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The influence of an inpatient dual diagnosis program on readmission rates

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THE INFLUENCE OF AN INPATIENT DUAL DIAGNOSIS PROGRAM ON READMISSION RATES

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfillment of the requirements for the degree of

Master of Medicine in the branch of Psychiatry

Johannesburg, 2013

DECLARATION

I, Dr Tasneem Mahomed, declare that this research report is my own work. It is being submitted in partial fulfillment of the requirements for the degree of Master of Medicine in the branch of Psychiatry. It has not been submitted before for any degree or examination at this or any other University.

……

May 2013

This work is dedicated to Bashir and Wazir, for their unconditional love and support throughout the course of this research report.

Abstract

The aim of this study was to establish whether the management of dual diagnosis patients in an integrated psychiatric unit influenced relapse and readmission rates.

A retrospective record review was conducted to illustrate the influence of an admission to the Dual Diagnosis Unit (DDU) at Sterkfontein Hospital (SFH) on readmission rates of patients. These results were compared to readmission rates of a matched standard care (SC) group.

Statistical data analysis revealed a larger presence of schizophrenia in the SC group, likely explained by the DDU's patient selection procedure. Though not significant, readmission rates in the DDU group were lower than in the SC group, even though substance use levels in the DDU group was higher. This demonstrates the potential positive impact of the DDU program.

The findings presented in this paper warrant further investigation in assessing the effectiveness of a DDU, using a larger sample size.

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1.0 Introduction

Sterkfontein Hospital (SFH), a tertiary and quaternary psychiatric hospital in Gauteng, has traditionally managed involuntary patients in secure adult (male and female) wards. In July 2008 a new service, the Dual Diagnosis Unit (DDU), was opened to cater for twenty patients (ten male and ten female) with a dual diagnosis, that is, patients with at least one Axis I diagnosis according to DSM-IV-TR (1) as well as a co-morbid substance use disorder (abuse or dependence).

Patients are referred to the DDU from the acute wards at SFH, from psychiatric units in other hospitals and from community mental health care clinics. The patients are initially assessed by the DDU's multidisciplinary team (MDT) and if found to be suitable, are admitted to the inpatient program. Patients must be clinically stable prior to referral to the DDU for assessment. Patients are reviewed and if found to be motivated and willing to enter into the DDU program, are accepted. Patients are also expected to have adequate cognitive functioning to be able to engage adequately in the program. The duration of the program is eight weeks and includes weekly individual psychotherapy sessions, daily psycho-education and / or life skills groups, weekly occupational therapy, daily physical exercise, weekly narcotics anonymous groups and weekly MDT reviews.

The purpose of this study was to determine the influence of an admission to the DDU on readmission rates amongst patients discharged from SFH with substance use disorders. To this end, the readmission rate of forty patients who completed the eight week program in the DDU was compared to the readmission rate of forty patients who received standard care (SC) in the acute general psychiatric wards at the hospital.

The primary benefits of this study are:

- This is the first study at SFH to compare readmission rates of patients who have completed the DDU program with patients from the acute general psychiatric wards being managed with a standard care (SC) approach.
- This study determines the efficacy of the DDU program using the output measure, namely, readmission rates.
- The DDU is the first public unit of its kind in Gauteng. The results from such a study may inform decision making regarding the expansion of the program to other public hospitals.
- Substance use is generally acknowledged as a major contributor to readmission and relapse rates in mentally ill patients. Specific units targeting substance use and mental illness may lower the rates of relapse which may contribute to a reduction in readmission rates, the revolving door syndrome and ultimately reduce the cost of managing these patients.
- This study is the first to propose a repeatable programme that can be amended and improved, with a tangible outcome.

1.1 Statement of hypothesis

H_O: Readmission rates of DDU program participants and acute standard care (non-DDU program) participants are equal at SFH.

H_A: Readmission rates of DDU program participants are lower than readmission rates of standard care participants at SFH.

2.0 Literature review

The concept of dual diagnosis was introduced in the late 1980's (2) and refers to the presence of substance abuse and at least one major psychiatric disorder diagnosed on Axis I according to DSM-IV-TR (1). Dual diagnosis or co-morbidity exists when a patient is suffering from more than one disease. Individuals with serious mental illnesses often have co-occurring substance use disorders which have a negative effect on their management (3). According to Sheehan (4), when such disorders co-exist, they tend to be more severe. In addition, the rate of substance abuse amongst individuals diagnosed with a mental illness is high (5).

2.1 Prevalence

It has been reported that severe mental illness (for example bipolar disorder and schizophrenia) and illicit drug and / or alcohol use may co-exist (6). This was seen in the Epidemiological Catchment Area (ECA) study by Regier et al. (7) which found that 28% of patients with a primary mental illness also had a substance abuse disorder; 45% of patients with a primary alcohol abuse disorder also had a co-morbid mental illness; and 71% of patients with a primary drug abuse disorder had a co-morbid mental illness. The ECA study also found that 32% of patients with any affective disorder had a substance use disorder and that individuals diagnosed with a mental disorder were three times more likely to have an addictive disorder (6). Further to these findings, a study conducted at Stikland hospital in the Western Cape by Weich and Pienaar (8), found that 51% of patients with a serious psychiatric disorder had a co-morbid substance use disorder (abuse or dependence).

2.2 Compliance and factors influencing compliance

Compliance has several definitions and refers to adherence to medication (9), to a treatment regimen (9), and / or to attendance at outpatient appointments (10). The rates of compliance of dual diagnosis patients have been found to be low (10). Studies amongst patients with a dual diagnosis show that these patients comply less with aftercare when compared to general psychiatric patients or patients with substance abuse only (11). Pristach and Smith (9) as well as Drake and Wallach (12) found that people with dual disorders tend to be non-compliant with treatment. They are often de-motivated to continue with treatment and are difficult to engage in outpatient treatment and / or rehabilitation programs (13).

2.3 Relapse and readmission

Patients with a dual diagnosis are more likely to receive inadequate treatment and are at much higher risk of relapse than with either of the disorders individually (4). This group of patients poses a challenge to psychiatric treatment teams because they have higher rates of relapse and re-hospitalisation, lower rates of completing treatment and have more complicated needs than patients with only substance abuse disorders (14).

Research has shown that approximately 50% of patients with severe mental illness and substance abuse are likely to have a recurrence of substance abuse within one year of discharge from treatment (15). Xie, McHugo, Fox and Drake (16) found that relapse was very common in the first year after discharge and by three years, approximately half of the patients in their study had relapsed. Their study confirmed that among patients with a mental illness, substance abuse disorders have a chronic and fluctuating course. In a study by Safer (1987) cited in Hoffman, DiRito and McGill (17) of a group of young chronic

mentally ill patients, those who had a history of substance abuse were admitted to psychiatric hospitals 2.5 times more frequently than those that did not have a history of substance abuse. Results from several studies do differ, yet relapse and readmission rates are observed to be higher in dual diagnosis patients.

2.4 Remission

The DSM-IV-TR (1) defines early full remission as meeting no criteria for abuse or dependence for one month and for full remission as meeting no criteria for abuse or dependence for twelve months. Cuffel and Chase (18) reported that remission rates from substance abuse disorders was 31% in a group of patients that had undergone treatment in their specialised inpatient dual diagnosis program. They also found that young males are less likely to remit a substance use disorder as compared to older females, that is, remission was associated with patient characteristics such as age and gender.

2.5 Prognosis

Substance abuse destabilises severe mental illness, thereby interfering with patient rehabilitation (5). Individuals with severe mental illnesses who misuse or abuse psychoactive substances pose several challenges to mental health care practitioners resulting in an increased likelihood of treatment failure (19). Sheehan (4) found that patients with a mental illness are at a significantly higher risk of developing or having a substance use disorder and when the two disorders co-exist and interact, this results in increased severity of both disorders which consequently leads to a poorer prognosis. As a result, such patients' prognoses are not very good.

2.6 Integrated treatment models

Dual diagnosis is relevant to patient management due to its important clinical consequences and costs of care (20). Rodriguez-Jimenez et al. (20) recognised that several studies have shown that patients with a dual diagnosis require specialised treatment programs as the coexistence of psychiatric and substance abuse disorders occurs with significant frequency. These patients present serious challenges to health care systems which traditionally treated mental health and substance abuse separately; with differing and sometimes contradictory treatment modalities (17).

Several studies support the integration of treatment programs so that patients with a dual diagnosis are managed by the same clinicians for their mental health and substance abuse needs (5). The consolidation of mental health services and substance abuse treatment has been thought to improve the prognosis for dual diagnosis patients (3). Drake et al. (19) deduced that there was satisfactory evidence to support the effectiveness of integrated treatment. Patients managed in an integrated treatment program showed increased knowledge, active engagement and motivation to remain sober in a study by Herman, Boots, Miller, Jordan, Mowbray, Brown, Deiz et al. (21). Weich and Pienaar (8) concluded that the presence of substance use disorders in patients with severe mental illness impacts negatively on patients as well as adds to the service delivery burden; thus supporting the development of complex integrated services for these patients.

A study by Mowbray et al. (3) compared two inpatient groups, one group from a mental illness and substance dependency program (high-change) and a second group from a standard mental illness treatment program (no-change). It was found that the two groups showed significant differences at discharge, that is, the high-change group had greater

involvement in their hospital program, were more motivated to engage in post discharge services, and were more hopeful. Post discharge (up to ten months), more than twice as many individuals in the no-change group were hospitalised. This study illustrates that the dual diagnosis program was effective in reducing the number of readmissions in the high change group. In a paper by Drake et al. (22) it is evident that patients in programs that do not address their substance abuse disorders have poorer outcomes. Several studies cited in the paper supported the implementation of integrated units to manage patients with a dual diagnosis.

Whilst there is a large body of evidence supporting the use of integrated units to treat dual diagnosis patients, there is also evidence in opposition thereof. In a review by Drake, Mueser, Brunette and McHugo (23), which assessed outpatient follow-ups, few differences were found in outcomes between the group receiving treatment in an integrated program compared with a control group receiving standard treatment. Mowbray et al. (3) also questioned the introduction of integrated inpatient units as some clinical trials that supported the efficacy of these units were based on outpatient programs. No compelling differences were found by Hoffman, DiRito, and McGill (17) when comparing pre- and post- discharge outcomes in an integrated inpatient unit thereby not supporting the introduction of dual diagnosis units.

2.7 Conclusion

Patients with a dual diagnosis pose several challenges to mental health care practitioners as observed in the studies above, that is, a high risk of non-compliance, relapse and readmission as well as poorer prognoses. Some of the studies mentioned above support the introduction of dual diagnosis programs, whereas others do not.

The aim of this retrospective record review is to illustrate the influence of an admission to the dual diagnosis unit at SFH on readmission rates of patients with a dual diagnosis to the acute general psychiatric wards at the same hospital.

3.0 Subject and methods

3.1 Study objectives

The aim of the study was to conduct a retrospective review of patient records to illustrate the influence, if any, of an admission to the Dual Diagnosis Unit (DDU) at Sterkfontein Hospital (SFH) on readmission rates of patients with a dual diagnosis.

3.2 Study design

This study was a retrospective record review, of patients from SFH comparing two groups of patients. There was no interaction with the sample. Permission was obtained from the Chief Executive Officer at Sterkfontein Hospital prior to commencement of the study.

The study included patients with a dual diagnosis discharged from SFH from 1 January 2009 until the 31 December 2010. A pilot study was conducted which analysed the randomly selected files of ten patients at SFH, five from the standard care (SC) wards and the remaining five from the DDU. The pilot study found that the percentage of patients readmitted in the DDU group was 0% and in the SC group was 60%, with a power of 90% at an *alpha* 0.05. The pilot study was also used to identify the number of patients which should be included in the sample to achieve a statistically relevant outcome.

The first forty consecutive patients who completed the DDU program were included in the DDU group. The SC group comprised patients who were discharged from the SC general psychiatric wards i.e. without receiving specific dual diagnosis intervention. Patients in the SC group were matched with the DDU group according to age, gender, employment status and social support.

