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Screening for metabolic syndrome in long-term psychiatric illness: Audit of patients receiving depot antipsychotic medication at a psychiatry clinic

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ABSTRACT – *Background and Objectives:* Metabolic syndrome (visceral obesity, dyslipidaemia, hyperglycaemia, hypertension) is a substantial public health problem, especially amongst individuals receiving antipsychotic medication.

Methods: We studied routine screening practices for metabolic syndrome amongst psychiatry outpatients receiving injected depot anti-psychotic medication at a clinic in Dublin, Ireland.

Results: Our initial audit (n = 64) demonstrated variable levels of documentation of criteria for metabolic syndrome in outpatient files; e.g. weight was recorded in 1.6% of files, serum high density lipoprotein in 12.5%. As our intervention, we introduced a screening check-list comprising risk factors and criteria for metabolic syndrome, based on the definition of the International Diabetes Federation. Re-audit (n = 54) demonstrated significantly improved levels of documentation; e.g. weight was recorded in 61.1% of files. Notwithstanding these improvements, only 11 (20.4%) of 54 patient files examined in the re-audit, contained sufficient information to determine whether or not the patient fulfilled criteria for metabolic syndrome; of these, 3 patients (27.3%) fulfilled criteria for metabolic syndrome. There was, however, significant additional morbidity in relation to individual criteria (waist circumference, serum triglyceride level, systolic blood pressure and serum fasting glucose).

Conclusions: We recommend enhanced attention be paid to metabolic morbidity in this patient group.

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Introduction

Metabolic syndrome comprises visceral obesity, dyslipidemia, hyperglycaemia and hypertension[1] (Table 1). Metabolic syndrome is one of the world's largest public health problems, with an estimated prevalence of 20%-25% in the general population[2-4]. It is associated with a three-fold increase in risk of myocardial infarction or cerebro-vascular accident, and two-fold increase in risk of dying from either[3,4].

Metabolic syndrome is especially prevalent amongst individuals with mental illness[2]. In the first instance, individuals with mental illness are significantly more likely to smoke cigarettes compared to the general population[5] and this increases risk of metabolic syndrome[6]. Individuals with mental illness are less likely to attend to their physical health, further increasing risk[7]. In addition, individuals receiving neuroleptic medications are at even greater risk of metabolic syndrome compared to individuals receiving no psychotropic medication (odds ratio

Table 1
The International Diabetes Federation (IDF) criteria for metabolic syndrome[3]

Criterion		Value
A	Central obesity	Body mass index (BMI) greater than 30 kilograms/metres^2 or waist circumference greater than or equal to 94 centimetres in males and 80 centimetres in females
B	Serum triglyceride level	Greater than or equal to 1.7 milimoles per litre
C	Serum high density lipoprotein	Less than 1.03 milimoles per litre in males, or less than 1.29 milimoles per litre in females
D	Systolic blood pressure	Greater than or equal to 130 millimetres of mercury or diastolic blood pressure greater than or equal to 85 millimetres of mercury
E	Fasting glucose	Greater than or equal to 5.6 milimoles per litre.

Notes: Adapted from the International Diabetes Federation criteria for metabolic syndrome[3].
In order to have a diagnosis of metabolic syndrome, the patient must fulfil criterion A and two of the other four criteria (B-E).

3.7, 95% confidence interval 1.7-7.9, p = 0.001)[8]. Overall, the prevalence of metabolic syndrome in schizophrenia is estimated as between 30% to 40%, although some suggest a prevalence as high as 63%[7].

An up-to-date overview of scientific and clinical aspects of the metabolic syndrome is provided by Byrne[9]; a detailed review of the relationship between metabolic syndrome and psychiatric illness by Mendelson[10]; and a focussed examination of metabolic effects of psychotropic drugs by Thakore and Leonard[11]. Much recent literature relating to metabolic syndrome has focussed on second generation oral antipsychotics, such as clozapine[12,13].

