

**Psychiatric Disorders and Suicidal Behaviour in Patients Seen at a
Transgender Clinic in Cape Town, South Africa**

*A Research Report to Meet the Requirements of the
Master of Medicine in Psychiatry at the University of Cape
Town*

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August 2022



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Acknowledgements

My sincere thanks and gratitude goes to my main supervisor of this research project, Dr D Pieterse whose guidance, patience and encouragement helped me complete this project. She has been an inspiration and role model to me.

A/Prof A Marais and Dr JR Torline who both have been a great support and valued mentors to me. They have continuously encouraged me as co-supervisors in this thesis. Thank you.

I wish to thank Dr R Ori and Dr J Bantjies for their critique of the protocol for this project.

Thank you to Dr M Henry and M De Bruyn for assistance with statistical analyses.

My educational supervisor, Prof S Kaliski, thank you. For his ongoing support and encouragement throughout my registrar training.

And finally, to the transgender community, thank you for providing us with greater insights into the challenges you face. From this study we hope to provide greater support to all of you.

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List of Abbreviations

| | |
|-------|--|
| DSM-5 | The Diagnostic and Statistical Manual of Mental Disorders, Version 5 |
| GSH | Groote Schuur Hospital |
| NSSI | Non-Suicidal Self-Injury |
| SA | South Africa |
| SAJP | South African Journal of Psychiatry |
| TGC | Transgender Clinic |

Glossary of Terms

Cisgender is a term for individuals whose gender identity matches the sex assigned at birth.¹

Gender refers to society's roles, behaviours and attributes labelled as masculine or feminine.^{1,2}

Gender affirming care refers to health care that respects the gender identity of the patient, as experienced and defined by the patient.²

Gender dysphoria is the distress a person feels due to their birth-assigned sex and gender not matching, or not being congruent with, their gender identity.³⁻⁵

Gender identity refers to one's personal sense and experience of gender; this can also be on a continuum between male and female and may be associated with variable levels of distress.³

Gender non-conforming are terms individuals use to describe genders that don't fall into one of the categories of male or female in a given society and historical era.^{2, 3}

Sex refers to the biological differences between males and females, especially differences in genitals and reproductive capabilities; it is to assign an individual to a sexual category: assigned sex – male or female.^{1,3}

Transgender or *gender incongruence* describes individuals whose gender identity and gender expression or experience are incongruent with their assigned sex.^{2,3}

Trans-female/trans-woman refers to a person who was assigned male at birth and whose gender identity is female.³

Trans-male/trans-man refers to a person assigned female at birth but whose gender identity is male.³

Abstract

Prepared for submission to the *South African Journal of Psychiatry (SAJP)*

Background: International research indicates that due to the impact of stigma, marginalisation and discrimination, transgender individuals are a vulnerable population at risk of psychiatric disorders and suicidal behaviour. Despite this, there is a lack of research on the prevalence of mental health conditions and suicidal behaviour amongst transgender individuals in South Africa.

Aim: To assess the prevalence of psychiatric disorders and suicidal behaviour in transgender individuals seen at the Transgender Clinic at Groote Schuur Hospital. To provide an improved understanding of the mental health needs of individuals attending the TGC.

Setting: This study was conducted at the multidisciplinary Transgender Clinic at Groote Schuur Hospital, South Africa.

Methods: The study was a retrospective folder review of individuals attending the clinic from November 2018 until December 2019.

Results: 44 individuals attended the clinic during the study, all of which were included in the analysis. Depression was the most commonly self-reported symptom (n=13, 29.5%). Other common symptoms included those of panic and generalised anxiety (n=10, 22.7%). After assessment at the TGC, thirty-one (70.5%) individuals met the criteria for a psychiatric disorder. Mood disorders were the most common DSM–5 diagnoses (n=28, 63.6%). Thirteen (41.9%) individuals with a current psychiatric disorder were on treatment. Almost three-quarters of the individuals (n=32, 72.7%) reported alcohol consumption, of which only 2 individuals (4.5%) reported regular daily consumption. Twenty-one individuals were tobacco smokers (47.7%), and approximately one-third used cannabis (n=16, 36.4%). Eighteen (40.9%) individuals reported suicidal behaviour, and fourteen (31.8%) non-suicidal self-injury.

Conclusion: Transgender individuals attending the GSH Transgender Clinic had a high prevalence of psychiatric disorders and suicidal behaviour. Our improved understanding of the mental health needs of individuals attending the Transgender Clinic will better inform future gender affirming care.

Keywords: gender non-conforming; mental health; non-suicidal self-injury; psychiatric disorders; South Africa; suicidal behaviour; transgender

Publication Ready Manuscript prepared for the *South African Journal of Psychiatry*

Psychiatric Disorders and Suicidal Behaviour Seen at a Transgender Clinic in South Africa

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Introduction

Worldwide research indicates that transgender individuals are a vulnerable population group highly at risk of psychiatric conditions and suicidal behaviour.⁶⁻⁸ There is an increasing awareness of the impact of stigma, marginalisation and discrimination on the mental health of individuals who identify as transgender.⁹ Wanta and Unger (2017) reviewed transgender literature published from January 1950 to June 2016, noting a paucity of published data on the care of transgender patients and outcomes related to their care. Their study also noted a lack of published data addressing the provision and evaluation of gender-affirming healthcare services and the outcomes of care.¹⁰ A research report addressing the realities of violence, mental health and access to health care related to sexual orientation and gender identity and expression in South Africa raises awareness of the broad ranging negative consequences of stigma, prejudice, marginalization and discrimination on the health of gender minority individuals in South Africa.⁹ Concerns have been raised about the lack of South African research to inform health care programmes and services for transgender individuals.¹

Recent research from the United States of America (USA) suggests that psychiatric disorders are highly prevalent among transgender and gender non-conforming individuals.⁶ Multiple mental health disparities affect transgender people at a higher rate than cisgender people (those whose gender identity matches the sex assigned at

birth), including depression, anxiety, suicidal ideation and suicide attempts, and nonsuicidal self-injury (NSSI). A study conducted across multiple sites in the USA concluded that transgender individuals (n=1683) compared to cisgender individuals had higher rates of depression (30% compared to 25%) and anxiety (28% compared to 18%), whilst the prevalence of bipolar disorder and schizophrenia remained the same between transgender and cisgender communities.⁶ A 2013 analysis of cross-sectional data in a large, online worldwide sample (n=1093) found that transgender respondents had a high prevalence of clinical depression (44%) and anxiety (33%).¹¹

A recent South-African cross-sectional study was performed looking at mental health disparities amongst transgender individuals.¹² It demonstrated that transgender individuals are more likely to experience higher rates of verbal harassment as well as violence than the general population when trying to access healthcare. The findings from the study confirm that in South Africa, social exclusion, marginalisation and stigma due to non-normative sexual orientation and/ or gender identity has a negative impact on mental health and wellbeing. The study demonstrated the urgent need for mental health services that are affirming of sexual and gender diversity and are provided without sexual orientation and gender identity-related stigma, prejudice and discrimination.

