference in the mean age or gender distribution between pre- and post-intervention.

At all three audit points there was not complete concordance with the guideline-set standard. Based on the defined audit criteria 33.8% of patients had metabolic monitoring completed in the preceding 6 months at pre-intervention. In the subsequent year post intervention there was improvement in frequency of patients with completed metabolic monitoring to 71.1% in the first 6 months and 77.2% at 1 year as per Figure 1. Comparison was made between pre- and post-intervention at 2 time points, initially when the metabolic monitoring clinic was initiated and then 1 year after. The main outcome measure was whether there was guideline-concordant monitoring of metabolic syndrome. The data was analysed using Pearson's chi-squared test with SPSS v24 (SPSS, Chicago, IL, USA) to test the difference between rates of metabolic monitoring completed pre- and post-intervention and the rates expected if the null hypothesis of no difference was true. Statistical analysis using the chi-squared test of independence showed there was a significant improvement to 66.7% (n=78) in metabolic screening every 6 months compared to pre-intervention 33.8% (n=45) [Chi squared = 27.4, $p<0.05$, df=1] [Table 2]. Cramer V value of 0.33 suggested a strong association between the intervention and improvement in metabolic monitoring. Table 2 demonstrates that the post-intervention rate of concordance with metabolic monitoring guidelines (78) was significantly greater than expected (57.3), whereas pre-intervention, there was less concordance with guidelines (45) than expected (65.7). This is confirmed by an odds ratio of 3.96 suggesting individuals were relatively more likely to have their metabolic monitoring completed in the audit period after the metabolic monitoring clinic was established. Other outcomes reviewed included the rates of measurement of the individual indices of metabolic monitoring in the post-intervention period to see where improvements were required to achieve 100% concordance. For the purpose of this audit, the indices were grouped as physical measurements and bloods with all parameters from the IDF definition were addressed. Data was separated based on whether patients were on clozapine as they are reviewed more frequently in a monthly clinic, and whether patients were ATSI as shown in table 3. Of the metabolic bloods which were not complete, 41% of the patients did not want blood tests, however clinicians failed to request any blood tests in 31% of patients and incorrect blood tests were requested for 28% of patients. Similarly, 6% of the patients with incomplete physical measurements was due to the patients declining because of not wanting to be weighed with the remaining 94% due to clinicians failing to complete monitoring.

DISCUSSION

After implementation of a dedicated metabolic monitoring clinic to ensure patients within the community mental health service had physical measurements and metabolic bloods done every 6 months in concordance with the standard set by guidelines, there was a significant improvement in the overall screening of metabolic parameters (Galletly *et al*., 2016). There was also noted to be concordance in metabolic monitoring amongst clozapine patients. Although this was a small sample, the high rates could be due to the requirement of clozapine patients to attend monthly clinics as opposed to 3-6 monthly for other patients, increasing the opportunities for

Table 1. Example of spreadsheet used by the Metabolic Champion for overseeing and documenting metabolic screening status of patients within the community clinic

Demographics	Sex	Indigenous status	GP	MHA status	Mental Health Diagnosis	Medical co-morbidities	Smoker Y/N	Medication	BMI	Waist circumference	BP	Date completed + next due	Metabolic Bloods	Date completed + next due	Normal/Abnormal results	Informed Doctor (Y/N)	GP notified (Y/N)