We performed a quality improvement project focussing on screening for metabolic syndrome amongst individuals receiving injected receiving depot antipsychotic medication at a general adult psychiatry outpatient clinic.

Methods

This study was a quality improvement project based at the Mater Misericordiae University Hospital Psychiatry Outpatient Clinic. This clinic provides psychiatric services to all adults residing in a geographically-defined inner-city catchment area; this catchment area is the most socio-economically disadvantaged in Ireland, with over 50% of its population in the most deprived socio-economic category[14,15].

The inclusion criteria were that the patient was (1) attending the clinic; (2) aged 18 years or over; (3) receiving injected depot anti-psychotic medication; and (4) willing to participate. Exclusion criteria were that the patient was (1) aged under 18 years; and (2) unwilling to participate. The patient could be receiving other medication in addition to injected depot anti-psychotic medication (e.g. oral antipsychotic medication); this ensured we included *all* patients receiving injected depot anti-psychotic medication, with the aim of redressing the literature's focus on second generation antipsychotics (such as clozapine), rather than injected depot antipsychotic medication[12,13].

All patients fulfilling inclusion criteria (n = 64) were invited to participate and audit data were acquired for all; re-audit data were acquired for 54 (eight were no longer attending the clinic and two declined to participate in re-audit).

As this was a quality improvement project, verbal consent was obtained from each patient. This study was undertaken with respect for the right to privacy and in a manner consistent with the guidelines of the World Health Organization and Declaration of Helsinki.

The audit commenced on 1 March 2009; the intervention was performed over a three month period commencing on 1 April 2009; and re-audit was performed on 1 July 2009.

For the audit, the multi-disciplinary team at the clinic devised a single-page checklist for features of, and risk factors for, metabolic syndrome, based on the International Diabetes Federation definition[3] (Appendix 1). The checklist was created following a series of multi-disciplinary meetings involving all members of the outpatient team including psychiatrists, endocrinologists, trainee doctors, community mental health nurses, psychiatry social worker, occupational therapist and administrative staff.

We commenced the audit by examining clinical files of all patients (n = 64) who were receiving injected depot anti-psychotic medication at the clinic on 1 March 2009. We introduced this check-list into clinical practice at the clinic over a three month period. Nursing staff, psychiatrists and trainee doctors were responsible for filling out the checklist. As each patient received their injected depot antipsychotic medication, clinical and anthropometric data were recorded, and a phlebotomy appointment arranged at the local hospital within the following week. After three months, we performed re-audit, in which we sought to review the same 64 patient files.

Results

Sixty-four patients were included in the audit. Twenty-seven (42%) were female. Mean age was 54.4 years (range, 21-76; standard deviation [SD] 12.1). Fifty patients (78%) had schizophrenia; 10 (16%) bipolar disorder; and 4 (6%) other diagnoses (e.g. schizoaffective disorder).

Seventeen patients (27%) were on fluphenazine decanoate depot; 16 (25%) zuclopenthixol decanoate; 16 (25%) flupenthixol decanoate; 9 (14%) haloperidol decanoate; and 6 (9%) risperidone microspheres. Mean dose of depot anti-psychotic medication was 530.7 milligrams of chlorpromazine per day (SD 554.7).

Thirty-seven patients (57.8%) were also on oral anti-psychotic medication (Table 2). Amongst those on oral anti-psychotic medication, mean dose of oral anti-psychotic medication was 567.2 milligrams of chlorpromazine per day (SD 611.6). Total mean dose of anti-psychotic medication (depot and oral) amongst all patients (n = 64) was 858.6 milligrams of chlorpromazine per day (SD 807.2).

Documentation of risk factors for metabolic syndrome varied significantly between risk factors; while 56.2% of patient files documented alcohol use, only 20.3% documented family history of premature ischaemic heart disease ($p < 0.001$) (Table 3). Regarding metabolic syndrome, only 1.6% of patient files contained patient weight, and the most commonly documented criteria were serum triglyceride level (12.5%) and serum high-density lipoprotein (12.5%) (Table 4).

