



ELSEVIER

Contents lists available at ScienceDirect

The Lancet Regional Health - Western Pacific

journal homepage: www.elsevier.com/locate/lanwpc

Research paper

Compulsory Community Treatment Orders in New Zealand and the provision of care: An examination of national databases and predictors of outcome

Ben Beaglehole^{1,*}, Giles Newton-Howes², Chris Frampton¹¹ Department of Psychological Medicine, University of Otago, Christchurch, PO Box 4345, Christchurch Mail Centre, Christchurch 8140, New Zealand² Department of Psychological Medicine, University of Otago, Wellington, 23a Mein Street, Newtown, Wellington, New Zealand

ARTICLE INFO

Article history:

Received 12 April 2021

Revised 10 August 2021

Accepted 26 August 2021

Keywords:

Compulsory treatment

Psychotic disorders

detention

CTOs

ABSTRACT

Background: Compulsory Community Treatment Orders (CTOs) are contentious because they impose severe restrictions on individuals in community settings. The existing evidence for CTOs is constrained by ethical and methodological limitations and may not support usual clinical practise. This study examines the effectiveness of CTOs using routine data in the New Zealand context.

Methods: Ministry of Health, New Zealand databases provided demographic, service use, and medication dispensing data for all individuals placed on a CTO between 2009 and 2018. We examined the effectiveness of CTOs through a comparison of psychiatric endpoints identified as useful in the literature according to CTO status. Further analyses examined the moderating influences of age, sex, ethnicity, and diagnosis on outcome.

Findings: 14,726 patients were placed under a CTO over the 10 year period between 1 January 2009 and 31 December 2018. Patients on CTOs experienced a reduced frequency of admissions (rate ratio of 0.94, 95% CI 0.93-0.95, $p < 0.01$) reduced admission days (rate ratio 0.97, 95% CI 0.97-0.98 $p < 0.01$), increased frequency of psychiatric community contacts (rate ratio 3.03, 95% CI 3.02-3.03 $p < 0.01$), and increased dispensing of psychiatric medication (rate ratio 2.27, 95% CI 2.27-2.28, $p < 0.01$). When sub-group analyses were undertaken, the association between treatment under a CTO and reduced admission frequency was only present for those with Psychotic Disorders.

Interpretation: CTOs in New Zealand are associated with increased community care, and increased dispensing of psychiatric medication. Patients with Psychotic Disorders also experienced reduced frequency and length of admissions whilst under a CTO.

Funding: No specific funding was received for this study.

© 2021 The Author(s). Published by Elsevier Ltd.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Research in context

Evidence before this study

We reviewed the literature relating to CTOs on EBSCO, Medline and the Cochrane trials registrar. There are three Randomised Controlled Trials (RCTs) examining the effectiveness of CTOs. Each of these studies have limitations that pre-

vent their findings being translated into real world settings. Cohort studies offer a different means of evaluating CTO use; studies of this type generally report more community contact and treatment adherence with CTO use. It is well known that patients treated under a CTO are typically male, middle aged, diagnosed with schizophrenia, and with a history of multiple admissions. However, it is not known if there are particular groups for whom CTOs are of greatest benefit.

Added value of this study

We examined two whole of nation datasets, combining them using unique identifiers to examine the effectiveness of CTOs and analyse for predictors of outcome. Like other cohort

* Corresponding author. Dr Ben Beaglehole FRANZCP, Department of Psychological Medicine, University of Otago, Christchurch, PO Box 4345, Christchurch Mail Centre, Christchurch 8140, New Zealand. Ph. 0064 3 3726700

E-mail address: ben.beaglehole@otago.ac.nz (B. Beaglehole).

studies, we report that CTOs are associated with increased contact with community services and increased medication use including depot antipsychotic use.

We also report two novel findings from sub-group analyses. The first is that the association between treatment under a CTO and reduced admission frequency is only present for those with a Psychotic Disorder. Secondly, we report a marked increase in depot antipsychotic use for patients without Psychotic Disorder when on CTOs. These findings question the use of CTOs for those without a Psychotic Disorder if the goal is to reduce admissions. Similarly, the prescribing of depot antipsychotics for patients without a Psychotic Disorder and detained on a CTO requires review as admission frequency is not reduced despite depot antipsychotic medications being used.

Implications of all the available evidence

Our study is consistent with other research that report CTOs are associated with increased contact with community services and medication use. We also report a specific association between positive CTO status and reduced admission frequency for patients with a Psychotic Disorder. It is possible that previous mixed findings on whether CTOs reduce admissions may partly be explained by diagnostic heterogeneity in the study populations. This variability could be explored by the re-examination of RCT and cohort data according to diagnosis. The high use of depot antipsychotic medications in patients without a Psychotic Disorder raises concern about whether there are sufficient benefits for coercive treatments to be applied in this group. In addition, the relationship between CTOs and reduced frequency of admissions for patients with Psychotic Disorders suggests CTOs could be targeted at this diagnostic group.