The records of the patients that were included in each group were examined for readmissions to the acute standard care wards until 31 December 2010. The two groups were compared with respect to the presence or absence of readmissions, number of readmissions, the length of time between discharge and the first readmission, as well as demographic, social and clinical variables.

Through the application of relevant statistical analysis techniques, the readmission rates of the two groups were analysed to determine if exposure to the DDU impacted on the readmission of patients to SFH, or not.

3.3 Subjects and method

3.3.1 Population

The population for this research included assisted and involuntary mental health care users discharged from SFH, with one group from the DDU and the other from the SC wards. Subjects from the population were assessed as to whether they were or were not readmitted to SFH's acute standard care wards.

3.3.2 Sample

The sample for this study was selected using the following criteria:

- DDU group: The first forty subjects who fulfilled the inclusion criteria and who were assessed for, and subsequently admitted to the DDU, were included in the DDU group.
- SC group: The first forty subjects who fulfilled the inclusion criteria and who were never assessed for admission to the DDU or who were assessed for and subsequently refused admission to the DDU, were included in the SC group.

- To account for the impact of extraneous variables, subjects in the two groups were matched according to age, gender, employment status and social support. These variables were identified as variables which could have impacted on readmission rates and through matching, the impact in both the test and control groups were equalised.

3.3.3 Inclusion criteria

The following inclusion criteria were applied to each group:

- DDU group:
    - Patients were to have at least one Axis I diagnosis according to DSM-IV-TR (1) as well as a co-morbid substance use disorder (abuse or dependence).
    - Patients must have been assessed and admitted to the DDU for the entire duration of the DDU treatment program (eight weeks).
- SC group:
    - Patients were to have at least one Axis I diagnosis according to DSM-IV-TR (1) as well as a co-morbid substance use disorder (abuse or dependence).
    - Patients must not have been exposed to the DDU treatment program.

If readmission of patients from either group occurred, only readmissions to the acute SC psychiatric wards at SFH were included in the study.

3.3.4 Exclusion criteria

The following exclusion criteria were applied during the selection process for the study:

- Non-completion of the eight week DDU program, irrespective of whether the patient terminated the program or the patient was discharged early.
- In the event of readmission, patients who were readmitted to wards other than the acute SC psychiatric wards at SFH were excluded from the study, for example to the forensic wards.
- Any patient presenting with an Axis II diagnosis according to DSM-IV-TR (1).
- Inadequate or incomplete information in hospital records resulted in patients being excluded from the study.

3.3.5 Methods of assessment

- Subject to the inclusion and exclusion criteria presented earlier, patient hospital records were reviewed to identify participants for both groups in the study, that is, the control and experimental group.
- Relevant data was extracted from the hospital records as per the data collection sheet, provided as Appendix 1.
- Appropriate statistical analysis was performed on the collected data to test the study hypothesis.

3.3.6 Sample size

- A sample size of forty (n=40) was calculated to be statistically significant. The sample size was calculated using the SAS 9.1.3. statistical software and was based on the results of the pilot study.

3.3.7 Outcome measures

The following outcome measures were tested in this study:

- The readmission rate of patients in each group.
- A comparison of the readmission rates of the two groups to determine if these rates were equal or not.
- In instances where readmissions occurred, the time between discharge and readmission was tested across both groups.
- Combined readmission rates of patients in both groups.
- Length of (first) readmission for patients who were readmitted.
- Readmissions in the period zero to twelve months following discharge.
- Readmissions in the period thirteen to twenty four months following discharge.
- Reasons for readmission.

4.0 Statistical analysis

- Data analysis was performed using SAS, version 9.1.3.
- A 95% confidence interval (CI), with an *alpha* of 0.05 was used for all statistical tests, unless specified otherwise.
- A two sided p value was calculated, whereby $p < 0.05$ was considered to be statistically significant.
- Tests for significant relationships between categorical variables were carried out using Pearson's X^2 test at the 95% confidence level.
- The chi squared test was performed on all covariate data and due to the expected cell count values being less than five, were considered invalid.
- Fisher's Exact Test was used where the requirements for the X^2 test could not be met, or for 2x2 tables. The strength of the association was determined by Cramer's V (the Phi coefficient was used in the case of Fisher's Exact Test). These coefficients were interpreted as follows:
    - Absolute value of coefficient:
        - >0.5 high / strong association
        - 0.3 to 0.5 moderate association
        - 0.1 to 0.3 weak association
        - 0 to 0.1 little if any association
- For continuous variables, a T-test was used for data normally distributed or a Mann-Whitney test if the distribution of the variables was not normal.

5.0 Ethics

Ethics approval was obtained even though this was a retrospective record review. Patient identities and personal details have not been revealed and remain anonymous and confidential. Access to the identities and personal details of patients included in this study is limited to the researcher.

As envisioned at the outset of the study, there was no subject engagement in the study. Patient consent was not required or applicable hereto.

Ethics clearance from the Human Research Ethics Committee (Medical), University of the Witwatersrand, Johannesburg was granted unconditionally. The clearance certificate number is M110310.

6.0 Descriptive analysis

Figure 1 provides an overview of the sequence of data analysis and presentation of findings.

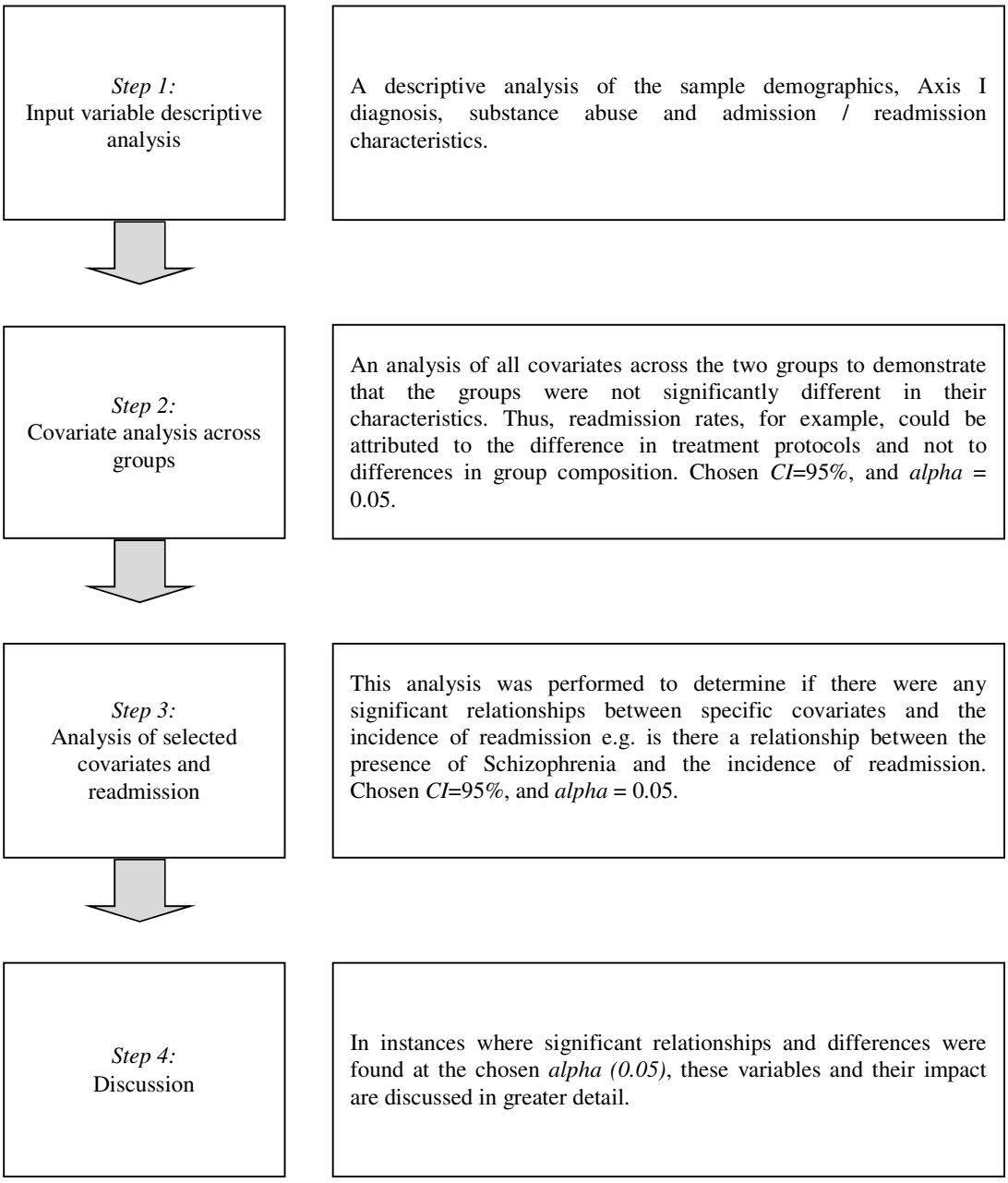

Figure 1: Sequence of data analysis and presentation of findings

6.1 Input variable descriptive analysis

6.1.1 Participant demographics

A descriptive overview of participant demographics is provided in Tables 1 - 7.

6.1.2 Age analysis

Table 1 provides an overview of participant age analysis. The ages of patients in the two groups were matched to within two years of each other. In the DDU group, twenty nine patients (72.5%) were in the 18 to 30 year old age group, eight (20%) in the 31 to 40 year old group and three (7.5%) were above the age of 40. In the SC group twenty six (65%) patients were in the 18 to 30 year old group, nine (22.5%) were in the 31 to 40 year old group and five (12.5%) were above the age of 40. The mean age in both groups was 28.

Table 1: Participant age analysis

Variable: Age		**SC Group**	**%**	**DDU Group**	**%**
Age	Mean	28.3	-	27.9	-
Age	Median	28	-	26	-
Age	Std Dev	7.8	-	7.4	-
Age category	18 – 30	26	65	29	72.5
	31-40	9	22.5	8	20
	> 40	5	12.5	3	7.5

6.1.3 Gender analysis

Both groups consisted of thirty five (87.5%) males and five (12.5%) females as depicted in Table 2.

Table 2: Participant gender

Variable: Gender	SC Group	%	DDU Group	%
Male	35	87.5	35	87.5
Female	5	12.5	5	12.5

6.1.4 Racial composition

Table 3 summarises the racial composition of the two groups. In the DDU group, twenty six (65%) patients were Black, eight (20%) were White and six (15%) were Coloured. In the SC group, thirty four (85%) were Black, three (7.5%) were White, one (2.5%) was Indian and two (5%) were Coloured.

Table 3: Racial composition

Variable: Race	SC Group	%	DDU Group	%
Black	34	85	26	65
White	3	7.5	8	20
Indian	1	2.5	0	0
Coloured	2	5	6	15

6.1.5 Highest level of education

A summary of the educational levels of participants is provided in Table 4. In the DDU group, fifteen (37.5%) patients had completed Grade 12 and / or tertiary education compared to ten (25%) in the SC group. Sixteen (40%) patients in both the DDU group and SC groups had completed either grade 10 or 11. In the DDU group, seven (17.5%) had completed between grade 1 and 9 compared to nine (22.5%) in the SC group. The number

of patients whose level of education was unknown in the DDU group was two (5%) and in the SC group, five (12.5%).

Table 4: Highest level of education

Variable: Highest Level of Education	SC Group	%	DDU Group	%
Grade 12 / Tertiary	10	25	15	37.5
Grade 10 or 11	16	40	16	40
Grade 1-9	9	22.5	7	17.5
Unknown	5	12.5	2	5

6.1.6 Employment status

Two (5%) patients in the DDU group and three (7.5%) in the SC group were employed. The rest in each group were unemployed, as per Table 5.

Table 5: Employment status

Variable: Employment Status	SC Group	%	DDU Group	%
Employed	3	7.5	2	5
Unemployed	37	92.5	38	95

6.1.7 Marital status

In the DDU group, thirty nine (97.5%) patients were single, none were married and one (2.5%) was divorced. In the SC group, thirty six (90%) were single, three (7.5%) were married and one (2.5%) was divorced, as captured in Table 6. The ‘Other’ category comprised a patient living with a partner or a friend.