Table 2
Oral anti-psychotic medications in patients receiving depot antipsychotic medication at a general adult psychiatry outpatient clinic (audit and re-audit)

Name of oral anti-psychotic medication	Audit (n=64)		Re-audit (n=54)	
	n	%	n	%
None	27	42.2%	22	40.7%
Olanzapine	9	14.1%	9	16.7%
Haloperidol	7	10.9%	6	11.1%
Risperidone	6	9.4%	6	11.1%
Aripiprazole	3	4.7%	3	5.6%
Chlorpromazine	3	4.7%	2	3.7%
Haloperidol and risperidone	3	4.7%	2	3.7%
Quetiapine	2	3.1%	1	1.9%
Amisulpiride	1	1.6%	0	0%
Haloperidol and quetiapine	1	1.6%	1	1.9%
Risperidone and quetiapine	1	1.6%	1	1.9%
Sulpiride	1	1.6%	1	1.9%

Fifty-four patients were included in the re-audit. Eight were no longer attending and two declined to participate. At re-audit, 21 patients (39%) were female. Mean age was 54.6 years (range 21-76; SD 12.2). Forty-three patients (79%) had schizophrenia; 9 (17%) bipolar disorder; and 2 (4%) other diagnoses.

Fourteen patients (26%) were on fluphenazine decanoate depot; 12 (22%) zuclopenthixol decanoate; 15 (28%) flupenthixol decanoate; 8 (15%) haloperidol decanoate; and 5 (9%) risperidone microspheres. Mean dose of depot anti-psychotic medication was 587.3 milligrams of chlorpromazine per day (SD 529.7).

Table 3
Clinical documentation of risk factors for metabolic syndrome in patients receiving depot antipsychotic medication at a general adult psychiatry outpatient clinic (audit and re-audit)

Variable	Audit (n = 64)			Re-audit (n = 54)*		
	Not recorded (%)	Recorded		Not recorded (%)	Recorded	
		Condition present (%)	Condition absent (%)		Condition present (%)	Condition absent (%)
Diabetes	70.3	9.4	20.3	44.4	9.3	46.3
Dyslipidemia	75.0	10.9	14.1	51.9	18.5	29.6
Hypertension	79.7	3.1	17.2	48.1	11.1	40.7
Family history of premature ishcaemic heart disease	79.7	6.3	14.1	51.9	13.0	35.2
Smoking	64.1	31.3	4.7	37.0	42.6	20.4
Alcohol use	43.8	45.3	10.9	20.4	42.6	37.1

* We described and analysed data using the Statistical Package for the Social Sciences, Version 12.0 [SPSS Inc. Upper Saddle River, New Jersey]. We used McNemar's test to compare rates of documentation in audit and re-audit; rates of documentation had improved significantly for all risk factors for metabolic syndrome between audit and re-audit ($p \leq 0.001$).

Table 4
Documentation of criteria for metabolic syndrome in the files of patients receiving depot antipsychotic medication at a general adult psychiatry outpatient clinic (audit and re-audit)

Criterion	Audit		Re-audit*	
	Not recorded (%)	Mean value (standard deviation)	Not recorded (%)	Mean value (standard deviation)
Height (metres)	100%	–	59.3%	1.71 (0.10)
Weight (kilograms)	98.4%	59.0 (0)	38.9%	86.74 (15.05)
Waist circumference (centimetres)	98.4%	105.0 (0)	61.1%	101.70 (22.50)
Serum fasting glucose (millimoles per litre)	84.4%	6.74 (2.31)	72.2%	6.12 (2.08)
Serum triglyceride level	87.5%	2.12 millimoles per litre (1.53)	79.6%	1.94 millimoles per litre (1.39)
Serum high density lipoprotein (millimoles per litre)	87.5%	1.21 (0.32)	75.9%	1.55 (1.34)
Systolic blood pressure (millimetres of mercury)	95.3%	142.0 (33.10)	44.4%	130.60 (20.94)
Diastolic blood pressure (millimetres of mercury)	95.3%	87.33 (11.68)	44.4%	84.48 (9.31)