1. Introduction

Compulsory Treatment Orders enable legally mandated treatment without the requirement for consent in inpatient and outpatient settings. Community compulsory treatment orders (CTOs) are intended to reduce the 'revolving door' of readmission identified as a concern by clinicians [1]. Patients treated under compulsory treatment are more likely to be male and socio-demographically deprived with a diagnosis of schizophrenia, non-affective psychosis or mood disorder [2,3] although compulsory treatment is initiated when medico-legal criteria are met and potential patient diagnoses cover the full breadth of psychiatry. In New Zealand and Australia, compulsory treatment is provided to patients whose mental illnesses place them at risk of serious harms to themselves or others [4]. CTOs require outpatients to adhere to treatment in the community and permit rapid return to hospital for the purpose of enforcing treatment if necessary [5]. In New Zealand, CTOs go further; allowing staff to enter a person's home for the purpose of monitoring adherence to oral medication and administering injectable antipsychotic treatment. Although oral medications are required to be taken through CTOs, in practise they cannot be enforced in the community if declined. As a consequence, injectable antipsychotic medications are typically used if patients refuse oral treatment. If injectable antipsychotic medications are declined in the community, a short 'recall' admission is typically organised for the purpose of administering the medication in a hospital setting. CTOs are therefore particularly contentious because they impose human rights restrictions on individuals in community settings when acute mental illness may not be present. Despite this, CTOs in various forms are utilised across many jurisdictions and their use is increasing over time [6-8].

The evidence for the benefits of CTOs is mixed. Randomised Controlled Trials (RCTs) are rare because of inherent ethical and methodological limitations. A Cochrane review [6] examining the effects of CTOs only identified three randomised studies for inclusion [9-11]. Swartz et al. concluded that individuals treated under a CTO of greater than 6 months duration had reduced hospital admissions and total hospital days when combined with intensive treatment [9]. Steadman et al evaluated court-ordered treatment including enhanced services compared to an enhanced service package alone and reported that there were no differences between the two groups on all major outcome measures [10]. The OCTET study randomised patients with psychosis to limited or extended compulsory community treatment and reported that the imposition of extended compulsory supervision did not reduce the rate of subsequent readmission [11].

The Cochrane review concluded that the quality of RCT evidence evaluating CTOs was low to moderate and that CTOs did not result in clear differences for the majority of outcomes considered [6]. Areas of methodological concern were highlighted including the exclusion of violent patients from study entry, study sample attrition, and the confounding effects of providing enhanced care as part of the study design [5]. In addition, key outcomes were measured at time points distant to the application of compulsory treatment meaning the efficacy of CTOs while they are in situ was not evaluated prior to establishing whether or not sustained effects were also present [12].

Using a cohort study where individuals act as their own controls overcomes some of these weaknesses. Studies of this type can evaluate CTOs whilst they are enacted as well as at later time points to evaluate longer term effects beyond the CTO conclusion in the real world. Previous cohort studies have reported that the application of involuntary treatment is associated with reduced hospitalisations [12-15] and increased community care and medication compared to a pre-compulsory treatment period [12,13,15] although these are not universal findings [5]. In some cohort studies, patients on CTOs are matched with controls to allow the influence of time, regression to the mean, and the natural history of psychiatric illness to be taken into account [5]. However, the use of matched controls has also been questioned because of the inherent difficulty in controlling for factors such as insight and refusal to accept treatment readily (factors which are not usually measured or accounted for in matched control studies) [6].

The initiation of a CTO may result in increased onus on clinicians to provide regular contact and care. As a consequence, any beneficial effects of CTOs may be derived through increased input as opposed to compulsion per se. The mediating influence of medication administration is not commonly considered although Lambert et al. reported that CTO implementation was significantly related to intramuscular antipsychotic use [16]. If beneficial effects of CTOs are present, it is therefore possible that these are mediated through the reliability of intramuscular rather than oral medication administration.

In the Western Pacific region, there are a number of Australian studies that have evaluated CTO efficacy using administrative datasets. For example, Harris et al reported that CTOs increase community care and delay hospitalisation with the number needed to treat for an additional beneficial outcome (NNTB) of 10 being required to reduce one admission [12]. Kisely et al. reported the opposite effect with CTOs being associated with higher admission rates [17]. However, there do not appear to have been other studies outside of Australia that have investigated CTO effectiveness in the Western Pacific region [17] and countries within the Western Pacific region vary in the extent to which mental health services are operationalised and able to be assessed [18].