Table 6: Marital status

Variable: Marital Status	SC Group	%	DDU Group	%
Single	36	90	39	97.5
Married	3	7.5	0	0
Other	1	2.5	1	2.5

6.1.8 Social support

A summary of the social support characteristics is provided in Table 7. Thirty eight (95%) lived with and were supported by family in the DDU group compared to forty (100%) in the SC group. One (2.5%) patient in the DDU group lived in a care home and one (2.5%) patient's support system was not defined, therefore both classified as 'Other' (5% in total).

Table 7: Social support

Variable: Social Support	SC Group	%	DDU Group	%
Family	40	100	38	95
Other	0	0	2	5

6.2 Axis I diagnoses

This study focused on a dual diagnosis population thus all patients had more than one Axis I diagnosis according to DSM-IV-TR (1).

6.2.1 Axis I diagnoses combined

The majority of patients had two Axis I diagnoses, while others had three or four. Combined frequencies across both groups are presented in Table 8.

Table 8: Combined frequencies of Axis I diagnosis

No. of Axis I Diagnoses	Frequency	%	Cumulative Frequency	Cumulative %
2	67	83.75	67	83.75
3	12	15	79	98.75
4	1	1.25	80	100

6.2.2 Axis I diagnoses per group

In the DDU group, thirty two (80%) patients had two diagnoses, seven (17.5%) had three diagnoses and one (2.5%) had four or more diagnoses. In the SC group, thirty five (87.5%) patients had two diagnoses, five (12.5%) patients had three diagnoses and none had four or more diagnoses. The diagnoses mentioned all met DSM-IV-TR (1) diagnostic criteria, and is summarised in Table 9.

Table 9: Axis I diagnoses per group

Variable: Axis Diagnoses	SC Group	%	DDU Group	%
2	35	87.5	32	80
3	5	12.5	7	17.5
≥ 4	0	0	1	2.5

6.2.3 Multiple diagnoses

The prevalence of multiple co-morbid diagnosis is presented in Table 10 and highlights that substance abuse was the most prevalent diagnosis (85% n=34) in the SC group compared to substance abuse (65% n=26) in the DDU group. Schizophrenia was the next most prevalent (37.5% n=15) in the SC group compared to substance induced mood

disorder (SIMD) and substance induced psychotic disorder (SIPD) (47.5% n=19) in the DDU Group. The detailed analysis with commentary is provided here.

Table 10: DSM-IV diagnosis

Variable: DSM-IV Diagnosis	SC Group	% Prevalence	DDU Group	% Prevalence
Alcohol Abuse	2	5	8	20
Alcohol Dependence	0	0	5	12.5
BD I	14	35	11	27.5
BD II	0	0	0	0
MDD	0	0	4	10
SAD	3	7.5	1	2.5
Schizophrenia	15	37.5	6	15
SIMD & SIPD	10	25	19	47.5
Substance Abuse	34	85	26	65
Substance Dependence	5	12.5	4	10
Other	2	5	3	7.5

In the SC group, fifteen (37.5%) patients fulfilled the criteria for a diagnosis of schizophrenia compared to six (15%) in the DDU group. Fourteen (35%) patients in the SC group and eleven (27.5%) in the DDU group had a diagnosis of bipolar disorder I (BD I). schizoaffective Disorder (SAD) was represented by three (7.5%) patients in the SC group and one (2.5%) in the DDU group. Four (10%) patients presented with major depressive disorder (MDD) in the DDU group compared to none in the SC group.

The criteria for SIMD and SIPD combined were met by nineteen (47.5%) patients in the DDU group and ten (25%) patients in the SC group. Twenty six (65%) patients in the DDU group and thirty four (85%) patients in the SC group had a diagnosis of substance

abuse, whilst four (10%) patients in the DDU group and five (12.5%) in the SC group had a diagnosis of substance dependence.

Alcohol abuse was diagnosed in eight (20%) patients in the DDU group and two (5%) in the SC group. Five (12.5%) patients in the DDU group had a diagnosis of alcohol dependence as compared to none in the SC group. Three (7.5%) patients in the DDU group and two (5%) patients in the SC group were included in the group 'Other' which comprised anxiety disorders, psychosis due to a general medical condition (Epilepsy), mood disorder due to a general medical condition (HIV), etc. No patients in either group fulfilled the criteria for bipolar disorder II.

6.3 Substance use

It was found that many of the patients in the DDU group used more than one substance. In the DDU group, ten (25%) patients used one substance, twelve (30%) patients used two substances, eight (20%) patients used three substances and ten (25%) patients used four or more substances. In the SC group, twenty four (60%) patients used one substance, ten (25%) patients used two substances, five (12.5%) patients used three substances and one (2.5%) patient used four or more substances. Hence eighteen patients in the DDU group had a diagnosis of polysubstance abuse (use of three or more substances in a twelve month period) according to DSM-IV-TR (1) as compared to six patients in the SC group.

A brief description of the lesser known substances is extracted from SACENDU (24) and Van Heerden et al. (25), and provided here for clarity:

- Nyaope is an illicit substance that contains heroin and cannabis and is typically smoked. Ecstasy is MDMA (3, 4-methylenedioxymethamphetamine), a synthetic,

psychoactive drug that is chemically similar to methamphetamine, a stimulant. It is usually ingested orally as a capsule or tablet.

- Mandrax is a combination of methaqualone and antihistamine and is a barbiturate-type sedative. It can be crushed, mixed with cannabis and smoked or is ingested orally in tablet form.
- Methcathinone (hereafter referred to as CAT) is a psychoactive stimulant that is closely related to methamphetamines. It can be smoked, injected, swallowed, but is usually snorted in a powder form.
- Tik (crystal methamphetamine) is an illicit highly addictive stimulant. It is usually smoked in a glass pipe, but can be snorted, inhaled, swallowed and injected.

Table 11 provides an overview of the frequencies of the number and type of substances used by the participants.

Table 11: Substance use

Variable: Substance Use	SC Group	% Prevalence	DDU Group	% Prevalence
Alcohol	11	27.5	27	67.5
Cannabis	37	92.5	34	85
CAT	2	5	5	12.5
Crack / Cocaine	9	22.5	7	17.5
Ecstasy	1	2.5	8	20
Heroin	2	5	5	12.5
Mandrax	0	0	10	25
Nyaope	0	0	1	2.5
Other (Tik / glue / etc)	1	2.5	2	5

Twenty seven (67.5%) patients used alcohol, thirty four (85%) used cannabis, eight (20%) used ecstasy, seven (17.5%) used crack / cocaine, five (12.5%) used heroin, one (2.5%) used nyaope, five (12.5%) used CAT and ten (25%) used mandrax in the DDU group. In the SC group, eleven (27.5%) patients used alcohol, thirty seven (92.5%) used cannabis, one (2.5%) used ecstasy, nine (22.5%) used crack / cocaine and two (5%) patients used heroin and CAT respectively. Three (7.5%) patients in the DDU group and two (5%) in the SC group used substances placed in the 'Other' category, comprising solvents such as glue; 'tik'; appetite suppressants; benzodiazepines and over the counter analgesics.

The mean, standard deviation and median for substance use are provided in Table 12.

Table 12: Mean, median and standard deviation for substance use

Variable: Substances Used	SC Group	DDU Group
Substances used (mean)	1.6	2.5
Substances used (median)	1	2
Substances used (standard deviation)	0.3	0.4

6.4 Admission and readmission characteristics

6.4.1 First admission length

The mean length of the first admission (the initial admission during the record review) in the DDU group was 11.8 weeks with a standard deviation of 4.8 compared to 9.3 weeks in the SC group with a standard deviation of 8.8. The median length of time for the SC group was 6.5 weeks compared to 10 weeks in the DDU group. The DDU program length is

eight weeks long, but the majority of patients were most likely admitted into the acute wards prior to transfer to the DDU. Data from the groups is provided in Table 13.

Table 13: First admission length across the groups

Variable: First admission Length	SC Group	DDU Group
First admission length - weeks (mean)	9.3	11.8
First admission length - weeks (standard deviation)	8.8	4.8
First admission length – weeks (median)	6.5	10

6.4.2 'Discharged to' location

On discharge following the first admission, thirty six (90%) patients from the DDU group and thirty seven (92.5%) from the SC group were discharged home to their families. The rest were discharged to 'Other' locations which included care homes, friends, their own homes, etc. This information is reflected in Table 14.

Table 14: 'Discharged to' location across the groups

Variable: Discharged to	SC Group	% Prevalence	DDU Group	% Prevalence
Home	37	92.5	36	90
Other	3	7.5	4	10

6.4.3 Follow-up location

Table 15 summarises the follow-up locations for patients in both groups. Twenty nine (72.5%) DDU patients were advised to follow up at their local clinics, two (5%) at their local hospital, eight (20%) at the Chris Hani Baragwanath Academic Hospital (CHBAH)

Zamani Dual Diagnosis outpatient clinic and one (2.5%) at 'Other' locations which included the care home with the resident psychiatrist or with a private psychiatrist.

In the SC group, thirty four (85%) patients were advised to follow up at their local clinics, four (10%) at their local hospital, none at the CHBAH Zamani Dual Diagnosis (DD) outpatient clinic and two (5%) at 'Other' locations.

Table 15: Follow-up location across the groups

Variable: Follow-up location	SC Group	% Prevalence	DDU Group	% Prevalence
Local clinic	34	85	29	72.5
Local hospital	4	10	2	5
CHBAH Zamani DD	0	0	8	20
Other	2	5	1	2.5

6.4.4 First readmission status

Table 16 summarises the first readmission frequencies of the two groups. Readmission refers to the patient's re-hospitalisation to SFH following the first admission during the study period. In the DDU group, three (7.5%) patients were readmitted after the first admission as compared to eight (20%) patients in the SC group.

Table 16: First readmission frequency and time-period across groups

Variable: Readmission	SC Group	% Prevalence	DDU Group	% Prevalence
Yes	8	20	3	7.5
No	32	80	37	92.5
Readmission within 12 months following discharge	4	10	2	5
Readmission between months 13 – 24 following discharge	4	10	1	2.5

In the SC group, 4 patients each were readmitted during both the zero to twelve month and thirteen to twenty four month periods. The DDU had two patients readmitted within the zero to twelve month period and one readmission in the thirteen to twenty four month period.

6.4.5 Reasons for readmission

In the DDU group reasons for readmission included substance use in one (33.33%) patient and both non-compliance with substance use in two (66.7%) patients, as presented in Table 17. In the SC group, one (12.5%) patient was readmitted due to non-compliance, two (25%) patients due to substance use and five (65%) due to both.

Table 17: Reasons for readmission across groups

Variable: Reason for readmission	SC Group	% Prevalence	DDU Group	% Prevalence
Non-compliance	1	12.5	0	0
Substance use	2	25	1	33.3
Both	5	62.5	2	66.7

6.4.6 Time between first admission and readmission

The mean length of time between the first admission and readmission was 29.3 weeks in the DDU group and 53.9 weeks in the SC group as presented in Table 18. It should be noted that not all patients in the two groups were readmitted, with eight patients from the SC group and three from the DDU group being readmitted.

The median number of weeks of the time between the first admission and readmission was 53 weeks for the SC group and 19 weeks for the DDU group. The mean length of readmission in the DDU group was 6.3 weeks and 11 weeks in the SC group.

Table 18: Time between readmission and length of readmission across groups

Variable 1: Time Between Admission and Re-admission (weeks)	**SC Group**	**DDU Group**
Mean	53.9	29.3
Standard Deviation	29.5	34.7
Median	53	19
Variable 2: Length of Readmission (weeks)	**SC Group**	**DDU Group**
Mean	11	6.3
Standard Deviation	11.2	5.5
Median	6.5	6

7.0 Covariate analysis across groups

An analysis was conducted which compared the two groups with respect to all the covariates to demonstrate that the groups were not significantly different in their characteristics. Thus, it was hoped that the difference in outcomes, for example readmission rates, could be attributed to the difference in treatment protocols and not to differences in group composition.

Depending on the normality of the raw data, a t-test was performed to compare the means of the two groups. Where the assumption of normality was not proven, the Wilcoxon Rank Sum or Fisher's Exact Test was performed using a 95% CI, whereby $p < 0.05$ was considered to be statistically significant.