Amongst other concerns, there is growing evidence around the burden of substance use amongst transgender individuals.⁶ Research on substance use amongst the transgender community in the Dominican Republic revealed that the impact of illicit substances may be more severe than initially hypothesised, and quite often the substance usage by this population is not reported.¹³ Studies conducted in other parts of the world found that stigma was associated with an increase in substance use amongst transgender women.^{6,14}

Mental health disorders and NSSI are common in transgender individuals, and there is a gap in the literature regarding rates in the South African transgender population. Within the United Kingdom (UK) and USA, NSSI rates were shown to be higher in the transgender population compared to cisgender population in both adults and youth, with an increased rate of NSSI in transgender men compared to transgender

women.^{11,15,16} NSSI, in these studies, has been linked to stigma, lower self-esteem and a younger age.^{11,16} Worldwide studies have shown that transgender individuals attempt suicide more frequently than cisgender individuals.^{16,17} Transgender persons presenting after non-fatal suicide (commonly referred to as a suicide attempt) have been shown to have additional risk factors such as substance abuse, physical abuse, sexual abuse, affective disorders, discrimination and stigmatisation – thus placing them at higher risk of fatal suicide, compared to cisgender individuals.^{18,19} Transgender persons with NSSI reported more psychological and interpersonal problems and perceived less social support than those without NSSI.²⁰ Recommendations made by studies of transgender individuals suggest that prevention and treatment of depression are most likely to reduce suicidal behaviour and that specific crisis services, such as mental health services and crisis centres, appear to play an important role in suicide prevention.⁷

The number of individuals presenting to gender clinics worldwide is increasing, thus more comparative work between countries is needed to establish optimal guidelines for this community.²¹ More research into the health care services available to transgender persons is needed for both individuals and health care professionals alike to promote public policies that favour the integration of transgender individuals into society. Recognising a vacuum in the literature, this study sought to investigate the incidence of co-occurring mental illnesses and suicidal behaviour among people who visited the Groote Schuur Hospital's (GSH) Transgender Clinic (TGC) in South Africa (SA). An improved understanding of the mental health needs of individuals attending the TGC will better inform future prevention, diagnosis and treatment of mental health conditions associated with conditions related to the oppression and stigmatisation that gender incongruent person's experience.

Research Methods and Design

Study Design

A retrospective descriptive cross-sectional folder review was used in this investigation.

Study Setting

The study was conducted at the TGC at GSH in Cape Town, SA. GSH is an urban, government-funded tertiary hospital with 893 beds serving an estimated 1.7 million individuals.²² The TGC is a monthly outpatient clinic that receives about 2 to 4 new referrals per month from all around the Western Cape Province.

Study Population and Sampling Strategy

All new individuals seen at the clinic from November 2018 until the end of December 2019 were included in the study. Since November 2018, new referrals were interviewed with a standardised history-taking and assessment booklet, making the data more reliable than previously. All individuals attending the TGC during the study period were included in the analysis. No exclusion criteria were applied to this study, all individuals were included.

Data Collection

The interview was conducted in a semi-structured way by a psychiatrist, a clinical psychologist or both. Psychiatric diagnoses were made using the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM–5).⁴ The TGC does extensive history and assessments of all individuals, but for the purpose of this study only limited information was extracted and analysed. The following information was extracted from the standardised history-taking and assessment booklet and entered into a database:

1. Socio-demographic details including age, assigned gender at birth, gender identity, and relationship status.
2. Diagnosis of gender dysphoria - including early-onset (before the age of 12), late-onset (after the age of 12), stage of transitioning (pre- or post-transition), and the presence of differences (disorder) of sex development.
3. The presence of current psychiatric symptoms and a diagnosis of a DSM-5 psychiatric disorder.
4. Current pharmacological psychiatric treatment.

5. Past or recent suicidality and non-suicidal self-injury (NSSI). Suicidality refers to engagement or thoughts of engagement in potentially self-injurious behaviours with at least some intent to die from the behaviour. In contrast, NSSI is defined as direct and deliberate destruction of body tissue without suicidal intent.
6. Past or current substance use.

Data Analysis

Data were analysed using SPSS Version 25. To describe the socio-demographic and clinical characteristics of individuals presenting to the TGC, descriptive statistics were generated using means and standard deviations (for continuous variables) and proportions (for categorical variables). Due to the purely descriptive nature of this study and the small sample size, no inferential statistical analyses were performed.

Ethical Considerations

Data were anonymised, and hospital folder numbers were substituted with research numbers to ensure privacy and confidentiality. A folder review was conducted and no patient interviews were conducted by the researcher. Explicit patient consent was not obtained as information was collected as part of routine clinical work. All data was anonymised to minimise the risk to participants. Ethical approval was obtained from the Human Research Ethics Committee (HREC 072/2020) at the University of Cape Town (UCT). Permission was granted from GSH to conduct this study.

Results

Participant Characteristics (n=44)

A total of 44 individuals were seen at the TGC during the fourteen-month study period. The average age of attendees was 28.6 years (\pm 9.8 years). The assigned gender (sex assigned at birth) distribution comprised of 28 (64%) male and 16 (36%) female individuals. No individuals reported a difference (disorder) of sexual development. Twenty-five (56.8%) individuals identified as transfemale, 13 (29.5%) transmale and 6 (13.8%) as non-binary. Most individuals were single (n=31; 70.5%) while 22.7% (n=10) were in a relationship.

All individuals met the DSM–5 criteria for gender dysphoria. The majority of these (n=33; 75%) reported gender dysphoria at an early age (before the age of 12) and were in the post-transition stage (n=29, 65.9%) at the time of the assessment. Post-transition is defined as the stage in which the individual has transitioned to full-time living in the desired gender (with or without legalisation of gender change) and has undergone (or is preparing to undergo) at least one gender-affirming medical or surgical procedure.

A sub-analysis of self-reported symptoms, present at the initial assessment, was performed (Table 1). Depression was the most commonly self-reported symptom in this time frame (n=13, 29.5%). Other common symptoms included those of panic attacks and generalised anxiety (n=10, 22.7%) respectively (Table 1).

After assessment at the TGC, thirty-one (70.5%) individuals met the criteria for a psychiatric disorder. Mood disorders were the most common psychiatric disorder in individuals at the TGC (n=28, 63.6%) (Figure 1). Twenty-four (54.5%) individuals were diagnosed with Major Depressive Disorder, whilst only four (9%) individuals were diagnosed with Bipolar Disorder. Anxiety disorders were also prominent (n=10; 22.7%), with all ten individuals having a Generalised Anxiety Disorder. Seven (15.9%) individuals were diagnosed with Trauma and Stress related disorders, with six (13.6%) individuals having Post Traumatic Stress Disorder and one (2.3%) an Adjustment disorder. Only thirteen (41.9%) individuals with a current psychiatric disorder were receiving treatment. There were no past or present diagnoses of Dissociative Disorders or Somatic Symptom and Related Disorders.

Almost three-quarters of the individuals (n=32; 72.7%) reported alcohol consumption, of which only two individuals (4.5%) reported regular (daily) consumption (Figure 2). Just under half (n=21; 47.7%) reported tobacco use, most of them on a regular basis. Furthermore, about one-third used cannabis on an occasional or regular basis. Two (5%) individuals reported methamphetamine usage. None of the individuals reported using heroin or misuse of prescription drugs.

Suicidal Group (n=18)

Eighteen (40.9%) individuals reported past or present suicidal behaviour (Figure 3).