Reviews that evaluate service-user perspectives of CTOs reveal a variety of perspectives [19,20]. Many service users reported feel-

ing coerced and controlled whilst under CTOs. This feeling was strongest relating to medication and enforcing adherence with treatment. However, positive aspects of CTOs were also reported including the perception that CTOs provide a safety net and opportunity to intervene before significant deterioration had occurred.

In New Zealand, there are ethnic disparities in the use of coercive interventions. Individuals of Māori ethnicity (the indigenous people of New Zealand) have higher prevalence rates of mental illness compared to non-Māori [21] and patients of Māori ethnicity are more likely to be placed on a compulsory inpatient or community treatment order [22]. In addition, during compulsory admissions, Māori patients are more likely to receive antipsychotic medication and at higher doses than non-Māori [23]. It is therefore important to clarify whether or not ethnicity impacts on the usefulness or otherwise of CTOs.

The frequency of CTO usage varies between jurisdictions with rates in New Zealand being high compared to international comparisons [7]. Given differences in CTO legislation, social milieu, and uptake between health care settings, the effects of CTOs may not be generalised. Further research can provide insights into the impact of CTOs in different jurisdictions as well as accumulate knowledge on the impact of CTO status overall.

We therefore evaluated the impact of CTO initiation in New Zealand using a cohort design. As suggested in the review by Rugkasa et al. [5], we utilised admission frequency as our primary outcome with short duration or 'recall' admissions being excluded. We also measured admission days/annum, psychiatric community contacts, and dispensing of psychiatric medication according to CTO status in order to evaluate a range of key outcomes. We were interested in the interplay between age, gender, ethnicity, and diagnosis in order to gain a comprehensive understanding of CTO effectiveness and predictors of outcome in the New Zealand context.

2. Methods

2.1. Datasets

The study was approved by the Human Research Ethics Committee of the University of Otago (reference number HD19/076). The Programme for the Integration of Mental Health Data (PRIMHD) is the national mental health information collection service for the Ministry of Health (MOH), New Zealand. The PRIMHD dataset records service activity and outcomes for all health consumers who receive treatment from public sector secondary care and non-governmental organisation mental health and addiction services [24]. PRIMHD holds data on CTO initiation and duration. PRIMHD also contains diagnostic data including the principal diagnosis for those attending secondary care services. The New Zealand Mental Health Act excludes substance use as a basis for providing compulsory psychiatric treatment so compulsory treatment of substance disorders is not addressed in this study. PRIMHD data was requested from the MOH for all patients commenced on a CTO between 1 January 2009 and 31 December 2018. Data was requested in anonymous form through the use of a unique identifier and included the following:

- Date and duration of first CTO (Section 29 Mental Health Act 1992) and subsequent CTOs. For PRIMHD purposes, these include the codes CK, C1, and C2, and TY.
- Demographic information including age at CTO commencement, date of birth, gender, ethnicity (European/other, Māori, Pacifica, Asian), current socio-economic status (measured in deciles through a deprivation index [25] obtained using census data from area of residence with higher deciles indicating greater

deprivation), and District Health Board (DHB) where currently domiciled

- DSM IV Principal diagnostic codes to allow the study population to be categorised according to the presence of a Psychotic Disorder diagnosis at any stage over the study period.
- Service use information including admissions to psychiatric institutions, duration of admissions, and outpatient contacts. Phone contacts, Did Not Attend appointments, and care coordination contacts such as phone calls were excluded.

The Pharmaceutical Collection is a data warehouse containing the vast majority of dispensing data in New Zealand [26]. As CTOs require adherence to psychiatric treatments, data on psychiatric medication dispensing was requested for individuals identified in the PRIMHD sample. Data was requested in anonymous form using the same unique identifier to allow linkage of the data sets. Medications were categorised using the online Pharmaceutical Schedule – November 2019 (a New Zealand database of medications subsidised by the government) classes of Antidepressants (includes lithium carbonate), Antipsychotics General (comprising oral antipsychotics), Antipsychotics Depot Injections (comprising Long acting injectable antipsychotic formulations), and Anxiolytics.

Primary outcome

- The number of psychiatric inpatient admissions/annum under a CTO compared to being free from CTO status. Admissions were required to be of greater than 48 hours to exclude brief admissions for the purpose of administering depot antipsychotic medication due to refusal to accept treatment in the community. Depot antipsychotic medication cannot be given under force in the community so these admissions were excluded as they are not regarded as being a failure of compulsory community treatment.