7.1 Summary of demographic-related covariate data analyses

Table 19 summarises the results of the covariate analyses, with none of the variables returning p values which were statistically significant.

Table 19: Summary of demographic-related covariate data analysis

Variable: Demographic	p Value	Outcome
Age (raw data)	*p = 0.85*	Wilcoxon Rank Sum: No significant difference between groups.
Age (categorisation)	*p = 0.83*	Fisher's Exact Test: No significant difference between groups.
Employment status	*p = 1.0*	Fisher's Exact Test: No significant difference between groups.
Gender	*p = 1.0*	Chi-square: No significant difference between groups.
Highest level of education	*p = 0.42*	Fisher's Exact Test: No significant difference between groups.
Marital status	*p = 0.24*	Fisher's Exact Test: No significant difference between groups.
Race	*p = 0.086*	Fisher's Exact Test: No significant difference between groups.
Social support	*p = 0.49*	Fisher's Exact Test: No significant difference between groups.

The descriptive statistics for the ages of patients from each group has already been presented in Table 1. In terms of the covariate analysis, it was determined that the frequency distributions indicate that the age data is positively skewed – see Figure 2.

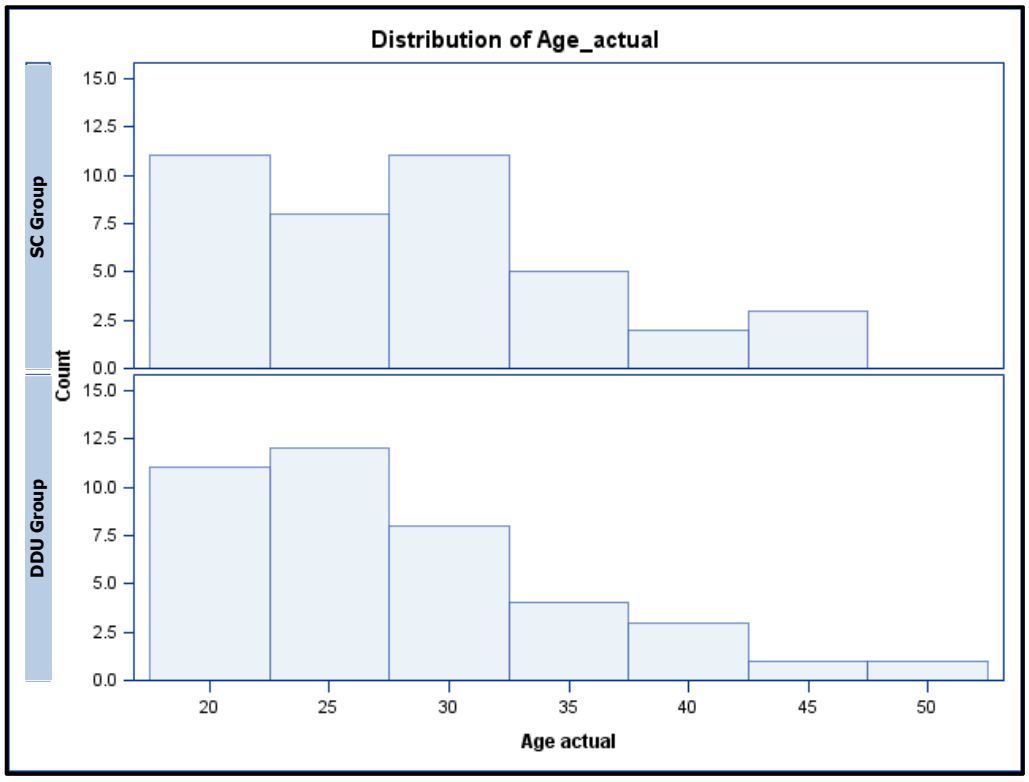

Figure 2: Age frequency spread

As the data is skewed, the assumption of normality of the data is not met and the Wilcoxon Rank Sum test was performed. The resultant $p = 0.85$ indicates there is no significant difference in the actual age of the two groups.

In summary, there were no significant demographic differences between the two groups.

7.2 Type of Axis I diagnosis

Two specific tests were performed:

- Test 1: The *number* of Axis I conditions per patient compared across the two groups.

- Test 2: For each diagnosis, the number of patients *with and without that diagnosis* was compared across the two groups.

Test 1: The *number* of conditions

The majority of patients (83.75%, n = 67) had two Axis I disorders according to DSM-IV-TR (1) while some had three or four diagnoses as depicted in Table 20.

Table 20: Frequency of Axis I conditions

***Number* of Axis I Conditions**	**Frequency**	**%**
2	67	83.75
3	12	15
4	1	1.25

The Wilcoxon Rank Sum test was used to analyse the *number* of conditions per patient and returned $p = 0.70$ indicating that there is no significant difference in the *number* of Axis I diagnoses of the patients between the two groups.

Test 2: Patients with and without a certain diagnosis between the two groups

To allow for multiple diagnoses, one variable was created for each diagnosis (for example, schizophrenia, bipolar disorder, etc.) indicating whether or not the patient had this condition. An additional variable was created to indicate the number of conditions diagnosed in each patient.

For each diagnosis, the number of patients with and without that diagnosis was compared across the two groups using Fisher's Exact Test. Except for schizophrenia, there were no

significant associations between the presence and absence of the respective diagnoses between the two groups. A summary is provided in Table 21.

Table 21: Summary of type of Axis I diagnosis significance

Axis I Diagnosis	p Value	Outcome	Phi
Alcohol dependence	*p = 0.055*	No significant association.	NA
BDI	*p = 0.83*	No significant association.	NA
MDD	*p = 0.12*	No significant association.	NA
SIMD & SIPD	*p = 0.062*	No significant association.	NA
SAD	*p = 0.62*	No significant association.	NA
Schizophrenia	*p = 0.046*	Significant association between groups.	- 0.26
Substance use	*p = 0.069*	No significant association.	NA
Substance dependence	*p = 1.0*	No significant association.	NA
Other	*p = 1.0*	No significant association.	NA

Key: NA – Not applicable.

Schizophrenia is the only variable which yielded a significant association between the presence thereof in patients and the two groups. Fisher's Exact Test yielded a *p = 0.046* and the associated *Phi = -0.26*.

In summary, except for schizophrenia, there were no significant differences in the *number* of Axis I conditions per patient compared across the two groups, nor in the number of patients *with and without that diagnosis across the two groups.*

7.3 Type of substances used

Two specific tests were performed:

- Test 1: The *number of substances* used per patient compared across the two groups.
- Test 2: For each substance, the number of patients *who had / had not used the substance* was compared across the two groups.

Test 1: The *number* of substances used

Thirty four (42.5%) patients used one substance, while others used two, three or four substances. One patient used six substances as presented in Table 22.

Table 22: Frequency of substances used

Number of substances used	Frequency	%
1	34	42.5%
2	22	27.5%
3	13	16.25%
4	10	12.5%
5	0	0
6	1	1.25%

The Wilcoxon Rank Sum test yielded a $p < 0.0001$ indicating that there is a significant difference in the *number* of substances used by the patients in the two groups.

Test 2: The number of patients who had / had not used a substance

To allow for multiple substance usage, one variable was created for each substance, indicating whether or not the patient had used that substance. An additional variable was created to indicate the number of substances used by the patient.

For each substance, the number of patients who had and who had not used that substance was compared across the two groups using Fisher's Exact Test. A summary of the results is provided in Table 23.

Table 23: Summary of substance use significance

Substance	p Value	Outcome	Phi
Alcohol	*p < 0.001*	Significant association.	*0.43*
Cannabis	*p = 0.48*	No significant association.	NA
CAT	*p = 0.43*	No significant association.	NA
Cocaine / crack	*p = 0.78*	No significant association.	NA
Ecstasy	*p = 0.029*	Significant association.	*0.28*
Heroin	*p = 0.43*	No significant association.	NA
Mandrax	*p = 0.001*	Significant association.	*0.38*
Nyaope	*p = 1.0*	No significant association.	NA
Other	*p = 1.0*	No significant association.	NA

Key: NA – Not applicable.

Alcohol, ecstasy and mandrax were variables that returned significant outcomes in terms of use by patients within each group and between the two groups. Fisher's Exact Tests revealed $p < 0.001, 0.029$ and 0.001 respectively.

In summary, there was a significant difference in the number of substances used by participants in the two groups. Furthermore, significant differences were found in the presence of alcohol, mandrax and ecstasy usage by the participants in the two groups.

7.4 Admission and readmission characteristics

A summary of the covariate analysis for the first admission and readmission related variables are presented in Table 24. Variables for which significant associations were found are discussed in greater detail thereafter.

Table 24: Summary of admission & readmission covariate significance

Variable	p Value	Outcome	Phi
Follow-up location	*p = 0.009*	Fisher's Exact Test: Significant association.	*0.34*
First admission length	*p < 0.001*	Wilcoxon Rank Sum: Significant association.	*NA*
Discharged to location	*p = 1.0*	Fisher's Exact Test: No significant association.	*NA*
Number of previous admissions	*p = 0.016*	Fisher's Exact Test: Significant association.	*0.36*

Key: NA – Not applicable.

As per Table 24, significant associations were found for the variables of Follow-up location, First admission length and Number of previous admissions across the two groups. The impact of these findings is presented in the Discussion section of this paper.

7.5 Summary of output variable significance

A summary of the output variable analysis across the two groups is presented in Table 25. Variables for which significant associations were found are discussed in greater detail thereafter. For all output variables tested, none of the tests yielded a significant association between the two groups.

Table 25: Summary of output variable significance

Variable	p Value	Outcome
Overall readmissions	*p = 0.19*	No significant association.
Time between discharge and first readmission	*p = 0.12* *p = 0.13*	Log rank test: No significant association Wilcoxon Rank Sum: No significant association.
Length of readmission for patients readmitted	*p = 0.62*	Fisher's Exact Test: No significant association.
Readmission in the 0-12 month period	*p = 1.0*	Fisher's Exact Test: No significant association.
Readmission in the 13-24 month period	*p = 0.15*	Fisher's Exact Test: No significant association.
Number of readmissions in the 0-12 month period	*p = 1.0*	Fisher's Exact Test: No significant association.
Number of readmissions in the 13-24 month period	*p = 0.15*	Fisher's Exact Test: No significant association.
Reason for readmission	*p = 0.38*	Fisher's Exact Test: No significant association.

- Length of time between discharge following the first admission to readmission. A survival analysis was performed for this variable to ensure that patients who had been readmitted as well as those who had not been readmitted were taken into consideration. Thus, it was assumed that those patients, who had not been readmitted at all during the study period, had 'survived' the two year period i.e. they had not been readmitted.

  The survival curves (product-limit survivor function estimate vs. survival time) for the two groups are shown in Figure 3. The Wilcoxon Rank Sum test indicated that there is no significant difference between the groups ($p = 0.12$ for the log-rank test and $p = 0.13$ for the Wilcoxon Rank Sum test).