The age of individuals reporting suicidal behaviour ranged from 18 to 40 years (mean=27). Seven (38.9%) were assigned female, and 11 (61.1%) assigned male; whilst four (22.2%), five (27.8%) and nine (50%) identified as non-binary, transmale and transfemale respectively. Twelve (66.7%) reported that they were not in a relationship. Self-reported substance use was common in the group who reported suicidal behaviour, with 12 (66.7%) reporting tobacco use, 15 (83.3%) alcohol use and seven (38.9%) cannabis use. Sixteen (88.9%) of the individuals who reported suicidal behaviour also had a psychiatric diagnosis. The most commonly in this group being a mood disorder, 12 individuals (66.7%), followed by five (27.8%) individuals with an anxiety disorder. Of the twelve individuals with a mood disorder, 11 (61.1%) had major depressive disorder. Eleven (61.1%) individuals with suicidal behaviour also reported NSSI (Figure 3).

NSSI group (n=14)

Fourteen (31.8%) individuals reported past or current NSSI (Figure 3), ranging from 18 to 40 years of age (mean=23 years). Eight (57.1%) were assigned female and six (42.9%) male, of which five (35.7%) identified as transmale, five (35.7%) transfemale and four (28.6%) non-binary. Ten (71.4%) individuals in the NSSI group reported to be single. Substance use was reported in this group with 12 (85.7%), seven (50%), and four (28.6%) individuals reporting occasional use of alcohol, tobacco and cannabis respectively. Twelve (85.7%) individuals in the NSSI group, had a diagnosis of a mood disorder, of which ten (71.4%) had Major Depressive disorder, and six had (42.9%) an anxiety disorder.

Table 1. Symptom screen as self-reported by individuals

| Symptom (self-reported) | Present | Percentage (n=44) |
|-------------------------|---------|-------------------|
| Depression | 13 | 29.5% |
| Generalised anxiety | 10 | 22.7% |
| Panic attacks | 10 | 22.7% |
| Social anxiety | 8 | 18.2% |
| Phobias | 7 | 15.9% |
| Mania/Hypomania | 5 | 11.4% |
| Obsessive-compulsive | 3 | 6.8% |
| Trauma related | 3 | 6.8% |
| Psychosis | 3 | 6.8% |

| | | |
|--------------------|---|------|
| Eating and feeding | 1 | 2.3% |
| Body dysmorphia | 0 | 0% |

Figure 1. Psychiatric Disorders in individuals at the TGC

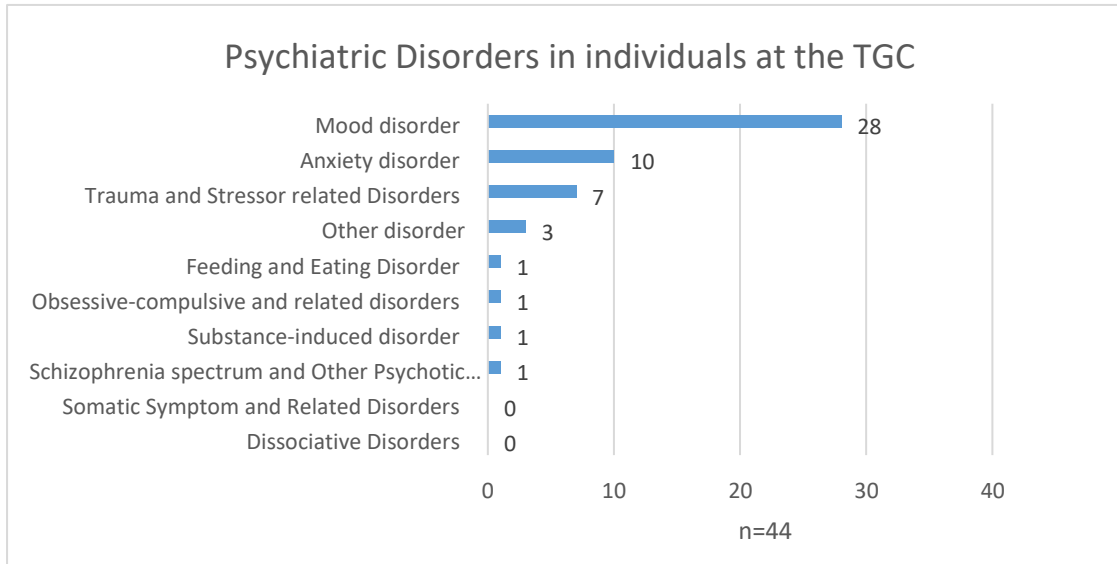


Figure 2. Substance use as reported by individuals

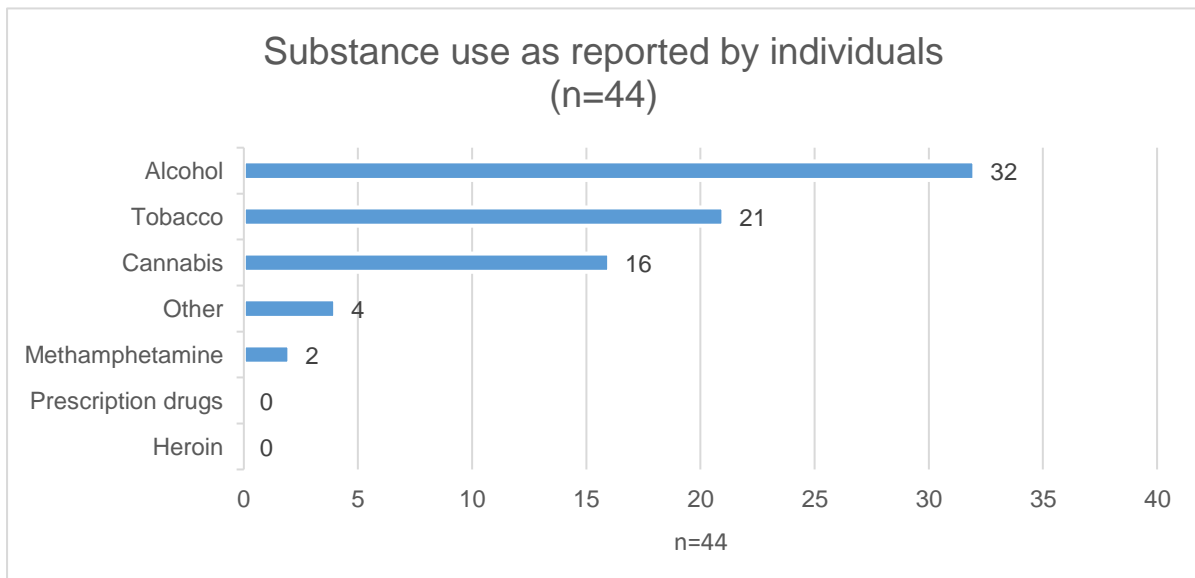
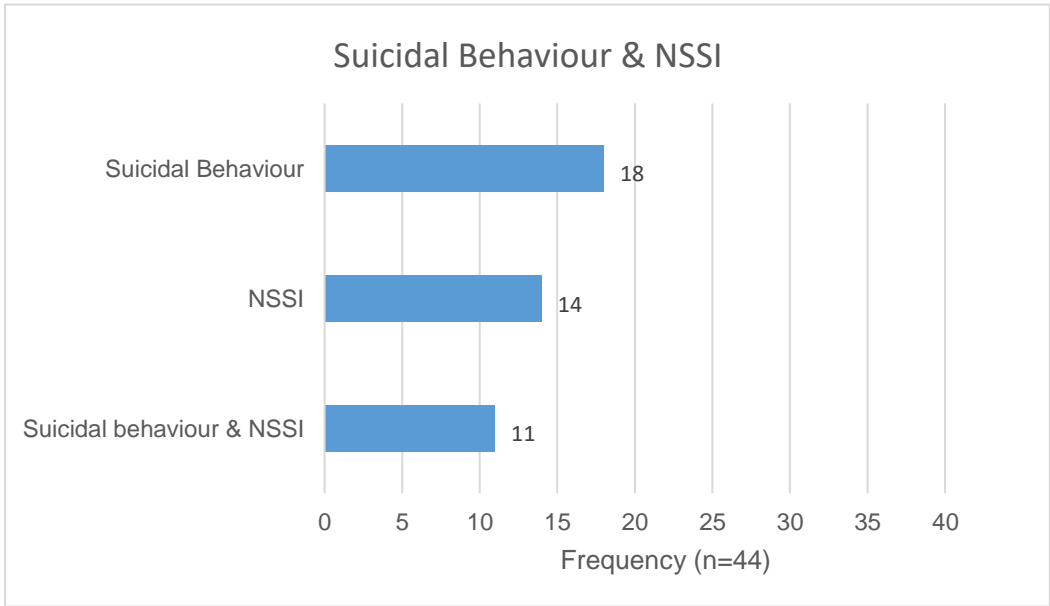