Secondary outcomes

- The number of psychiatric inpatient days/annum under a CTO compared to being free from CTO status.
- Number of contacts with community psychiatric services under a CTO compared to being free from CTO status.
- Rates of psychiatric medication dispensing under a CTO compared to being free from CTO status.
- The moderating influences of ethnicity, diagnosis and medication dispensing, in determining any of the above effects on inpatient admissions, admission days/annum, or psychiatric community contacts.

2.2. Statistical analysis

The clinical and demographic features of the study population were summarised using standard descriptive statistics. The incidence of the key outcome measures for the study population were calculated for the periods on and off CTOs. Patients do not act as their own controls; instead, the data was aggregated according to CTO status. The grouped period for patients on CTOs was compared to the grouped period for patients off CTOs. This involved calculating the person-years represented for each individual on and off CTOs within the total study period. The total number of the relevant outcome events both on and off CTOs for each individual were then summed to calculate the rates on and off CTOs. A rate ratio (RR) was calculated using these incidences by dividing the incidence of the outcome measure on CTOs with the corresponding figure off CTOs. Rate ratios of less than one means that the outcome is less likely on CTOs and rate ratios greater than one mean the outcome measure is more likely on CTOs. The 95% confidence intervals for the incidence and ratio estimates were calculated using the standard Poisson approximation [27]. Significant p values were set at <0.05. SPSS version 27 was used for analysis.

Rate ratios were calculated using the approach above for different sub-groups and sub-group combinations in order to better understand the impact of diagnosis, age, gender and ethnicity on the outcomes. Grouping and analysing the data in this form over the 10 year study period did not account for the time course or the number of CTOs for each individual. It enabled the calculation of robust outcome rates and rate ratios but was not amenable to standard multivariate analysis.

2.3. Role of the funding source

No specific funding was received for this study.

3. Results

14,726 patients were placed under a CTO over the 10 year period between 1 January 2009 and 31 December 2018 (comprising 0.32% of New Zealanders) [28]. The mean incidence of CTO use for the study period was 95.5 CTOs/100,000. Table 1 summarises the socio-demographic variables. 50% of the study population was of European/other ethnicity, 34.3% were Māori, 9.3% were Pacifica, and 6.0% were of Asian ethnicity. The mean age of the population was 35 years. 59.7% were male. The mean deprivation score for the study population was seven. 57.7% of the study population received a Psychotic Disorder diagnosis over the study period. The median number of periods in which a CTO was used for a participant over the time course of the study was two (IQR 1-4). Approximately 25% of the total study period was spent on CTOs.

Key outcomes are summarised in Table 2. For the overall study population, admission rates were 1.01/annum on CTOs and 1.08 off CTOs giving a RR of 0.94, 95% CI 0.93-0.95, $p < 0.01$. When admission rates were considered according to gender, males but not females were associated with a significant reduction in admissions when on CTOs (RR males 0.91, 95% CI 0.90-0.93 $p < 0.01$, RR females 0.99, 95% CI 0.97-1.01 $p = 0.31$). European/other (RR 0.90, 95% CI 0.88-0.91 $p < 0.01$) and Māori ethnicity (RR 0.96, 95% CI 0.94-0.97 $p < 0.01$) were associated with a reduced admission frequency on CTOs whereas there was no significant change in admission frequency for people of Pacifica ethnicity (RR 0.99, 0.95-1.03, $p = 0.57$). Asian ethnicity was associated with increased admissions on CTOs (RR 1.07 95% CI 1.00-1.13 $p = 0.03$). When diagnosis was considered, only the group with Psychotic Disorders were associated with reduced admissions on CTOs whereas the non-Psychotic Disorder category were associated with increased frequency of admissions (RR Psychotic Disorders 0.82, 95% CI 0.81-0.83, $p < 0.01$, RR non-Psychotic Disorders 1.15, 95% CI 1.12-1.17, $p < 0.01$).

For the overall study population, admission days/year were 12.39 on CTOs and 12.74 off CTOs (RR 0.97, 95% CI 0.97-0.98 $p < 0.01$). When gender was considered there was a small significant increase in admission days/year for females on CTOs (RR 1.01, 95% CI 1.00-1.02, $p < 0.02$). Admission days/year were shorter for patients of European/other (RR 0.92, 95% CI 0.91-0.92, $p < 0.01$) and

Māori ethnicity (RR 0.98, 95% CI 0.97-0.98, $p < 0.01$) but were increased for patients of Pacifica (RR 1.08, 95% CI 1.07-1.09, $p < 0.01$) and Asian ethnicity (RR 1.13, 95% CI 1.11-1.15, $p < 0.01$). A Psychotic Disorder diagnosis was associated with reduced admission days/year on CTOs (RR 0.82, 95% CI 0.81-0.82, $p < 0.01$) whereas the group with non-Psychotic Disorders was associated with an increase in admission days/year when on CTOs (RR 1.25, 95% CI 1.25-1.26, $p < 0.01$).