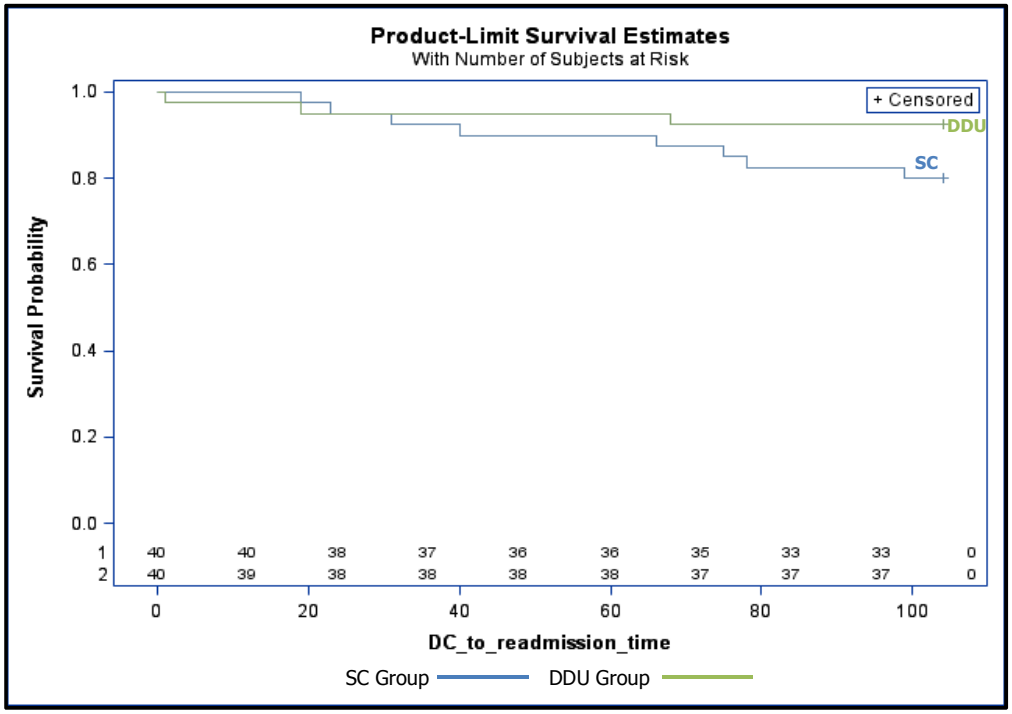

Figure 3: Readmission survival curve

As per the readmission survival curve presented in Figure 3, it is evident that neither group contained participants who survived the entire period, with no readmissions during the period under investigation. However, it should be noted that members of the DDU group demonstrated a greater time between discharge and readmission and thus, a lower rate of readmission. Unfortunately, these face-value observations were not statistically significant.

- Length of readmission for patients who were readmitted.

  There were very few patients who were readmitted during the period of the study, and the periods for which they were readmitted varied between one and thirty six weeks as presented in Figure 4.

Figure 4 demonstrates the length of readmission (weeks) in the SC group and the DDU group. In the SC Group, there were eight re-admissions, two of which were three weeks long and the remainder were each between three and thirty six weeks long. In the DDU Group, there were three readmissions, one each of three, six and twelve week's duration.

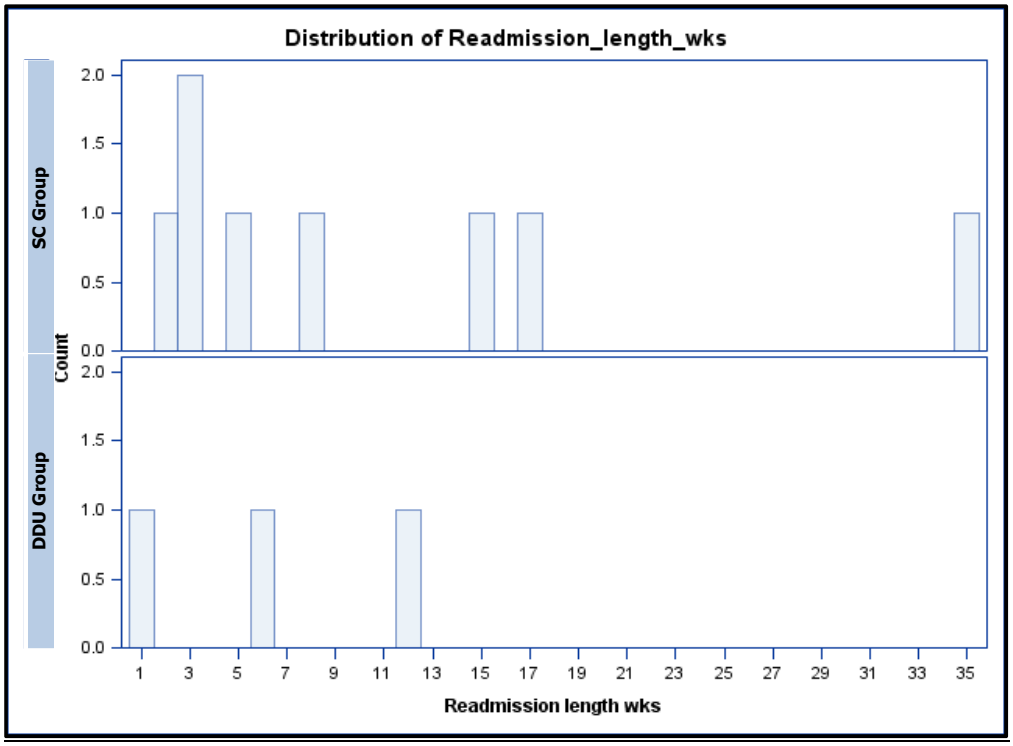

Figure 4: Distribution of readmission length across the two groups

The outcome of the Wilcoxon Rank Sum test yielded no significant difference in the duration of the first readmission of the patients from the two groups ($p = 0.62$).

- Readmissions in the period 0-12 months (yes / no)

  There was no significant association between the readmissions in the period zero to twelve months and the two groups ($p = 1.0$).

- Readmissions in the period 13-24 months (yes / no)

  There was no significant association between the readmissions in the thirteen to twenty four month period and the two groups ($p = 0.15$).

- Number of readmissions in the period 0-12 months

  This test was hampered by the limited number of readmissions and consequently, the limited number of categories in the associated zero to twelve month variable. Data in this test was categorised as 'none', 'once' and 'more than once' to enable analysis, and yielded $p = 1.0$. Thus there is no significant association between the two groups.

- Number of readmissions in the period between thirteen and twenty four months following discharge. This test returned a $p = 0.15$, with no significant association between the two groups.

- Reason for readmission

  This data set focused only on those patients who were readmitted and thus, comprised a small sample. There was no significant association between the reason for readmission in the two groups ($p = 0.38$).

8.0 Analysis of selected covariates and readmission

The purpose of this analysis was to determine if there were any significant relationships between specific covariates and the incidence of readmission, for example, is there a relationship between the presence of schizophrenia and the incidence of readmission, or the marital status of a patient and the incidence of readmission.

8.1 Demographic variables

A summary of the analysis of demographic variables is provided in Table 26. Based on the test results, there are no significant associations between any of the demographic variables and the incidence of readmission.

Table 26: Demographic variables and readmission

Axis I Diagnosis	P Value	Outcome - Readmission
Marital status	*p = 1.0*	Fisher's Exact Test: No significant association.
Social support	*p = 1.0*	Fisher's Exact Test: No significant association.
Follow-up location	*p = 0.89*	Fisher's Exact Test: No significant association.

- Marital status

  There was no significant association between marital status and readmission (*p = 1.0*). All the readmitted patients (n=11) were single, as was 93.75% n=75 of the sample.

- Social support

  There was no significant association between social support and readmission (*p = 1.0*). All the readmitted patients (n = 11) had family support, as did 97.5% of the sample.

- Follow-up location

  There was no significant association between follow-up location and readmission (*p = 0.89*). Ten of the eleven readmitted patients were referred for follow-up at their local clinic, as was 78.8% of the sample.

In summary, demographic variables such as Marital Status, Social Support and Follow-up Location yielded no significant association to the readmission of participants in either group.

8.2 Type of Axis I diagnosis

As per Table 27, no statistically relevant associations were found between any of the Axis I diagnosis variables and patient readmission in either of the groups.

Table 27: Type of Axis I diagnosis and incidence of readmission

Axis I Diagnosis	p Value	Outcome – Incidence of Readmission
Alcohol use	*p = 1.0*	No significant association.
Alcohol dependence	*p = 1.0*	No significant association.
BDI	*p = 0.31*	No significant association.
MDD	*p = 1.0*	No significant association.
SIMD and SIPD	*p = 0.73*	No significant association.
SAD	*p = 1.0*	No significant association.
Schizophrenia	*p = 1.0*	No significant association.
Substance use	*p = 0.72*	No significant association.
Substance dependence	*p = 1.0*	No significant association.
Other	*p = 0.14*	No significant association.

Following from Table 27, there was no statistically significant relationship between the presence of any of the Axis I diagnosis variables and patient readmission in either of the groups.

The *number* of Axis I diagnoses and readmission was also tested to determine if there is a significant relationship to the incidence of readmission. The Wilcoxon Rank Sum test yielded $p = 0.72$, implying that there is no difference in the number of Axis I diagnoses between patients who were readmitted and those who were not.

8.3 Type of substances used

A summary of test results is provided in Table 28. In general, no statistically relevant associations were found between any of the substance use categories and patient readmission rates in either of the groups.

Table 28: Substance use and incidence of readmission

Substance	p Value	Outcome – Incidence of Readmission
Alcohol	$p = 0.19$	No significant association.
Cannabis	$p = 0.35$	No significant association.
CAT	$p = 0.58$	No significant association.
Cocaine / Crack	$p = 1.0$	No significant association.
Ecstasy	$p = 0.35$	No significant association.
Heroin	$p = 1.0$	No significant association.
Mandrax	$p = 0.62$	No significant association.
Nyaope	$p = 1.0$	No significant association.
Other	$p = 0.36$	No significant association.

9.0 Discussion

9.1 Covariate analysis across groups

As mentioned previously, it was hoped that by matching the two groups, significant differences in their characteristics would be limited and the covariate analysis would thus act as an assurance that the outcomes attained could be attributed to the difference in treatment protocols, that is, treatment within a DDU context as opposed to a SC non-DDU treatment program and not to differences in group composition. This study, therefore, did not support the findings of earlier studies (3, 22) that suggest that management in an integrated dual diagnosis setting improves outcomes and decreases relapse and readmission rates. This study does however support research that was not in favour of integrated dual diagnosis programs (17, 23).

The covariate analysis was separated into four groups for ease of analysis and interpretation. The groups are:

- Demographic-related data
- Type of Axis I diagnosis
- Type and number of substances used
- Admission and readmission characteristics

9.1.1 Demographic-related data

The covariate analysis of demographic-related data confirmed that there was no significant difference between groups on any of the demographic-related variables. This was a desirable outcome as it underscored the effectiveness of the matching process relating to these variables.

Some of the demographic variables observed in this study reflect those found in previous research, namely the study by Rodríguez-Jiménez et al. (20) as well as the study by Weich et al. (8), specifically that a higher proportion of patients with a dual diagnosis were observed to be male and of a younger age.

Although there was no statistical significance between the highest levels of education in the two groups, a larger proportion of patients in the DDU group had a higher level of educational attainment and therefore, may explain why these patients were accepted into the DDU. Patients are required to have adequate cognitive functioning and good communication skills in order to be accepted into the DDU program and to be able to engage in the program effectively. The other demographic variables were matched between the two groups and were not significant.

9.1.2 Type of Axis I diagnosis

The analysis of the number of disorders per patient across the two groups yielded no significant differences in Axis I diagnoses according to DSM-IV-TR (1) between the two groups.

Schizophrenia is the only variable which yielded a significant association between the presence in patients and the two groups. Fisher's Exact Test yielded a $p = 0.046$ and the associated $Phi = -0.26$, suggesting a weak association. There were a higher number of patients with a diagnosis of schizophrenia in the SC group compared to the DDU group as presented in Figure 5.

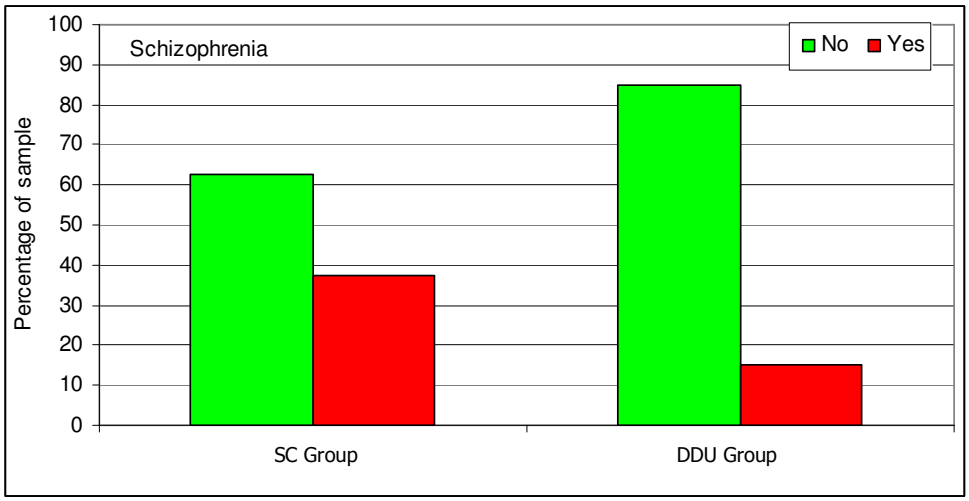

Figure 5: Prevalence of Schizophrenia across the two groups

Schizophrenia is a serious mental illness and patients present with a range of symptoms, that is, positive symptoms, negative symptoms and cognitive deficits (26). Decreased motivation, apathy, perceptual disturbances, formal thought disorder and marked cognitive impairment are some of the disabling features of this illness (27). These symptoms may have contributed to patients not being accepted into the DDU program.