Figure 3. Suicidal Behaviour & NSSI



Discussion

The rates of psychiatric illness assessed in individuals at our in our transgender population (70.5%) exceeded the 2014 data analysis from the TGC at GSH, which showed that 20% of 102 individuals who presented to the TGC had a psychiatric illness.¹ These higher rates of psychiatric conditions may either reflect a more positive change toward acceptance of transgender individuals within the last few years and more awareness around mental health needs of this vulnerable population, or may be due to incomplete documentation upon initial assessment. The multidisciplinary team at the TGC also inform patients about their access to gender affirming health care, should they have a psychiatric disorder.

When looking at specific DSM–5 diagnoses, findings appeared to be similar to a 2013 analysis of cross-sectional data in a large, diverse online worldwide sample of 1093 individuals (n=1093).²³ This study found that respondents had a high prevalence of clinical depression (44%) and anxiety (33%), which is congruent with our results (54.5% and 22.7%, respectively). This signifies that there are ongoing mental health concerns amongst transgender individuals, and confirms the need for mental health

practitioners to be mindful of the needs of this population, as well as advocate for the ongoing requirement of gender affirming health care.

Despite high reports of depressive (29.5%) and generalised anxiety symptoms (22.7%), as well as co-occurring psychiatric illness (70.5%), the rates of individuals with psychiatric illness on treatment were low (41.9%). This may be attributed to these individuals receiving psychosocial support from non-governmental organisations within the community. It can also be explained by a lack of access to care and stigma preventing people from seeking help, especially in a resource limited setting like SA, with increased barriers to accessing care.

A worldwide literature search conducted by Virupaksha et al.²⁴ revealed that the suicide attempt rate among transgender persons ranged from 32% to 50% across countries. Our study found similar results (40.9%), the similarity of these results with worldwide results indicate that, despite the additional hardships faced by transgender individuals within SA, such as a lower socioeconomic status and barriers to access to care, suicidal behaviour and NSSI rates remain in keeping with worldwide studies.

Research on substance use amongst the transgender community in the Dominican Republic revealed that the impact of illicit substances might be more severe than initially hypothesised, and quite often the substance use by this population is not reported.¹³ Studies conducted in other parts of the world found that stigma was associated with an increase in substance use amongst transgender women.^{13,14} These studies show that whilst heavy alcohol use (five or more drinks in a single day) and higher use of cannabis were reported, the most frequently used illicit drug was methamphetamine. These findings seemed congruent with our study, in which 16 individuals (36%) reported cannabis usage, while methamphetamine was used by two (5%) individuals (Figure 2). As this study was limited to only looking at substance use, and no substance use disorders were diagnosed, the results were difficult to generalise.

Some limitations of this study have to be considered. This study was performed in a single tertiary level hospital in the Western Cape with a relatively small cohort of individuals. The results generated may not be generalised to the rest of the Western

Cape or South Africa in general. Cape Town is an urban area, which is not generalisable to the most marginalised people in rural areas, where there are more barriers to access to care. There are also different health care services available to South Africans namely private and public healthcare, not all transgender individuals in Cape Town present to GSH TGC for assessment, so the sample may be limited depending on the individual's access to care and referral pathways available. The data was based on the limited assessment of the individuals, over one to two interviews, and relied on the history provided by the individuals, with limited collateral information available. Individuals may have provided a slanted history for various reasons, such as fear of marginalisation. Assessments are made by one to three clinicians and may be influenced by the clinician's experience(s). Interviews at the TGC are conducted in a semi-structured interview; thus, the content of these interviews is largely determined by the clinician's clinical experience and the ability of the individual's ability to express themselves. Although a checklist is used to verify symptoms to make a DSM diagnosis, clinicians are responsible for the particular questions required to complete the assessment. As a result, the DSM diagnoses may become less reliable. A limitation of using semi-structured interviews is that the quantification may not be as precise as expected with a structured interview using specific pre-determined questions. Although data on substance use was collected, substance use disorders were not explicitly quantified.

Given the high mental health burden faced by individuals presenting at the TGC, we propose that clinics assisting transgender people ideally have a multidisciplinary team to provide comprehensive care - including a psychiatrist and/or psychologist. Improved access to mental health care for transgender individuals is important for health equity. Providing additional mental health and psychosocial resources within our service will further promote better transgender care. More research into understanding factors that contribute to the mental health burden of transgender individuals is needed, as well as identification of areas within communities for gender-affirming services, such as psychosocial interventions and therapeutic support. The authors would recommend further clinical research, be conducted at the TGC looking at the lived experiences of individuals to better understand the needs of this population.

Conclusion

Although there is emerging literature, there remains a need for ongoing research for transgender individuals regarding their mental health burden and needs, especially within the South African context. This study demonstrates that transgender individuals remain a vulnerable population, with high rates of psychiatric disorders and suicidal behaviour. There remains a compelling need to improve access to care for this population and to improve gender-affirming services within SA.

Acknowledgements

The authors recognise the power dynamics often present in trans and GNC healthcare seeker/provider encounters. They endeavoured to conduct this research respectfully to broaden and deepen awareness of trans and gender diversity. The authors would like to thank all the participants in the study for aiding in bettering future services we can provide at the TGC. Our sincerest gratitude is also extended to Dr Rasmita Ori and Dr Jason Bantjes for critique and recommendations to the research protocol and Dr M Henry and M De Bruyn for assistance with statistical analyses.

Competing interests

The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

Author contributions

All authors conceptualised the study. FD collected the data and wrote the final draft. DP, AM and JT supervised the study and edited the article.