* We used McNemar's test to compare rates of documentation in audit and re-audit; rates of documentation had improved significantly for height ($p < 0.001$), weight ($p < 0.001$), waist circumference ($p < 0.001$), serum fasting glucose ($p = 0.016$), serum high density lipoprotein ($p = 0.031$), systolic blood pressure ($p < 0.001$) and diastolic blood pressure ($p < 0.001$), but not for serum triglyceride level ($p = 0.125$).

Thirty-two patients (59.3%) were also on oral anti-psychotic medication (Table 2). Amongst those who were on oral anti-psychotic medication, mean dose of oral anti-psychotic medication was 591.8 milligrams of chlorpromazine per day (SD 595.1). Total mean dose of anti-psychotic medication (depot and oral) was 943.54 milligrams of chlorpromazine per day (SD 780.3).

Documentation of all risk factors for metabolic syndrome had improved significantly, but still varied between risk factors; for example, while 79.6% had documentation regarding alcohol use, only 48.1% had documentation regarding family history of premature ischaemic heart disease ($p < 0.001$) (Table 3).

Documentation of criteria for metabolic syndrome had also improved significantly (Table 4); for example, weight was recorded in approximately 61% of patient files on re-audit, although serum triglyceride levels were recorded in only approximately 20%. On re-audit, mean BMI was 28.3 kilograms per metre squared (SD 5.6, range 19.9-40.2); mean serum fasting glucose was 6.12 millimoles per litre; mean serum triglyceride level was 1.94 millimoles per litre; mean serum high-density lipoprotein was 1.55 millimoles per litre; mean systolic blood pressure was 130.6 millimetres of mercury; and mean diastolic blood pressure was 84.5 millimetres of mercury.

Combining information from outpatient files, audit checklists and computerized phlebotomy results at the local hospital, we had information regarding metabolic syndrome criterion A for 22 patients (40.7%); criterion B for 20 (37.0%); criterion C for 21 (38.9%); criterion D for 30 (55.6%); and criterion E for 24 (44.4%). Overall, we had sufficient information to diagnose or outrule metabolic syndrome for 11 patients (20.4%) of whom 3 (27.3%) fulfilled criteria for metabolic syndrome.

Discussion

Our audit demonstrated variable levels of documentation of criteria for metabolic syndrome in outpatient files and, as our intervention, we introduced a screening checklist comprising risk factors and criteria for metabolic syndrome, based on the definition of the International Diabetes Federation[3]. Re-audit demonstrated significantly improved levels of documentation, although only 20.4% of patient files contained sufficient information to determine whether or not the patient fulfilled criteria for metabolic syndrome. There was, however, significant morbidity in relation to individual criteria (waist circumference, serum triglyceride level, systolic blood pressure and serum fasting glucose).

This audit addressed an important clinical issue, metabolic syndrome, associated with significant and avoidable mortality, morbidity and health-care costs[2,8]. The audit was performed in the context of a standard general adult psychiatry service, with a focus on the day-to-day practical issues involved in screening for metabolic syndrome (e.g. requesting blood tests, obtaining results, etc.). The mean doses of anti-psychotic medication in both audit and re-audit were within standard prescribing parameters for commonly-used medications (e.g. haloperidol, risperidone, clozapine), thus enhancing generalizability. This audit involved a range of members of the multi-disciplinary team, again reflecting common clinical practice and optimising applicability of findings. Finally, this paper describes a full audit cycle, including audit, intervention and re-audit[16,17].