The DDU program requires patients to be motivated, to have insight, to have an adequate level of functioning and to be cognitively intact so as to be able to engage in the program effectively. Thus, one can infer that the nature of schizophrenia and its sequelae may have prevented many patients from being accepted into the DDU program therefore accounting for the higher rates of this illness in the SC group. Patients in the SC group with a diagnosis of schizophrenia may have declined referral to the DDU due to lack of motivation, lack of insight and / or due to the presence of residual positive symptoms. In the SC group, schizophrenia was the second commonest diagnosis of participants following substance abuse.

Following a diagnosis of substance abuse, the diagnoses of substance induced mood disorder (SIMD) and substance induced psychotic disorder (SIPD) accounted for the highest percentage of patients in the DDU group compared to the SC group. The difference in rates of these diagnoses may also be explained by a misdiagnosis of SIMD and SIPD in the DDU group. Symptoms of SIPD are analogous to those of schizophrenia and misdiagnosis of these disorders is common (28). SIPD and SIMD may have also been misdiagnosed in patients that were intoxicated. Patients that are intoxicated present with symptoms that often resemble SIPD and SIMD thus resulting in a possible diagnosis of these disorders resulting in a higher prevalence rate in the DDU group.

In addition, SIPD and SIMD are not typically associated with cognitive deficits, thus culminating in these patients being accepted into the DDU program at a higher rate than patients with a diagnosis of schizophrenia.

9.1.3 Type and number of substances used

The Wilcoxon Rank Sum test yielded a $p < 0.0001$ indicating that there was a significant difference in the *number* of substances used by the patients in the two groups. Patients in the DDU group had a higher rate of polysubstance abuse. The remainder of the demographic variables (age, gender, employment status, marital status and social support) were matched and thus were unlikely to have influenced the difference in the number of substances abused between the two groups.

Patients' access and exposure to various substances as well as having attained a higher education level may have contributed to the higher rates of the number of substances abused by patients in the DDU group. The lower rate of schizophrenia in the DDU group

may have also negatively impacted on the rate of polysubstance abuse. Patients with schizophrenia commonly have lower levels of motivation, decreased goal directed behaviour and poorer cognitive functioning (29) which may have contributed to their use of a limited number of illicit substances (SC group).

Cannabis was the substance that was most commonly used in both groups in this study. The ECA study conducted by Regier et al. (7) found that community prevalence rates of substance dependence and abuse were as follows: cannabis 4.3%, amphetamines 1.7%, barbiturates 1.2%, cocaine 0.2%, etc. The findings related to cannabis in this study mirrored the results in the ECA study (7) even though this study focused on an inpatient population. The study by Weich et al. (8) also found that cannabis was the most commonly used substance in their study population. This study, therefore, is in line with earlier research (international and national) with regards to the high prevalence rates of cannabis abuse. This may be explained by the fact that cannabis is cheap, is often believed to be harmless and is highly accessible in all communities to people of all ages and backgrounds. It is also regarded by many as not an illicit substance and is culturally accepted in several communities.

Further analysis to identify the specific differences between the two groups indicated that alcohol, ecstasy and mandrax were significantly associated between the two groups.

Alcohol: There was a significant association between the presence / absence of alcohol use in patients and the two groups ($p < 0.001$). The association was moderate ($Phi = 0.43$). There were more patients with alcohol use in the DDU group than in the SC group as indicated in Figure 6.

Alcohol was the second commonest used substance in both groups, but the rates in the DDU group were significantly higher. Alcohol is not an illicit substance and is often used with other substances; hence rates of use may have been underreported and or under diagnosed in the SC group. In addition, alcohol may not have been readily available to all patients as it is an expensive substance. Patients in the DDU group had a higher level of education, possibly a higher standard of living and thus may have had access to more expensive substances, such as alcohol.

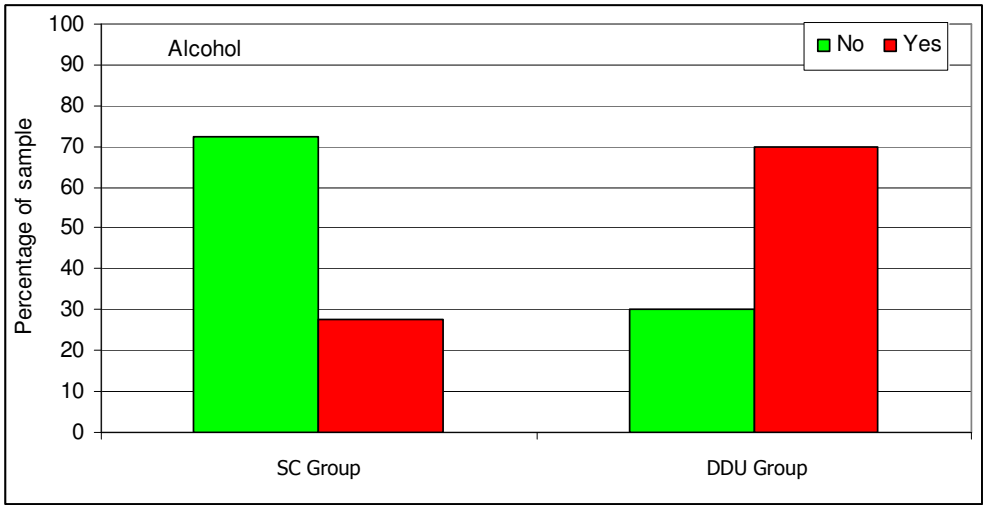

Figure 6: Prevalence of alcohol use across the two groups

Ecstasy: There was a significant association between the presence / absence of ecstasy use in patients and the two groups ($p = 0.029$). The association was weak ($Phi = 0.28$). As indicated in Figure 7, there were more patients who used ecstasy in the DDU group than in the SC group. Ecstasy is thought to be a more sophisticated substance that is expensive, thus not widely available to substance abusers in all communities. It has been found to lead to some cognitive deficits such as poor performance in memory tasks (30), but it is unlikely that this would impact on a patient's ability to engage in the DDU program. This may explain why the prevalence of ecstasy use was lower in the SC group.

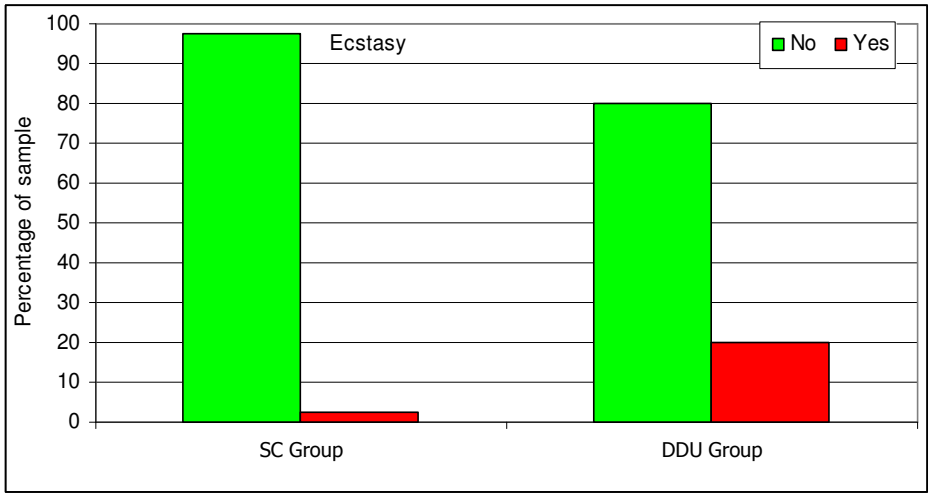

Figure 7: Prevalence of ecstasy use across the two groups

Mandrax: There is a significant association between the presence / absence of mandrax use in patients and the two groups (*p = 0.001*). The association was moderate (*Phi = 0.38*). All patients who used mandrax were in the DDU group as indicated in Figure 8.

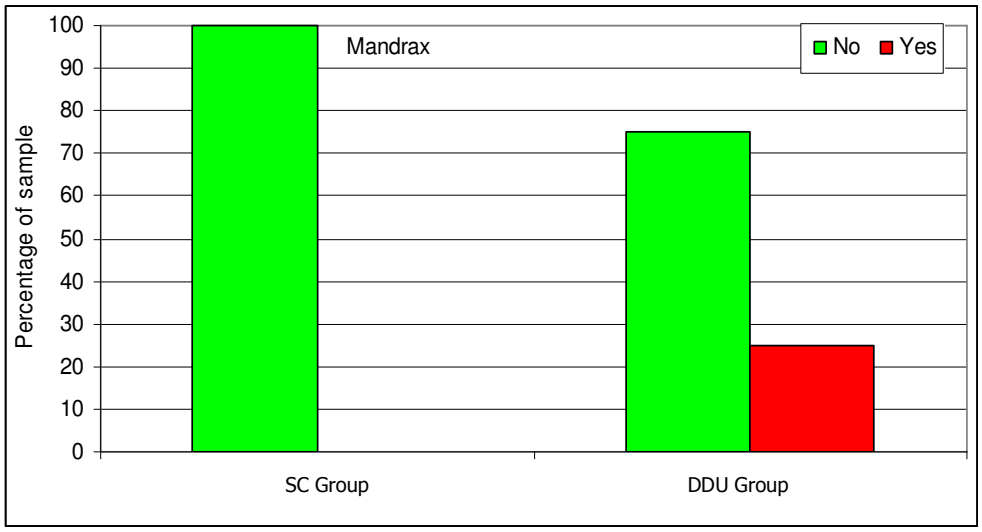

Figure 8: Prevalence of mandrax use across the two groups

It is worthy of mention that even though there are differences in substance use between the two groups, in each of the three instances that is, alcohol, ecstasy and mandrax, more patients in the DDU group used alcohol, ecstasy and mandrax in comparison to the SC group, and the impact of this should be evident in terms of the readmission rates as discussed in the section *Admission and readmission characteristics*.

The statistically significant increased rates of alcohol, mandrax and ecstasy use in the DDU group may be attributed to several factors. Namely that these substances are not easily available to patients from lower socio-economic classes, they are expensive as compared to cannabis and hence are not as easily attainable to lower income groups. Availability and access of these substances to patients in their communities may have directly influenced the prevalence rates of specific substance use in each group. Maxwell et al (31) found that methamphetamine and amphetamine use is influenced by geographical variations and availability. This may explain the increased use of mandrax and ecstasy in this sample.

Patients were accepted into the DDU program following a comprehensive assessment by the DDU's MDT if they were found to have good insight, were motivated and enthusiastic to engage in the program. Their cognitive functioning and perceived ability to engage in the DDU program successfully was also assessed. Thus, it is postulated that as patients from the DDU group had a higher level of functioning and were more motivated as compared to the SC patients, this may have influenced the type of substance initially abused by these patients, that is, substances such as alcohol, mandrax and ecstasy that are more sophisticated, more difficult to obtain, more harmful, and more expensive.

9.1.4 Admission and readmission characteristics

The pilot study conducted at the onset of this research found that the percentage of patients that were readmitted in the DDU group was 0% and in the SC group was 60% with a power of 90% at an *alpha* of 0.05. It was hoped that this study would replicate the findings of the pilot study. The readmission rates from the study and those recorded in the pilot are presented in Table 29.