Funding

The authors have nothing to disclose.

Data availability

Data sharing and availability does not apply to this article as no new data were created or analysed in this study.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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Supervisor Declaration

The journal publishing the paper is accredited by the Department of Higher Education and Training or it has been approved by the UCT Health Sciences Specialist Training Committee and:

- The candidate is the first author on the paper
- The candidate contributed the most to the paper
- The candidate developed the protocol and wrote the paper under supervision • The candidate was involved in the analysis, presentation and interpretation of results
- The other authors and their contributions to the paper are stated.

Signed:

Dr D Pieterse

Appendices

Appendix I: Data Collection Sheet

Research Number:

| Question | Options for answer | Patient's Answer |
|---|---|------------------|
| <u>Socio-demographic:</u> | | |
| Age | | |
| Assigned gender (sex assigned at birth) | Male/Female | |
| Identified gender | Male (transmale)/Female (transfemale)/gender non-binary | |
| Marital status | Single/Relationship/Married/Divorced/Widowed | |
| <u>Clinical:</u> | | |
| Gender dysphoria diagnosis | Yes/No | |
| - Specifier for gender dysphoria | Early onset/late-onset | |
| - Stage of transition | Pre-transition/post transition/preparing | |
| Disorder of sexual development | Yes/No, Specify | |
| <u>Symptom Screen:</u> | | |
| Depression (symptoms of) | Yes/No | |

| | | |
|----------------------------------|--------|--|
| Mania/Hypomania (symptoms of) | Yes/No | |
|----------------------------------|--------|--|

| | | |
|---|-----------------|--|
| Generalised anxiety (symptoms of) | Yes/No | |
| Social Anxiety (symptoms of) | Yes/No | |
| Panic Symptoms | Yes/No | |
| Phobias (symptoms) | Yes/No | |
| Obsessive-compulsive symptoms | Yes/No | |
| Trauma-related symptoms | Yes/No | |
| Psychosis (symptoms of) | Yes/No | |
| Eating and feeding symptoms | Yes/No | |
| Body Dysmorphia symptoms | Yes/No | |
| <u>DSM Diagnosis:</u> | | |
| Schizophrenia spectrum and Other Psychotic disorder (past) | Yes/No, Specify | |
| Schizophrenia spectrum and other psychotic disorder (present) | Yes/No, Specify | |
| Mood disorder (past) | Yes/No, Specify | |

| | | |
|-------------------------|-----------------|--|
| Mood disorder (present) | Yes/No, Specify | |
| Anxiety disorder (past) | Yes/No, Specify | |

| | | |
|--|-----------------|--|
| Anxiety disorder (present) | Yes/No, Specify | |
| Substance-induced disorder (past) | Yes/No, Specify | |
| Substance-induced disorder (present) | Yes/No, Specify | |
| Obsessive-compulsive and related disorders (past) | Yes/No, Specify | |
| Obsessive-compulsive and related disorders (present) | Yes/No, Specify | |
| Trauma and Stressor related Disorders (past) | Yes/No, Specify | |
| Trauma and Stressor related Disorders (present) | Yes/No, Specify | |
| Dissociative Disorders (past) | Yes/No, Specify | |
| Dissociative Disorders (present) | Yes/No, Specify | |
| Somatic Symptom and Related Disorders (past) | Yes/No, Specify | |

| | | |
|--|------------------|--|
| Somatic Symptom and Related Disorder (present) | Yes/No, Specify | |
| Feeding and Eating Disorder (past) | Yes/No, Specify | |
| Feeding and Eating Disorders (present) | Yes/No, Specify | |
| Other disorder | Yes/No, Specify | |
| | | |
| Suicidal behaviour (past/recent) | Yes/No | |
| Self-harming behaviours (past/present) | Yes/No | |
| If there is a current psychiatric disorder – is the individual currently on treatment? | Yes/No | |
| <u>Substance Use:</u> | | |
| Tobacco usage | Yes/No, Quantify | |
| Alcohol usage | Yes/No, Quantify | |
| Cannabis usage | Yes/No, Quantify | |
| Methamphetamine usage | Yes/No, Quantify | |
| Heroin usage | Yes/No, Quantify | |
| Prescription drugs abuse | Yes/No, Quantify | |

| | | |
|------------------|------------------------------|--|
| Other substances | Yes/No, Quantify and specify | |
|------------------|------------------------------|--|

Appendix II: UCT Human Research Ethics Committee Approval



Z
UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room G50- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-enquiries@uct.ac.za

Website: www.health.uct.ac.za/fhs/research/humanethics/forms

13 March 2020

HREC REF:072/2020

Dr D Pieterse
Psychiatry & Mental Health
2nd Floor
Drs Bungalows -GSH

Dear Dr Pieterse

PROJECT TITLE: PSYCHIATRIC DISORDERS AND SUICIDAL BEHAVIOUR IN PATIENTS SEEN AT A TRANSGENDER CLINIC IN CAPE TOWN, SOUTH AFRICA (MMED DEGREE - DR FATIMA DANGOR)

Thank you for your response letter addressing the issues raised by the Faculty of Health Sciences Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 March 2021.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Dr Fatima Dangor will also be involved in this study.

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 072/2020sa



FHS017: Annual Progress Report / Renewal

Record Reviews/Audits/Collection of Biological Specimens/Repositories/Databases/Registries

HREC office use only (FWA00001637; IRB00001938)

This serves as notification of annual approval, including any documentation described below.

| | | | |
|---------------------------------------|------------------------|----------------------------------|------------|
| <input type="checkbox"/> Approved | Annual progress report | Approved until/next renewal date | 30-11-2022 |
| <input type="checkbox"/> Not approved | See attached comments | | |

| | | | |
|-----------------------------------|---------------------|-------------|-----------|
| Signature Chairperson of the HREC | Signed by candidate | Date Signed | 1/12/2021 |
|-----------------------------------|---------------------|-------------|-----------|

Principal Investigator to complete the following:

1. Protocol information

| | | | |
|--|--|---|--|
| Date (when submitting this form) | 25/11/2021 | | HUMAN RESEARCH ETHICS COMMITTEE 29 NOV 2021 HEALTH SCIENCES FACULTY UNIVERSITY OF CAPE TOWN |
| HREC REF Number | 072/2020 | Current Ethics Approval was granted until | |
| Protocol title | Psychiatric Disorders and Suicidal Behaviour in patients seen at a Transgender Clinic in Cape Town, South Africa | | |
| Principal Investigator | Dr Deirdre Pieterse | | |
| Department / Office | Psychiatry and Mental Health | | |
| Internal Mail Address | Deirdre.pieterse@uct.ac.za | | |
| 1.1 Does this protocol receive US Federal funding? | | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |

2. Protocol status (tick ✓)

| | |
|--|---|
| <input type="checkbox"/> | Research-related activities are ongoing |
| <input checked="" type="checkbox"/> | Data collection is complete, data analysis only |
| Please indicate (in the block below) the titles and HREC reference numbers of any projects currently making use of the Database/registry/repository. | |
| | |

3. Protocol summary

| | |
|--|---|
| Total number of records or specimens collected, reviewed or stored since the original approval | 44 |
| Total number of records or specimens collected, reviewed or stored since last progress report | |
| Have any research-related outputs (e.g. publications, abstracts, conference presentations) resulted from this research? If yes, please list and attach with this report. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

4. Signature

| | | | |
|-----------------|---------------------|------|------------|
| Signature of PI | Signed by candidate | Date | 25/11/2021 |
|-----------------|---------------------|------|------------|

Appendix III: Groote Schuur Hospital Research Ethics Committee Approval



Western Cape
Government

Health



GROOTE SCHUUR HOSPITAL

Enquiries: Dr Bernadette Eick

e-mail: Bernadette.Eick@westerncape.gov.za

Dr Deidre Pieterse
PSYCHIATRY & MENTAL HEALTH

E-mail: deidre.pieterse@uct.ac.za / dangorf@gmail.com

Dear Dr Pieterse,

RESEARCH PROJECT: Psychiatric Disorders And Suicidal Behaviour In Patients Seen At A Transgender Clinic In Cape Town, South Africa, (MMed Dr Fatima Dangor)

Your recent letter to the hospital refers.