Community contacts/year were increased in the presence of CTOs for the overall sample (RR 3.03, 95% CI 3.02-3.03 $p < 0.01$). Community contacts/year were also increased in the presence of CTOs for all sub-groups.

There was a significant association between increased medication dispensing and treatment under a CTO for the overall sample (RR 2.27, 95% CI 2.27-2.28, $p < 0.01$) and for all medication sub-groups. This association was most striking for depot antipsychotics (RR 3.68, 95% CI 3.66-3.70, $p < 0.01$). Table 3 summarises the associations between CTO status, sub-groups, and dispensing of specific medication categories.

We report the frequencies of brief admissions of less than 48 hours duration (these were excluded from the primary outcome measure) to allow the impact of this exclusion to be evaluated. The frequencies of brief admissions were 1.91/annum on CTOs compared to 1.95/annum off CTOs (RR 0.98, 95% CI 0.98-0.99, $p < 0.01$). We also completed a sensitivity analysis removing the highest 2.5% rate ratios for the primary outcome and recalculated the rate ratio for the primary outcome to assess whether outliers had an excessive influence on outcome. The original estimate RR of 0.94, 95% CI 0.93 to 0.95, $p < 0.01$ dropped to 0.90, 95% CI 0.89 to 0.91, $p < 0.01$.

3.1. Sub-group analysis

Figure 1 illustrates the association between Psychotic Disorder status and the primary outcome of admission frequency according to age. This figure highlights the variable association between age and admission frequency (those aged < 18 years had increased rates of admission rather than reduced rates on CTOs irrespective of diagnosis). Figure 1 also demonstrates the relationship between diagnosis and the primary outcome: Patients with a Psychotic Disorder diagnosis aged 18+ years were less likely to be admitted on a CTO whereas a non-Psychotic Disorder diagnosis was associated with a lesser reduction in admissions (compared to Psychotic Disorders) and increased admission frequency on CTOs for most age groups.

Figure 2 demonstrates the association between Psychotic Disorder status and admission frequency according to gender. This figure demonstrates that admission frequency is reduced for both genders whilst on a CTO but only for those with a Psychotic Disorder diagnosis.

Figure 3 demonstrates the association between Psychotic Disorder status and admission frequency according to ethnicity. This figure demonstrates that admission frequency for all ethnicities is reduced whilst on a CTO but again only for those with a Psychotic Disorder diagnosis.

We also examined the relationship between Psychotic Disorder status and admission length. Similar patterns to admission frequency data were observed for all ages, gender, and ethnicity. For community contacts, these were increased for the overall sample and when the sample was dichotomised according to diagnosis. For each age, gender, and ethnicity comparison, the rate of increase in community contacts on CTOs were greater for the Non-Psychotic Disorder group compared to the Psychotic Disorder group.

Figure 4 demonstrates the association between diagnosis and medication dispensing. Dispensing rates were increased in the presence of CTOs and differences in magnitude according to diagnosis are largely small with the exception of depot antipsychotics.

Table 1

Characteristics of the study population (N=14726) placed on a CTO between 1/1/09-21/12/18.

Male (N, %)	9792 (59.7)
European/other (N, %)	7414 (50.3)
Māori (N, %)	5053 (34.3)
Pacifika (N, %)	1374 (9.3)
Asian (N, %)	885 (6.0)
Age (Mean, SD)	35.2 (16.0)
Psychotic Disorder diagnosis (N, %)	8941 (57.7%)
Deprivation Index (Mean, SD)*	7.0 (2.6)

* Deprivation Index derived from census data to report deciles of deprivation with higher scores denoting greater deprivation.

Table 2
The relationship between CTO status and admissions/annum, admission days/annum, community contacts/annum, and medication dispensing/annum.