Table 29: Readmission rates: pilot versus actual study

Pilot Readmission Rates	Study Readmission Rates
DDU: 0%	DDU: 7.5%
SC Group: 60%	SC Group: 20%

The readmission rates of the study were substantially lower and unfortunately did not replicate those of the pilot study. However, even though these rates are lower than those achieved in the pilot study, the trend of lower admissions amongst the DDU group when compared to the SC group is still evident, even though not significant.

An analysis of the study readmission data indicates that significant associations were found in three of the four admission and readmission-related variables analysed, that is, Follow-up location; First admission length; and The number of previous admissions. The only variable which was not significant was the *Discharged to* variable.

Follow-up location type yielded a significant result, albeit a moderate association with a *Phi = 0.34*. The nature of the differences between the groups is demonstrated in Figure 9.

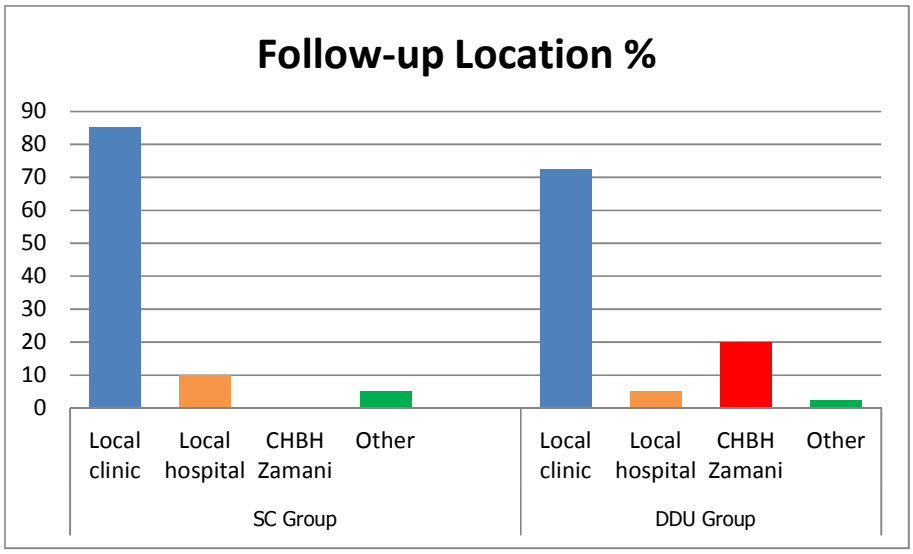

Figure 9: Differences in follow-up location between the groups

Both groups had relatively similar follow-up patterns to the patients' local clinic, local hospital and 'Other' categories. However, 20% of the DDU group had been referred to the CHBAH Zamani DD outpatient clinic for follow-up, which is a specialised outpatient dual diagnosis clinic. Patients from the Zamani DD outpatient clinic are often referred to the SFH DDU inpatient program; therefore these patients would naturally be referred back to the Zamani clinic on completion of the SFH DDU program.

Patients from the SFH DDU program would also be referred to the Zamani DD outpatient clinic for follow-up if the Zamani clinic was in close proximity to the patient's home, if the patient's illness was deemed to be more complicated and difficult to treat and if the patient agreed to attend the Zamani clinic. Patients from the SFH SC group would, however, be referred to their standard local mental health clinic.

The DDU's MDT may have been of the opinion that patients who have completed the DDU program would have better outcomes if they attended the specialised Zamani

outpatient clinic as compared to their local psychiatric clinic. The SFH DDU mental health care practitioners may have been highly invested in the DDU patients and thus referred them to an integrated outpatient dual diagnosis clinic such as Zamani, to reduce the risk of relapse and readmission. The follow-up location of patients that were readmitted did not yield statistically significant results, however, it must be noted that none of the patients referred to the Zamani outpatient clinic on discharge from SFH, were readmitted.

First admission length in weeks presented with a frequency distribution wherein the admission length is very uneven. The comparison of this spread is provided in Figure 10. The mean admission length in the SC group was 9.3 weeks with a standard deviation of 2.8 and median of 6.5 weeks while that for the DDU group was longer at 11.8 weeks, standard deviation of 1.5 and median of 10.0 weeks. This difference in the mean length of admission between the two groups, i.e. 11.8 versus 6.5 weeks, may be explained by the length of the DDU program, i.e. eight weeks long. The majority of the patients that were admitted into the DDU program were transferred from the SC care wards once they were stable thus lengthening their total admission period.

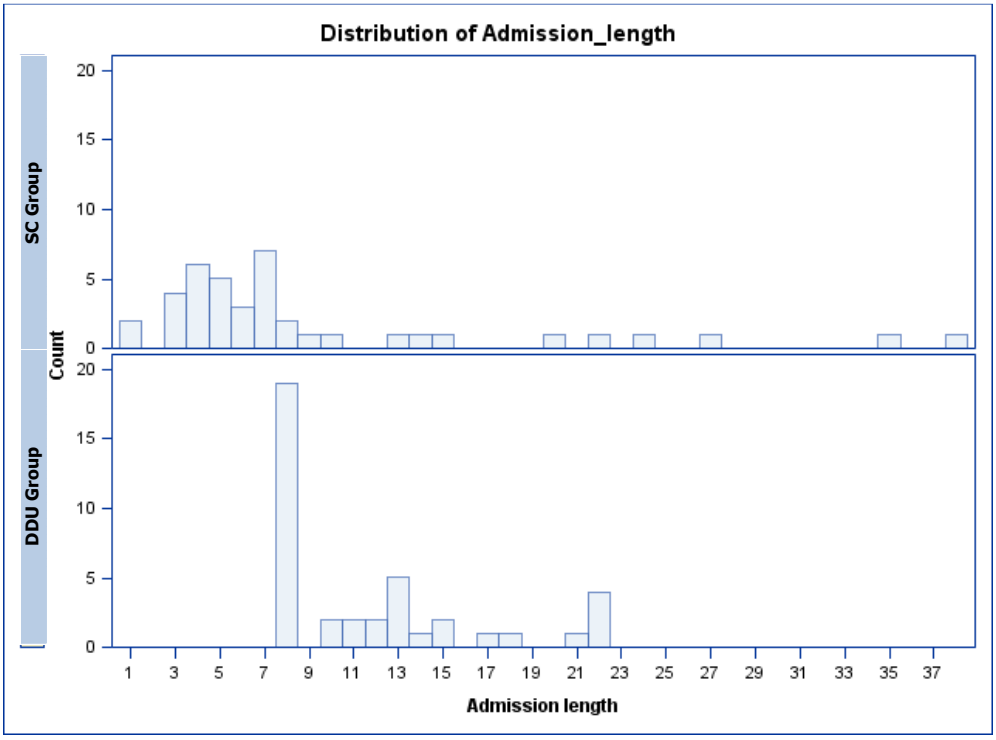

Figure 10: Distribution of admission lengths between the two groups

A longer **total admission length** (as evident in the DDU group) may have also positively influenced a patient's progress whilst in hospital as well as on their reintegration into their home environment following discharge. Unfortunately, this was not observed in this study.

The number of previous admissions (categorised) resulted in a significant association between the two groups, with a moderate *Phi = 0.36.* Both groups comprised a large percentage of patients with an unknown number of previous admissions; with nearly twice as many in the SC group than in the DDU group as indicated in Figure 11. This increased number in previous readmissions in the SC group may be attributed to the chronicity of patients that were admitted to the SC wards. This is supported by the increased rate of schizophrenia (a serious relapsing mental illness) as well as the (statistically insignificant) increased number of readmissions in the SC group as compared to the DDU group.

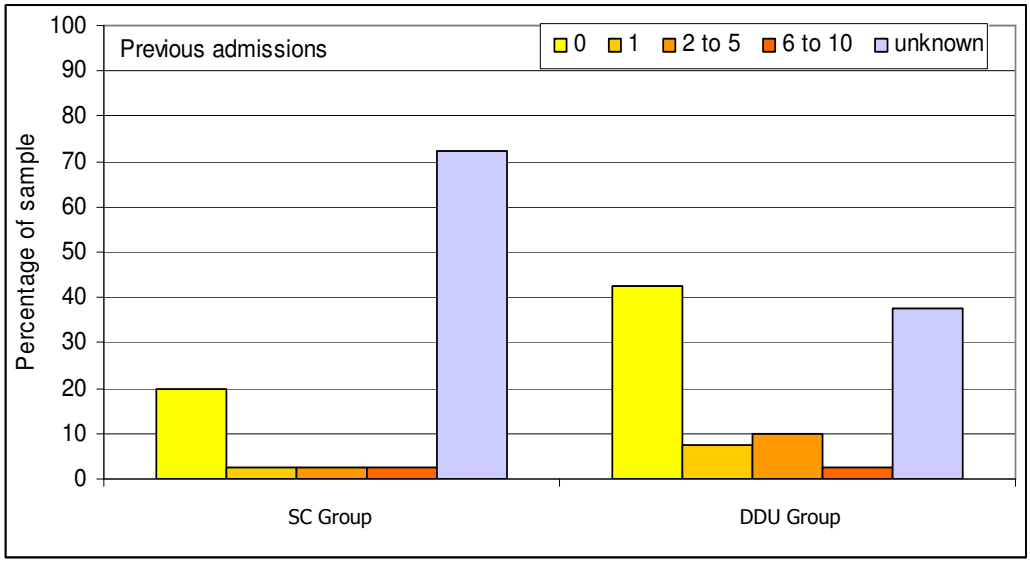

Figure 11: Previous admissions across both groups

9.1.5 Summary of demographic-related covariate data analysis

It was the intention to match the two groups as closely as possible to ensure that findings from the study could be attributed to the differences in treatment type. As per the covariate analysis, it is evident that matching was reasonably successful in terms of the demographic-related variables. The presence of schizophrenia was a significant difference between the two groups.

The rate of alcohol, ecstasy and mandrax usage in the DDU group was higher than in the SC group. It should be noted that even though the usage rates were higher in the DDU group, the number of readmissions are much lower than in the SC group as demonstrated in Table 30. This should be indicative of the influence of the DDU as an intervention in managing patients who present with both an Axis I diagnosis and co-morbid substance use.

9.2 Output variable analysis across groups

An analysis was conducted on output variables viz. Overall Readmissions, Time between Readmissions, Length of First Readmission of patients who were readmitted and Reason for Readmission; to determine if there was any statistical significance between these variables across the two groups. For all output variables tested, none of the tests yielded a significant association between the two groups.

The number of readmissions in the period zero to twelve months following discharge was specifically tested to replicate research which has shown that approximately 50% of patients with a history of severe mental illness and substance use are likely to have a recurrence of substance abuse within one year of discharge from treatment (15). Xie, McHugo, Fox and Drake (16) found that relapse was very common in the first year after discharge and by three years, approximately half of the patients in their study had relapsed. The current analysis was hampered by the limited number of readmissions and did not reflect a 50% readmission rate during the first twelve months. There is no significant association between the readmission rates of participants in the two groups in this study.

Time between readmissions did not yield any statistically significant results across the two groups; however the mean length of time between the first readmission in the SC group was 53.9 weeks and in the DDU group, 29.3 weeks. This may be attributed to the higher rates of polysubstance abuse, as well as the abuse of more sophisticated substances, namely ecstasy, mandrax and possibly alcohol in the DDU group. The shorter time period in the DDU group between discharge and readmission may be attributed to the DDU patients having higher educational levels, improved cognitive functioning (as discussed earlier), and good insight, thus having a greater understanding of their personal needs as

compared to patients in the SC groups, for example on relapse they present themselves earlier for treatment.

9.3 Analysis of selected covariates and readmission

Certain variables were selected for testing against the incidence of readmission to determine if there were significant associations towards readmission. These were categorised as follows, for easy analysis and interpretation:

- Demographic-related variables and readmission
- Type of Axis I diagnosis
- Type of substances used

9.3.1 Demographic variables and readmission

In this category, marital status, social support and follow-up location were tested. None of these variables were significantly associated with readmission. Referral to the CHBAH Zamani outpatient DD clinic did not significantly influence readmission rates between the two groups, however of the patients that had been readmitted, none had been referred to the Zamani outpatient clinic on discharge.