You are granted permission to proceed with your research, which is valid until **30 March 2021**.

Please note the following:

- a) Your research may not interfere with normal patient care.
- b) Hospital staff may not be asked to assist with the research.
- c) No additional costs to the hospital should be incurred i.e. Lab, consumables or stationary. **If access to TRACK Care/NHLS is required, kindly attach our letter of approval to the application form.**
- d) **No patient folders may be removed from the premises or be inaccessible.**
- e) Please provide the research assistant/field worker with a copy of this letter as verification of approval.
- f) Confidentiality must always be maintained .
- g) **Should you at any time require photographs of your subjects, please obtain the necessary indemnity forms from our Public Relations Office (E45 OMB or ext. 2187/2188).**
- h) Should you require additional research time beyond the stipulated expiry date, please apply for an extension.
- i) Please discuss the study with the HOD before commencing.
- j) Please introduce yourself to the person in charge of an area before commencing.
- k) On completion of your research, please forward any recommendations/findings that can be beneficial to use to take further action that may inform redevelopment of future policy / review guidelines.
- l) Please contact Michelle Riley (Patient Fees) at ext. 2276 to ascertain if there will be charges for conducting the Research and to obtain a quote or to discuss charges
- m) **Kindly submit a copy of the publication or report to this office on completion of the research.**
- n) **At no time should any posters encouraging patients to partake in research, be displayed within a clinical area.**

I would like to wish you every success with the project.

Yours sincerely

Signed by candidate

DR BERNADETTE EICK
CHIEF OPERATIONAL OFFICER
Date: 16 April 2020

C.C. Mr. L. Naidoo, Dr T. Numanoglu, Professor D. Stein

G46 Management Suite, Old Main Building,
Observatory 7925
Tel: +27 21 404 6288 fax: +27 21 404 6125

Private Bag X,
Observatory, 7935
www.westerncape.gov.za/health

Appendix IV: Submission Guidelines for the South African Journal of Psychiatry

Original Research Article

An original article provides an overview of innovative research in a particular field within or related to the focus and scope of the journal, presented according to a clear and well-structured format. Systematic reviews should follow the same basic structure as other original research articles. The aim and objectives should focus on a clinical question that will be addressed in the review. The methods section should describe in detail the search strategy, criteria used to select or reject articles, attempts made to obtain all important and relevant studies and deal with publication bias (including grey and unpublished literature), how the quality of included studies was appraised, the methodology used to extract and/or analyse data. Results should describe the homogeneity of the different findings, clearly present the overall results and any meta-analysis.

Word limit 3000-4000 words (excluding the structured abstract and references)

Structured abstract 250 words to include a Background, Aim, Setting, Methods, Results and Conclusion

References 60 or less

Tables/Figures no more than 7 Tables/Figure

Ethical statement should be included in the manuscript

Compulsory supplementary file ethical clearance letter/certificate

Original Research Article full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract, written in English, should be no longer than 250 words and must be written in the past tense. The abstract should give a succinct account of the objectives, methods, results and significance of the matter. The structured abstract for an Original Research article should consist of six paragraphs labelled Background, Aim, Setting, Methods, Results and Conclusion.

- Background: Summarise the social value (importance, relevance) and scientific value (knowledge gap) that your study addresses.
 - Aim: State the overall aim of the study.
 - Setting: State the setting for the study.
 - Methods: Clearly express the basic design of the study, and name or briefly describe the methods used without going into excessive detail.
 - Results: State the main findings.
 - Conclusion: State your conclusion and any key implications or recommendations.
- Do not cite references and do not use abbreviations excessively in the abstract.

Introduction: The introduction must contain your argument for the social and scientific value of the study, as well as the aim and objectives:

- **Social value:** The first part of the introduction should make a clear and logical argument for the importance or relevance of the study. Your argument should be supported by use of evidence from the literature.
- **Scientific value:** The second part of the introduction should make a clear and logical argument for the originality of the study. This should include a summary of what is already known about the research question or specific topic, and should clarify the knowledge gap that this study will address. Your argument should be supported by use of evidence from the literature.
- **Conceptual framework:** In some research articles it will also be important to describe the underlying theoretical basis for the research and how these theories are linked together in a conceptual framework. The theoretical evidence used to construct the conceptual framework should be referenced from the literature.
- **Aim and objectives:** The introduction should conclude with a clear summary of the aim and objectives of this study.

Research methods and design: This must address the following:

- **Study design:** An outline of the type of study design.
- **Setting:** A description of the setting for the study; for example, the type of community from which the participants came or the nature of the health system and services in which the study is conducted.
- **Study population and sampling strategy:** Describe the study population and any inclusion or exclusion criteria. Describe the intended sample size and your sample size calculation or justification. Describe the sampling strategy used. Describe in practical terms how this was implemented.
- **Intervention (if appropriate):** If there were intervention and comparison groups, describe the intervention in detail and what happened to the comparison groups.
- **Data collection:** Define the data collection tools that were used and their validity. Describe in practical terms how data were collected and any key issues involved, e.g. language barriers.
- **Data analysis:** Describe how data were captured, checked and cleaned. Describe the analysis process, for example, the statistical tests used or steps followed in qualitative data analysis.
- **Ethical considerations:** Approval must have been obtained for all studies from the author's institution or other relevant ethics committee and the institution's name and permit numbers should be stated here.

Results: Present the results of your study in a logical sequence that addresses the aim and objectives of your study. Use tables and figures as required to present your findings. Use quotations as required to establish your interpretation of qualitative data. All units should conform to the SI convention and be abbreviated accordingly. Metric units and their international symbols are used throughout, as is the decimal point (not the decimal comma).

Discussion: The discussion section should address the following four elements:

- **Key findings:** Summarise the key findings without reiterating details of the results.
- **Discussion of key findings:** Explain how the key findings relate to previous research or to existing knowledge, practice or policy.
- **Strengths and limitations:** Describe the strengths and limitations of your methods and what the reader should take into account when interpreting your results.

- Implications or recommendations: State the implications of your study or recommendations for future research (questions that remain unanswered), policy or practice. Make sure that the recommendations flow directly from your findings.
- Conclusion: Provide a brief conclusion that summarises the results and their meaning or significance in relation to each objective of the study.