This paper has a number of limitations. While the findings from this quality improvement project are not unexpected, and do not modify existing scientific knowledge

of metabolic syndrome, the project aimed to provide an insight into the realities of quality improvement initiatives in busy, day-to-day clinical practice. The project was, however, very underpowered to look at the prevalence rate of metabolic syndrome, and therefore does not present reliable results in this regard. This project was also dependent on standards of clinical record-keeping; this, however, reflects the reality of clinical practice where the ready availability of the results of a test, rather than whether or not the test was performed, is the key determinant of clinical value derived from the test.

Finally, this audit was based in one psychiatry clinic, in an especially socio-economically deprived inner-city area, and this may limit generalizability to other socio-economic contexts. Nonetheless, this audit highlights certain issues that appear relevant to most psychiatry outpatient settings, including the necessity for good clinical record-keeping and ready accessibility of test results, as well as the overall importance of screening for metabolic syndrome.

Screening for metabolic syndrome is an especially important issue in this population group: there is strong evidence that individuals with mental illness are less likely to attend to their physical health, compared with individuals without mental illness[7]. Many also smoke[5] and receive medication associated with various metabolic anomalies and, in some cases, metabolic syndrome[11]. Even if our audit does not support reliable conclusions regarding *all* criteria for metabolic syndrome, we still found strong evidence of morbidity in relation to specific metabolic parameters; i.e. while there were sufficient data to determine the presence or absence of *all* criteria in just 11 files, greater numbers had data relating to individual criteria. For example, on re-audit, mean waist circumference (101.7 centimetres) was greater than the threshold required in order to fulfil one of the criteria for metabolic syndrome (for both males and females).

On this basis, we conclude that attendance at the psychiatry clinic presents a unique opportunity for routine health screening amongst this population which is at especially high risk of metabolic morbidity (including diabetes). Moreover, we recommend that special effort be applied to assessment of anthropometric, clinical *and* biochemical parameters of metabolic syndrome at psychiatry outpatient clinics. Our audit demonstrates clearly the difficulties associated with such extensive screening in day-to-day clinical practice, but the broader literature confirms clearly that the morbidity associated with metabolic syndrome in this group is sufficiently large to justify such greater efforts at detection and management[2,7,10].

Finally, we recommend that future studies focus not only on factors contributing to metabolic syndrome, such as psychotropic drugs[11] and smoking[5], but also the effectiveness of therapeutic measures, especially amongst individuals with mental illness (e.g. exercise, dietary improvement, medication changes, smoking cessation programmes)[9]. Many of these therapeutic measures may be difficult to implement in practice, just as our audit demonstrates that screening measures can be difficult to integrate into day-to-day clinical practice. Nonetheless, the morbidity associated with metabolic syndrome amongst the mentally ill indicates clearly a need for greater basic research, clinical focus and therapeutic intervention in relation to this disorder.

Appendix 1: Checklist for features of and risk factors for the metabolic syndrome

Date: _____
Audit No.: _____
Date of birth: _____
Gender: Male/Female
Height: _____centimetres
Weight: _____kilograms

Psychiatric diagnosis:	Schizophrenia		
	Bipolar affective disorder		
	Others: _____		
Depot antipsychotic:	Name:	Dose	Frequency
Oral antipsychotic:	Name	Dose	Frequency
	Name	Dose	Frequency
	Name	Dose	Frequency

Risk factors for cardiovascular disease:

Diabetes mellitus	Y/N/ND
Dyslipidaemia	Y/N/ND
Hypertension	Y/N/ND
Family history of premature ischaemic heart disease	Y/N/ND
Smoker	Y/N/ND
Alcohol intake	Y/N/ND

Screening for Metabolic syndrome:

Waist circumference	Y/N/ND	_____	centimetres
Serum fasting glucose	Y/N/ND	_____	millimoles per litre
Serum triglyceride	Y/N/ND	_____	millimoles per litre
Serum high density lipoprotein	Y/N/ND	_____	millimoles per litre
Blood pressure	Y/N/ND	_____	millimetres of mercury

Y = Yes, N = No, ND = Not documented.

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