Outcome	Category	On CTO	Off CTO	Rate ratio	95% CI	P-value
Admissions/annum	Total population	1•01	1•08	0•94	0.93 - 0.95	<0•01
	Male	1•00	1•10	0•91	0.90 - 0.93	<0•01
	Female	1•03	1•04	0•99	0.97 - 1.01	0•31
	European/other	0•96	1•07	0•90	0.88 - 0.91	<0•01
	Māori	1•10	1•15	0•96	0.94 - 0.97	<0•01
	Pacifika	1•01	1•02	0•99	0.95 - 1.03	0•57
	Asian	0•85	0•80	1•07	1.00-1.13	0•03
	Psychotic Disorder	1•00	1•21	0•82	0.81 - 0.83	<0•01
	Non-Psychotic Disorder	1•05	0•91	1•15	1.12-1.17	<0•01
Admission days/annum	Total population	12•39	12•74	0•97	0.97 - 0.98	<0•01
	Male	12•88	13•77	0•93	0.93 - 0.94	<0•01
	Female	11•45	11•34	1•01	1.00-1.02	<0•01
	European/other	11•51	12•53	0•92	0.91-0.92	<0•01
	Māori	13•35	13•65	0•98	0.97-0.98	<0•01
	Pacifika	13•90	12•87	1•08	1.07-1.09	<0•01
	Asian	10•89	9•60	1•13	1.11-1.15	<0•01
	Psychotic Disorder	12•34	15•11	0•82	0.81-0.82	<0•01
	Non-Psychotic Disorder	12•49	9•96	1•25	1.25-1.26	<0•01
Community contacts/annum	Total population	95•98	31•71	3•03	3.02-3.03	<0•01
	Male	94•89	32•02	2•96	2.96-2.97	<0•01
	Female	98•07	31•28	3•14	3.13-3.14	<0•01
	European/other	85•20	28•79	2•96	2.95-2.97	<0•01
	Māori	107•04	36•95	2•90	2.89-2.90	<0•01
	Pacifika	115•79	37•28	3•11	3.09-3.12	<0•01
	Asian	80•44	19•70	4•08	4.05-4.11	<0•01
	Psychotic Disorder	101•90	38•46	2•65	2.64-2.65	<0•01
	Non-Psychotic Disorder	83•10	23•75	3•50	3.49-3.51	<0•01
Frequency of medication dispensing/annum	Total population	68•23	30•01	2•27	2.27-2.28	<0•01
	Male	62•89	25•98	2•42	2.42-2.43	<0•01
	Female	78•42	35•49	2•21	2.20-2.22	<0•01
	European/other	74•28	34•83	2•13	2.13-2.14	<0•01
	Māori	66•68	27•54	2•42	2.41-2.43	<0•01
	Pacifika	50•31	21•17	2•38	2.36-2.39	<0•01
	Asian	51•75	17•84	2•90	2.86-2.93	<0•01
	Psychotic Disorder	68•61	31•27	2•19	2.19-2.20	<0•01
	Non-Psychotic Disorder	67•39	28•52	2•36	2.36-2.37	<0•01

P-value refers to the statistical comparison of the rate-ratios compared to 1.00

Effect of CTO status on Admission frequency according to age and diagnosis

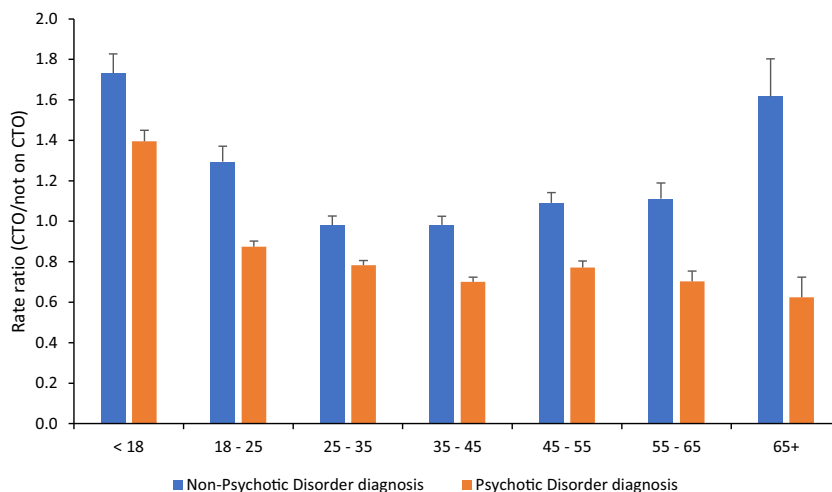


Figure 1. Rate ratio of admission frequency (95% Confidence Interval) according to age and Psychotic Disorder status.

The rate ratio for dispensing of depot antipsychotics for those without a Psychotic Disorder was 5.60 (95% CI 5.54-5.67, $p < 0.01$) compared to 2.86 (95% CI 2.83-2.88, $p < 0.01$) for those with a Psychotic Disorder.

4. Discussion

This study of real world data in New Zealand over a ten year period reports that CTOs are associated with reduced frequency

Table 3
Frequency of medication dispensing/annum for sub-groups according to CTO status.