9.3.2 Type of Axis I diagnosis

There are no statistically significant associations to report between the type of Axis I diagnosis and the incidence of readmission between the two groups. The rates of schizophrenia were higher in the SC group, but the type of Axis I diagnosis is not likely to influence the readmission rates.

9.3.3 Type of substances used

In general, no statistically relevant associations were found between the type of substances used and readmission rates in either of the groups. The rates of alcohol, ecstasy and mandrax usage in the DDU group was higher, but did not significantly impact readmission rates.

10.0 Limitations of the study

The following limitations have been identified in this study:

- The sample size per group (n=40) was most likely too small to obtain meaningful results.
- This was a retrospective study and information in the files may have been over or under reported, thus a prospective study may have revealed more accurate information.
- The two year duration covered in this retrospective analysis may have been too short to find a meaningful trend in readmission rates.
- The lack of statistical significance on many of the variables analysed decreased the overall strength of the study findings.
- As SFH is a quaternary hospital it is unknown whether patients were readmitted to secondary or tertiary hospitals within the study period. This study focuses on readmissions to SFH, but due to limitations beyond the scope of this study, it is not known if patients were readmitted to other psychiatric institutions.
- The infancy of the DDU program, that is, the DDU program was in operation for approximately six months when data for the study was collected. It is possible that the effectiveness of the DDU may not have been realised in this period.

11.0 Conclusion and recommendations

The purpose of this study was to determine the impact of an admission to a DDU on readmission rates amongst patients discharged from SFH with substance use disorder(s) and at least one other Axis I diagnoses according to DSM-IV-TR (1). Forty patients who completed the eight week program in the DDU at SFH (DDU group) were compared to forty patients who received standard care in the acute general psychiatric wards at the same hospital (SC group).

A pilot study was conducted and yielded a 0% readmission rate for DDU patients and a 60% readmission rate in the SC group patients. It was hoped that the results from the pilot study would be replicated in the actual study, but this was not achieved. Readmission rates in the actual study were lower at 7.5% (n=3) for the DDU group and 20% (n=8) for the SC group and were not statistically significant.

The analysis of covariates highlighted a larger presence of schizophrenia in the SC group which may be explained by the admission criteria to the DDU, that is, patients with schizophrenia may have not been accepted into the DDU program. In addition, the increased prevalence of schizophrenia, a serious debilitating mental illness, may account for the increased rate of readmission in the SC group as compared to the DDU group, even though this was not found to be significant.

There was a significant association of alcohol, ecstasy and mandrax use when compared across the two groups, with the DDU group displaying higher rates of usage. The

predominant substance used in both groups was cannabis; this may explain why the readmission rates in the DDU group and SC group were not significantly different.

Eight (20%) patients in the DDU group were referred to the CHBAH Zamani DD outpatient clinic for follow-up treatment which may have contributed to the lower, but statistically insignificant, readmission rate in this group. It must be noted, however insignificant, that none of the patients that had been referred to the Zamani outpatient clinic, were readmitted.

Even though the substance use levels were greater and more sophisticated drugs were used, the readmission rate was lower (and statistically insignificant) in the DDU group as compared to the SC group. This may be due to the impact of the SFH DDU program, increased motivation and insight of patients, lower rates of serious mental illnesses such as schizophrenia in the DDU group as well as the influence of follow-up attendance at the CHBAH Zamani DD outpatient clinic.

It was hoped that this study would yield significant results that support the implementation and development of additional integrated dual diagnosis services which provide improved and aligned treatment for patients with co-morbid mental illness and substance abuse disorders. Patients that present with these disorders place a high burden on mental health services and add to the 'revolving door' syndrome. Adequate and appropriate services are needed to target this patient group to improve their prognoses, improve their level of functioning and productivity as well as decreasing the burden placed on their families, communities and society.

Further investigation with a larger sample size is required to reliably protest the value and effectiveness of a DDU in the treatment of patients diagnosed with an Axis I disorder in conjunction with a substance use disorder. Based on these proportions, a sample size of approximately 160 would be required for power = 0.90 and $\alpha=0.05$. Thus, continuation of this study with a larger sample size and possibly a longer study period would yield more reliable results for better decision and policy making.

12.0 Appendices

Appendix 1: Data Collection Sheet

Ward & allocated number:	Dual Diagnosis Group		1-40 DDU		Standard Care Group		41-80	
Initials:			DOB			Age		
Gender:	Male		Female		HLOE			
Employed:	Yes	Occupation:					Unemployed	
Marital Status:	Single		Married		Divorced		Widow	Other
Lives with:	Family		Alone		Friends		Care home / Placement	Other
Standard care group only:	Assessed for DDU and accepted	Yes	No		Refused DDU	Yes	No	
MHCA Status on admission	Assisted				Involuntary			
Date of admission to SFH:		Date of discharge:			Length of admission:			
Completed DDU program:	Yes				No			
Axis 1 Diagnosis/es:	Schiz	BDI/II	SAD	MDD	SIMD & SIPD	Substance abuse / dependence	Alcohol abuse / dependence	Other
Substance/s used:	Alcohol	Cannabis	Ecstasy	Cocaine / Crack	Heroin	Nyaope	CAT	Mandrax	Other
Discharged to:	Home		SFH acute / chronic wards		Placement / Care home		Referral Hosp / clinic	Other
Follow up	Local Clinic			Hospital			Other	
Readmission	Yes				No			
Readmission date	Discharge date of 1st readmission			Length of readmission:			Length of time between discharge & readmission	
Reason for readmission:	Non-compliance		Substance use		Both		Other	Not known
Number of readmissions after admission to SFH :	-within 1 year:			-within 2 years				

Appendix 2: Human Ethics Research Council Approval

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Tasneem Mohamed

CLEARANCE CERTIFICATE	**M110310**
PROJECT	The Impact of an Inpatient Dual Diagnosis Program on Readmission Rates to a Psychiatric Hospital in Gauteng
INVESTIGATORS	Dr Tasneem Mohamed.
DEPARTMENT	Department of Psychiatry
DATE CONSIDERED	25/03/2011
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 25/03/2011 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Dr W Friedlander

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

13.0 References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Text Revision, Washington, DC: American Psychiatric Association; 2000.

2. Drake RE, Wallach MA. Dual Diagnosis: 15 Years of Progress. Psychiatric Services. 2000;51(9):1126-9.

3. Mowbray CT, Jordan LC, Ribisl KM, Kewalramani A, Luke D, Herman S, et al. Analysis of post-discharge changes in a dual diagnosis population. Health and Social Work. 1999;24(2):91-101.

4. Sheehan MF. Dual Diagnosis. Psychiatric Quarterley. 1993;64(2):107-34.

5. Drake RE, Bartels SJ, Teague GB, Noordsy DI, Clark RE. Treatment of substance abuse in severely mentally ill patients. The Journal of Nervous and Mental Disease. 1993;181(10):606-11.

6. Bradizza CM, Stasiewicz PR, Paas ND. Relapse to alcohol and drug use among individuals diagnosed with co-occurring mental health and substance use disorders: a review. Clinical Psychology Review. 2006;26(2):162-78.

7. Regier DA, Farmer ME, Rae DS, Locke BZ, Keith SJ, Judd LL, et al. Co-morbidity of mental disorders with alcohol and other drug abuse: results from the epidemiologic catchment area (ECA) study. Journal of the American Medical Association. 1990;264(19):2511-8.

8. Weich L, Pienaar W. Occurrence of comorbid substance use disorders among acute psychiatric inpatients at Stikland Hospital in the Western Cape, South Africa. African Journal of Psychiatry. 2009;August(12):213-7.

9. Pristach CA, Smith CM. Medication compliance and substance abuse among schizophrenic patients. Hospital and Community Psychiatry. 1990;41:1345-8.

10. Wolpe P, Gorton G, Serota R, Sanford B. Predicting compliance of dual diagnosis inpatients with aftercare treatment. Hospital and Community Psychiatry. 1993;44(1):45-9.

11. Herbeck DM, Fitek DJ, Svikis DS, Montoya ID, Marcus SC, West JC. Treatment compliance in patients with comorbid psychiatric and substance use disorders. American Journal of Addiction. 2005;14(3):195-207.

12. Drake RE, Wallach MA. Substance abuse among the chronically mentally ill. Hospital and Community Psychiatry. 1989;40:1041-6.

13. Ridgely MS, Goldman HH, Willenbring M. Barriers to the care of persons with dual diagnoses: organizational and financing issues. Schizophrenia Bulletin. 1990;16(1):123-32.

14. Stahler GJ, Mennis J, Cotlar R, Baron DA. The influence of neighborhood environment on treatment continuity and rehospitalization in dually diagnosed patients discharged from acute inpatient care. American Journal of Psychiatry. 2009;166(11):1258-68.

15. Farren CK, McElroy S. Treatment response of bipolar and unipolar alcoholics to an inpatient dual diagnosis program. Journal of Affective Disorders. 2008;106(3):265-72.

16. Xie H, McHugo GJ, Fox MB, Drake RE. Substance abuse relapse in a ten year prospective follow-up of clients with mental and substance use disorders. Psychiatric Services. 2005;56(10):1282-7.

17. Hoffman GW, DiRito DC, McGill EC. Three-month follow-up of 28 dual diagnosis inpatients. The American Journal of Drug and Alcohol Abuse. 1993;19(1):79-88.

18. Cuffel B, Chase P. Remission and relapse of substance use disorders in schizophrenia: results from a one year prospective study. The Journal of Nervous and Mental Disease. 1994;182(6):342-8.

19. Drake RE, Meuser KT, Clark RE, Wallach MA. The course, treatment, and outcome of substance disorder in persons with severe mental illness. The American Journal of Orthopsychiatry. 1996;66(1):42-51.

20. Rodriguez-Jimenez R, Aragues M, Jimenez-Arriero MA, Ponce G, Munoz A, Bagney A, et al. Dual diagnosis in psychiatric inpatients: prevalence and general characteristics. Investigacion Clinica. 2008;49(2):195-205.

21. Herman SE, Boots Miller B, Jordan L, Mowbray CT, Brown WG, Deiz N, et al. Immediate outcomes of substance use treatment within a state psychiatric hospital. Journal of Mental Health Administration. 1997;24(2):126-38.

22. Drake RE, Essock SM, Shaner A, Carey KB, Minkoff K, Kola L, et al. Implementing dual diagnosis services for clients with severe mental illness. Psychiatric Services. 2001 April;52(4):469-76.

23. Drake RE, Mueser KT, Brunette MF, McHugo GJ. A review of treatments for people with severe mental illnesses and co-occurring substance use disorders. Psychiatric Rehabilitation Journal. 2004 Spring;27(4):360-74.

24. South African Community Epidemiology Network on Drug Abuse (SACENDU). Report Back Meetings, Medical Research Council, Alcohol and Drug Abuse Research Unit, September 2012. Tygerberg: Western Cape: Medical Research Council 2012.

25. Van Heerden MS, Grimsrud AT, Seedat S, Myer L, Williams DR, Stein DJ. Patterns of substance use in South Africa: results from the South African stress and health study. South African Medical Journal. 2009;99(5):358-66.

26. Flaum M, Schultz SK. The Core Symptoms of Schizophrenia. The Annals of Medicine. 1996;28(6):525-31.

27. Goldberg TE, Elvevag B. Cognitive impairment in schizophrenia is the core of the disorder. Clinical Reviews in Neurobiology. 2000;14(1):1-21.

28. Bacon A, Granholm E, Withers N. Substance-Induced Psychosis. Seminars in Clinical Neuropsychiatry; January; San Diego: San Diego Joint Doctoral Program in Clinical Psychology; 1998. p. 70-9.

29. Foussias G, Mann S, Zakzanis KK, Van Reekum R, Remington G. Motivational deficits as the central link to functioning in schizophrenia: a pilot study. Schizophrenia Research. 2009;115(2-3):333-7.

30. Klugman A, Gruzelier J. Chronic cognitive impairment in users of 'ecstasy' and cannabis. World Psychiatry. 2003;2(3):184-90.

31. Maxwell JC, Rutkowski BA. The prevalence of methamphetamine and amphetamine abuse in North America: a review of the indicators, 1992 – 2007. Drug and Alcohol Review. 2008;27(3):229-35.