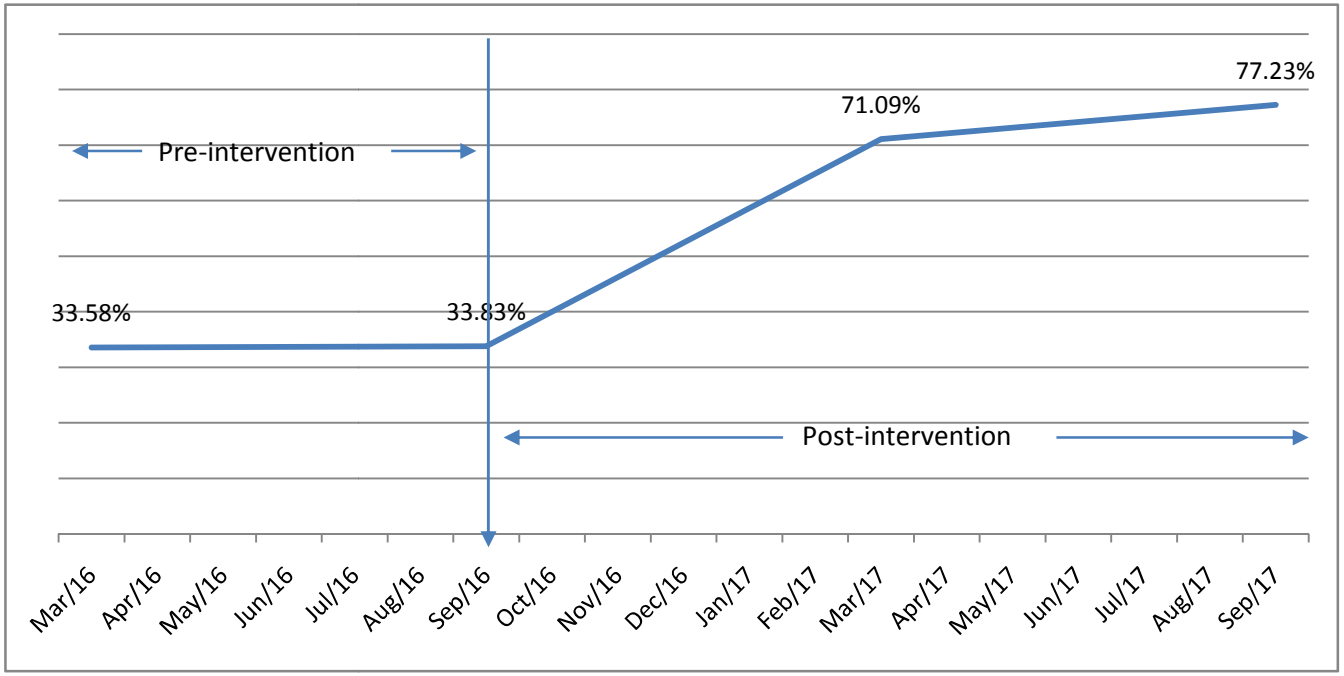

Figure 1. Graph showing percentage of patients with guideline concordant metabolic monitoring pre- and post-intervention

Table 2. Contingency 2x2 table showing proportion of patients with concordance to metabolic monitoring guidelines pre- and post-intervention with observed frequency, (expected cell frequency) and {chi-square cell value}

Concordance with Guidelines	Pre -Intervention	Post-Intervention
Yes	45 (65.7) {6.5}	78 (57.3) {7.45}
No	89 (68.3) {6.25}	39 (7.16) {7.16}

Table 3. Percentage of patients with completed individual metabolic monitoring parameters one-year post intervention

		Patients (n)	All indices measured (%)	Physical measurements (%)	Metabolic bloods (%)
All patients		117	67	86	73
Clozapine	Yes	13	100	100	100
	No	104	63	85	69
ATSI	Yes	33	73	97	76
	No	84	64	67	58

clinicians to address metabolic monitoring. Mental health services have long been working to embed attention to physical health in routine practice as it has frequently fallen below standard (Sciences, 2018). Screening rates in the UK are suboptimal with only 11% patients on psychotropic medications having all parameters measured (Barnes *et al*., 2007). Baseline monitoring rates across 17 clinical services in 3 states of Australia showed that on average 12% had their metabolic monitoring measured (Stanton *et al*., 2016). This is supported by an Australian study which reported that around 60% of patients' files contained data on lipid and blood glucose levels and only 7% had their weight circumference recorded (Organ *et al*., 2010). This is in keeping with low adherence to monitoring in this regional service as indicated by pre-intervention rates of 33%. Systematic review of worldwide interventions to increase access to, or uptake of, physical health screening demonstrated that specialised tools and health delivery changes all led to improved uptake of screening, however behaviour-change intervention is still required to reduce identified barriers from patients and clinicians (Lamontagne-Godwin *et al*., 2018). Emphasis is required to monitor patients for cardiovascular risk factors and improve lifestyle factors. Ultimately no psychotropic medications are weight neutral, despite some having better side effect profiles. Cumulative long-term effect of poor health behaviours and long-term exposure to antipsychotic drugs places a patient with longer illness duration at greater risk of cardio-metabolic disorders (Mitchell *et al*., 2012). Therefore, more emphasis should be placed on regular medication review, rationalisation of any polypharmacy, aiming for individualised structured nutritional and exercise interventions. The UK have employed an intervention strategy by deriving a structured collection tool which achieved 100% compliance of metabolic monitoring, albeit only at baseline, 3 months and annually. This was in an inpatient rehabilitation facility where patients were more likely to engage (Senthil, ?). A similar audit was completed in Australia where 2 months of each year were designated for completion of metabolic monitoring although this cohort of patients were limited to those on clozapine.