Category	Medication	On CTO	Off CTO	Rate ratio	95% CIs	P-value
Male	Antidepressant	5•29	3•20	1•65	1.64-1.66	<0•01
	Anxiolytic	5•22	2•53	2•06	2.05-2.08	<0•01
Female	Antipsychotic (depot)	6•16	1•74	3•54	3.52-3.57	<0•01
	Antipsychotic (oral)	39•07	15•81	2•47	2.46-2.48	<0•01
	Antidepressant	9•08	6•50	1•40	1.39-1.41	<0•01
	Anxiolytic	7•60	4•21	1•80	1.79-1.82	<0•01
European/other	Antipsychotic (depot)	5•40	1•42	3•80	3.76-3.84	<0•01
	Antipsychotic (oral)	46•95	19•79	2•37	2.37-2.38	<0•01
	Antidepressant	9•32	6•41	1•45	1.45-1.46	<0•01
	Anxiolytic	8•20	4•51	1•82	1.81-1.83	<0•01
Māori	Antipsychotic (depot)	5•72	1•26	4•54	4.50-4.59	<0•01
	Antipsychotic (oral)	43•32	19•34	2•24	2.23-2.25	<0•01
	Antidepressant	4•26	2•97	1•43	1.42-1.45	<0•01
	Anxiolytic	4•37	2•40	1•83	1.81-1.85	<0•01
Pacifika	Antipsychotic (depot)	6•25	2•06	3•03	3.01-3.07	<0•01
	Antipsychotic (oral)	43•17	16•98	2•54	2.53-2.55	<0•01
	Antidepressant	2•65	1•73	1•53	1.50-1.57	<0•01
	Anxiolytic	2•57	0•99	2•60	2.53-2.68	<0•01
Asian	Antipsychotic (depot)	5•44	2•29	2•37	2.33-2.42	<0•01
	Antipsychotic (oral)	32•99	13•75	2•40	2.38-2.42	<0•01
	Antidepressant	4•01	2•91	1•38	1.34-1.42	<0•01
	Anxiolytic	3•18	1•00	3•18	3.07-3.30	<0•01
Psychotic Disorder	Antipsychotic (depot)	5•98	0•98	6•10	5.91-6.29	<0•01
	Antipsychotic (oral)	31•35	11•22	2•79	2.77-2.83	<0•01
	Antidepressant	5•82	3•77	1•54	1.53-1.55	<0•01
	Anxiolytic	6•05	3•05	1•98	1.97-2.00	<0•01
Non-Psychotic Disorder	Antipsychotic (depot)	6•15	2•15	2•86	2.83-2.88	<0•01
	Antipsychotic (oral)	43•49	19•45	2•24	2.23-2.24	<0•01
	Antidepressant	8•26	5•57	1•48	1.47-1.49	<0•01
	Anxiolytic	5•99	3•47	1•73	1.71-1.75	<0•01
	Antipsychotic (depot)	5•36	0•96	5•60	5.54-5.68	<0•01
	Antipsychotic (oral)	38•06	15•19	2•50	2.50-2.51	<0•01

P-value refers to the statistical comparison of the rate-ratios compared to 1.00

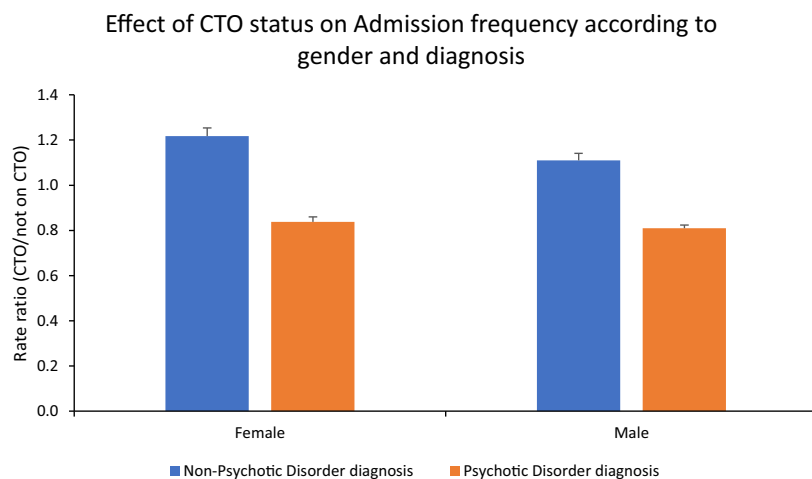


Figure 2. Rate ratio of admission frequency (95% Confidence Interval) according to gender and Psychotic Disorder status.

and length of admissions alongside increased community care and dispensing of psychiatric medication. Whilst significant differences for gender, ethnicity, and diagnosis exist for the key outcomes, the presence of a Psychotic Disorder diagnosis was a key factor in interpreting the overall effects of CTOs.