Acknowledgements: Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution. Authors are responsible for ensuring that anyone named in the Acknowledgments agrees to be named. Refer to the acknowledgement structure guide on our Formatting Requirements page.

Also provide the following, each under their own heading:

- Competing interests: This section should list specific competing interests associated with any of the authors. If authors declare that no competing interests exist, the article will include a statement to this effect: The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article. Read our policy on competing interests.
- Author contributions: All authors must meet the criteria for authorship as outlined in the authorship policy and author contribution statement policies.
- Funding: Provide information on funding if relevant
- Data availability: All research articles are encouraged to have a data availability statement.
- Disclaimer: A statement that the views expressed in the submitted article are his or her own and not an official position of the institution or funder.

References: Authors should provide direct references to original research sources whenever possible. References should not be used by authors, editors, or peer reviewers to promote self-interests. Refer to the journal referencing style downloadable on our Formatting Requirements page.

Style and format

File format

- Manuscript files can be in the following formats: DOC, DOCX, or RTF. Microsoft Word documents should not be locked or protected.
- LaTeX documents (.tex) should be converted into Microsoft Word (.doc) before submission online.
- Rich Text Format (RTF): Users of other word processing packages should save or convert their files to RTF before uploading. Many free tools are available that will make this process easier.

Length

Manuscripts should adhere to the author guidelines of the journal. There are restrictions on word count, number of figures, or amount of supporting information.

Font

Use a standard font size and any standard font family.

Special characters

Do not use the font named 'Symbol'. To add symbols to the manuscript, use the Insert → Symbol function in your word processor or paste in the appropriate Unicode character. Refer to our AOSIS house style guide on mathematical and Unicode font guidelines.

Headings

Ensure that formatting for headings is consistent in the manuscript. Limit manuscript sections and sub-sections to four heading levels. To avoid confusion during the review and production process, ensure that the different heading levels used in your work are visually distinct from one another. The simplest way to achieve this is to use different font sizes and/or a combination of bold/italics for different heading levels.

Keywords

Identify eight keywords that represent the content of your manuscript and are specific to your field or sub-field. Test your keywords: when you enter your keywords into the various journal and academic databases like Google Scholar, do the results include papers similar to your topic? If not, revise the terms until they do.

Layout and spacing

Manuscript text should have a 1.5 line spacing.

Page and line numbers

Include page numbers and line numbers in the manuscript file. Use continuous line numbers (do not restart the numbering on each page).

Footnotes

Footnotes are not ideal. If your manuscript contains footnotes, move the information into the main text or the reference list, depending on the content.

Language

Manuscripts must be written in British English, according to the Oxford English Dictionary (avoid Americanisms [e.g. use 's' and not 'z' spellings], and set your version of Microsoft Word default language to UK English). Refer to the AOSIS house style guide for more information.

Abbreviations

Define abbreviations upon first appearance in the text. Do not use non-standard abbreviations unless they appear at least three times in the text. Keep abbreviations to a minimum.

Illustrations

Illustrations fall into two categories:

- Figures: Photographs, drawings, diagrams, graphs, flowcharts, maps, etc.
- Tables and/or Boxes: Text and/or numbers arranged in orderly columns and rows.

Every time a Figure, Table and/or Box is presented in your manuscript, it should be referred to three times:

- In a legend, which includes a number, a title, and its source. The legend is placed below a Figure and above a Table and/or Box. The source section should consist of

the in-text citation, creator or owner and its year of creation, and any other attribution required as stipulated by the permission received (person and place) to reproduce.

- In the body of your written manuscript. You should include an in-text citation and a sentence or two about the image explaining what it illustrates and why it is there.
- As a reference entry within your reference list.

AOSIS house style

The manuscript must adhere to the AOSIS house style guide.

References

Referencing style guide

The manuscript must adhere to the Vancouver referencing style.

Permission to use copyright material

The following information will assist you in understanding your responsibilities and in requesting permission to reproduce copyrighted material in your work. All permissions granted must be submitted to the journal together with your manuscript, and you must ensure that a clearly written source accompanies the work.

Your responsibilities

As the author, you are responsible for obtaining permission and paying any fees to use the third-party copyrighted material that your manuscript contains.

Material that will need clearance

Content not in the public domain or freely available to use under a license such as a creative commons license will require clearance. It includes the use of photographs, figures, maps, tables, cartoons, advertisements, epigraphs and quotations that are over the limits referred to under 'Modification/adaptation of figures and tables'.

Web material

Image or text material on the Web may not be the intellectual property of the site hosting it. You must always identify the original copyright source and obtain explicit permission. Take particular care with photographs obtained from websites, blogs, Google image searches, YouTube, Wikimedia, etc.

Material previously published by you or your colleague

Check the contract with the other publisher to see whether, and under what conditions, the material can be reused in this AOSIS publication. If in any doubt, permission must be obtained.

Images of, or information about, identifiable individuals

It is your responsibility to obtain consent from patients and other individuals for the use of information, images, audio files, and video clips from which they may be identified. Bear in mind the following points:

- Masking a person's eyes is not an adequate or acceptable means of rendering an image anonymous.

- People may still be recognizable to individuals or their families, even if head/shoulders are not included.
- People may recognize themselves from clinical descriptions or case reports.

Modification/adaptation of figures and tables

Use the original figure as first published where appropriate. However:

- No clearance is required if you create figures or tables using factual data from copyrighted material.
- No clearance is required if, after you have created a single figure or table using data from two or more figures or tables, no single source comprises more than 75% of the new figure or table.
- No clearance is required if, after you have created a new figure or table by adding your own data to an existing figure or table, your data comprises more than 25% of the new figure or table.
- Clearance is required if you create a figure or table using parts from two or more third-party sources, and each part contains more than 75% of the content of the original figure/table part.

Quotations

For prose, permission is required for single quotations of over 400 words or multiple quotations from the same source that cumulatively total more than 800 words. But note that, even if below these limits, permissions must be cleared for quotations that represent the 'heart of the work' or a substantial portion of the overall original source material.

Clear before you submit your final manuscript

Permissions must be cleared before the final version of your manuscript is submitted for publication. If permission cannot be obtained, you should find an alternative or remove the material. Provide electronic copies of all consent forms obtained when you submit your final manuscript, numbered and named accordingly.

Ethical considerations

This section should include the statements of compliance with standards of research involving either animal or human involvement. If your study involves human subjects and/or animals, and if your manuscript includes case reports/case series, you need to provide the following:

- Authors must provide the name of the ethical approval committee/Institutional Review Board they have obtained consent from and approval number/ID.
- Authors should specifically mention if a waiver was obtained for the study and the reason for the waiver. They should confirm that the study was conducted in accordance with Helsinki Declaration as revised in 2013.

Subject Scenario Suggested statement of compliance

Animals: Include the statement of compliance with standards of research involving animals. If your work includes animals, it is necessary to have a statement of compliance with research standards involving animals.

All procedures performed in studies involving animals followed all international, national, and/or institutional guidelines for the care and use of animals.

If you publish an article and there are reasons to believe that you could have used animals but did not.

This article does not contain any studies involving animals performed by any of the authors.

Humans: Include the statement of compliance with standards of research involving humans. If your work does not include humans as subjects, you may finish the ethical statement to include.

This article does not contain any studies involving human participants performed by any of the authors.