Results of the intervention led to improved screening rates of 53.6% which is lower than the results from this audit (Wilson *et al*., 2014). In the UK, 6 audits were conducted over a 6-year period with the change intervention being a poster in all participating trusts that indicated the abnormal ranges of the 4 components of metabolic syndrome. This intervention improved rates from 10% to 33% (Barnes *et al*., 2007). Although rates improved in this audit, there is still potential to further improve monitoring in patients. Perhaps a more assertive approach, as adopted by an Australian homeless community team, is required whereby enhanced phlebotomy access and mobile metabolic monitoring packs enabled the target of >90% monitoring to be achieved (Sciences, 2018). Limitations to this audit are that this was a naturalistic observation study into whether the effects of a focussed intervention would change the current practice. This audit was not randomised and therefore changes in practice could be secondary to time and increased awareness in the population from outside the service. Within the year after the metabolic monitoring clinic was initiated there were two changeovers of the 'metabolic champion' which resulted in slight variations in practice amongst the different clinicians due to some not being involved in training and psychoeducation provided in the pre-intervention audit period. There were also changes in the psychiatric registrar in the clinic during the audit period due to training rotations and these clinicians varied in their stage of progression which could account for variation in practice. The post-intervention audit also involved a smaller group of 117 patients compared to the 134 patients at pre-intervention, leading to the use of the chi-square statistic which does not require equality of variances. Although there was a significant improvement in the rate of monitoring after establishing the clinic, current practice is still not fully concordant with guidelines. Therefore, as well as starting metabolic clinics in other community clinics amongst the service, further interventions are still required to improve the level of monitoring. Continued audit and feedback are required to assess that rates of monitoring continue to improve. Although MDT members are able to access individual patients' metabolic monitoring data on the electronic database, access to the audit spreadsheet could act as a prompt for clinicians to complete necessary monitoring for their patients thus making everyone accountable.

Even in circumstances where screening is completed, studies across Queensland mental health services suggest that follow-up for identified risks is often absent therefore the onus should be on the treating clinician who is prescribing the medication to be initiating actions for risks identified (Plever *et al*., 2016). Barriers like limited staffing and time restraints make it hard for clinicians to be able to educate patients on lifestyle interventions to address metabolic disturbance or to advise those identified as high-risk. Following on from this audit, a dietician has been employed within the service to educate patients started on psychotropic medication on reducing the risk of metabolic syndrome via a healthy eating day program me called 'Live Life Well'. In addition to this, patients are now able to self-refer to the 'Healthy Bodies Healthy Minds' initiative run by Police-Citizens Youth Clubs **(**PCYC**)** Queensland which is an 8-week exercise and healthy eating

program supervised by a personal trainer. Measurements of psychological wellbeing and metabolic health are monitored throughout the course of the program. Further research could investigate whether having a GP on site as well as a phlebotomist would engage patients in completing metabolic monitoring. This would also enable better communication between specialties and ease the transition once the patient is discharged from case management. However, since patients often fear stigmatisation from their mental health diagnosis research would be required to review feasibility of this option as well as the financial implications.

Conclusion

Implementing a clinic dedicated to metabolic monitoring significantly improved routine screening within a regional mental health community clinic for patients on anti-psychotic medications. Although further improvement is required to achieve the standards recommended by the RANZCP guidelines, this strategy could be adopted in similar regional areas to improve local service provision. This audit highlights the need for a systematic approach to assessment and management of physical health in patients with mental health diagnosis as improved physical/laboratory monitoring can increase number of patients with undiagnosed and untreated metabolic syndrome.

Declaration of Interest: The authors have no conflict of interest to disclose related to this manuscript.

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