If your work involves humans as a subject, you had to receive ethics approval.

An application for full ethical approval was made to the [committee/Institutional Review Board] and ethics consent was received on [date]. The ethics approval number is [full ethics approval number].

If your work involves humans as a subject, but you received an ethics waiver.

An application for full ethical approval was made to the [committee/Institutional Review Board] and ethics consent was received on [date]. The ethics waiver number is [full number]. The [committee/Institutional Review Board] issued an ethics waiver for the study because [reason for the ethics waiver].

Additional statements: If your work involves humans, it is necessary to include one of the above and the following two additional statements. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.^a

Informed Consent: [Written/Verbal] informed consent was obtained from all individual participants involved in the study. [If verbal informed consent was obtained, the reason(s) for the absence of written consent must be provided.]

- Authors must state that written informed consent was obtained from the participants of the study (and the relevant document(s) must be provided when requested by the journal). If verbal informed consent was obtained, the reason(s) for the absence of written consent must be provided.
- For case reports/case series involving minor subjects/children/infants, authors should confirm that the statements of written informed consent from legally authorized representatives/parents/guardians are available; if verbal informed consent was obtained, reasons for this must be mentioned.
- Since patients have a right to privacy, identifying information (including patients' images, names, initials, or hospital numbers) should not be included in recordings, written descriptions, or photographs unless the information is essential for scientific purposes. In any case, written informed consent from the patient must be obtained for publication of these graphics in print and electronic form. If such consent has not been obtained, personal details of patients in any part of the paper and in any supplementary materials (including illustrations) must be removed before submission.

a, Do keep in mind: The necessary and sufficient condition is to conduct research in accordance with the 1964 Helsinki Declaration. If your institution has no department that deals with ethics, then you should not mention institutional

Scenario Suggested competing interest statements

Example 1 The author(s) declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

Example 2 The author reported that they [have a financial and/or business interests in] [are a consultant to] [received funding from] a company that may be affected by the research reported in the enclosed publication. They have disclosed those interests fully and have in place an approved plan for managing any potential conflicts arising from [that involvement].

Example 3 A.B. developed the theoretical formalism, performed the analytic calculations and performed the numerical simulations. Both A.B and B.C. contributed to the final version of the manuscript. B.C. supervised the project.

Example 4 A.B., B.C., C.D., D.E., E.F., F.G., and G.H. conceived and planned the experiments. A.B., B.C., C.D. and D.E. carried out the experiments. A.B., F.G. and E.F. planned and carried out the simulations. J.K., K.L., A.B., B.C., D.E., C.D., F.J., and F.G. contributed to sample preparation. A.B., B.C., C.D., D.E., F.J, E.F., F.G. and G.H. contributed to the interpretation of the results. A.B. took the lead in writing the manuscript. All authors provided critical feedback and helped shape the research, analysis and manuscript.

Example 5 A.B. and B.C. designed the model and the computational framework and analysed the data. A.B. and C.D. carried out the implementation. A.B. performed the calculations. A.B. and B.C. wrote the manuscript with input from all authors. D.E. and E.F. conceived the study and were in charge of overall direction and planning.

Example 6 A.B. designed and performed the experiments, derived the models and analysed the data. B.C. assisted with XYZ measurements and C.D. helped carry out the XYZ simulations. A.B. and D.E. wrote the manuscript in consultation with C.D., B.C. and E.F..

Example 7 A.B. devised the project, the main conceptual ideas and proof outline. B.C. worked out almost all of the technical details, and performed the numerical calculations for the suggested experiment. C.D. worked out the bound for quantum mechanics, with help from D.E.. E.F. verified the numerical results of the XYZ by an independent implementation. F.G. and G.H. proposed the XYZ experiment in discussions with A.B., B.C., C.D., G.H. and A.B. wrote the manuscript.

Example 8 A.B., B.C. and C.D. designed the study. A.B., D.E. and E.F. performed the XYZ experiments. F.G. and G.H. performed XYZ simulations. I.H. and M.C. expressed and purified all proteins. A.B., H.J., B.C. and C.D. analysed the data. A.B., B.C. and C.D. wrote the paper with input from all authors.

Example 9 A.B. and B.C. designed and directed the project; C.D., D.E., A.B. and B.C. performed the experiments; C.D. and B.C. analysed spectra; A.B. and E.F. made the simulations; B.C. developed the theoretical framework; C.D., A.B. and B.C. wrote the article.

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The acknowledgement section follows the conclusions section and addresses formal, required statements of gratitude and required disclosures. It includes listing those who contributed to the work but did not meet authorship criteria, with the corresponding description of the contribution. Acknowledge anyone who provided intellectual assistance, technical help (including with writing and editing), or special equipment and/or materials. Authors are responsible for ensuring that anyone named in the Acknowledgements agrees to be named.

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Example 2 A.B. and B.C. carried out the experiment. A.B. wrote the manuscript with support from C.D.. D.E. and E.F. fabricated the XYZ sample. F.G. and G.H. helped supervise the project. G.H. and H.I. conceived the original idea. H.I. supervised the project.

Example 3 A.B. developed the theoretical formalism, performed the analytic calculations and performed the numerical simulations. Both A.B and B.C. authors contributed to the final version of the manuscript. B.C. supervised the project.

Example 4 A.B., B.C., C.D., D.E., E.F., F.G., and G.H. conceived and planned the experiments. A.B., B.C., C.D. and D.E. carried out the experiments. A.B., F.G. and E.F. planned and carried out the simulations. J.K., K.L., A.B., B.C., D.E., C.D., F.J., and F.G. contributed to sample preparation. A.B., B.C., C.D., D.E., F.J., E.F., F.G. and G.H. contributed to the interpretation of the results. A.B. took the lead in writing the manuscript. All authors provided critical feedback and helped shape the research, analysis and manuscript.

Example 5 A.B. and B.C. designed the model and the computational framework and analysed the data. A.B. and C.D. carried out the implementation. A.B. performed the calculations. A.B. and B.C. wrote the manuscript with input from all authors. D.E. and E.F. conceived the study and were in charge of overall direction and planning.

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Example 8 A.B., B.C. and C.D. designed the study. A.B., D.E. and E.F. performed the xyz experiments. F.G. and G.H. performed XYZ simulations. I.H. and M.C. expressed and purified all proteins. A.B., H.J., B.C. and C.D. analysed the data. A.B., B.C. and C.D. wrote the paper with input from all authors.

Example 9 A.B. and B.C. designed and directed the project; C.D., D.E., A.B. and B.C. performed the experiments; C.D. and B.C. analysed spectra; A.B. and E.F. made the simulations; B.C. developed the theoretical framework; C.D., A.B. and B.C. wrote the article.

Example 10 A.B., B.C. and C.D. performed the measurements, D.E. and E.F. were involved in planning and supervised the work, A.B. and B.C. processed the experimental data, performed the analysis, drafted the manuscript and designed the figures. F.G., and G.H. performed the xyz calculations. H.I., and I.J. manufactured the samples and characterized them with xyz spectroscopy, J.K. performed the xyz characterization. K.L. aided in interpreting the results and worked on the manuscript. All authors discussed the results and commented on the manuscript.

Example 11 A.B., B.C., C.D. and D.E. contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

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