The reductions in admission frequency and length for patients on CTOs for the overall sample were statistically significant. However, these effects are small and unlikely to be discernible to clinicians and families. Similarly, although positive CTO status was associated with statistically significant increases in admission frequency and length for patients of female gender, Asian and Pacific ethnicity, the increases in rate ratios were also small and unlikely to be evident to others. However, once the overall sample,

and sub-groups were split according to Psychotic Disorder status, the reductions in frequency and length of admissions are noteworthy. For example, patients with Psychotic Disorders have 18% less admissions on CTOs. This can be contrasted with patients without Psychotic Disorders who have 15% more admissions on CTOs. Not only were admissions reduced in frequency for patients with Psychotic Disorders, the duration of these admissions was also reduced. For patients with Psychotic Disorders, the average admission days/annum reduced by approximately 3 days on CTOs compared to patients without Psychotic Disorders whose admission days/annum increases by approximately 2.5 days. In our view, it is likely that these reductions for patients with a Psychotic Disorder and the increases for patients without Psychotic Disorders deserve

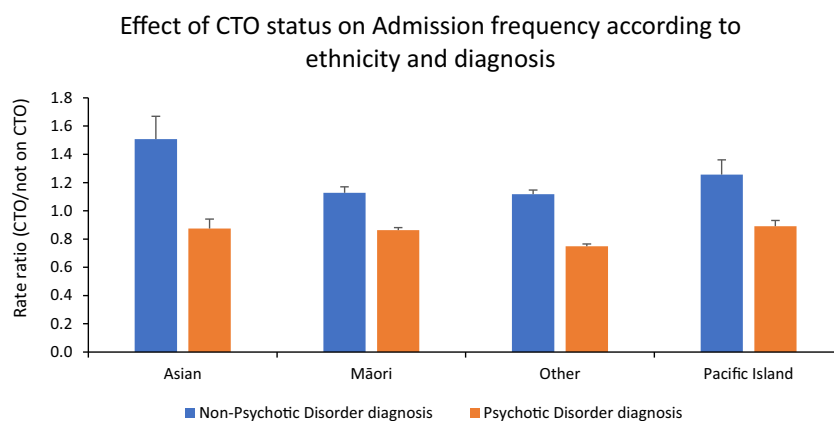


Figure 3. Rate ratio of admission frequency (95% Confidence Interval) according to ethnicity and Psychotic Disorder status.

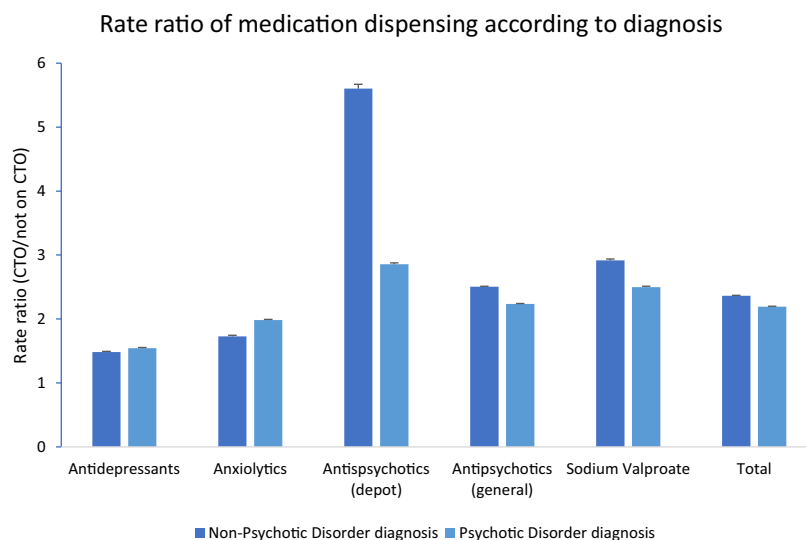


Figure 4. Rate ratio of medication dispensing (95% Confidence Interval) according to Psychotic Disorder status.

highlighting to clinicians and families and are important for mental health services. We are aware of studies reporting that CTOs are more commonly applied to patients with psychotic disorders (see, for example Harris et al [12]) but are unaware of other studies reporting on the moderating effect of diagnosis on CTO efficacy. This finding has direct relevance for clinicians to consider when deciding on patients for whom to request CTOs and when considering clinical outcomes they are seeking to achieve.

The association between CTO status and frequency of psychiatric community contacts and dispensing of medication was considerable. For the study population, positive CTO status was associated with a three-fold increase in community contacts and a two-fold increase in dispensing of medication. The relationship between CTO status and medication dispensing was greatest for depot antipsychotics (rate ratio 3.68 for the overall sample and 5.60 in the non-Psychotic Disorder group). The high rate ratio for depot antipsychotics for patients with Psychotic disorders is expected in the context of limited insight and non-adherence to oral medication that occurs with severe Psychotic Disorders [29]. It is accompanied by a reduction in admission frequency and length. The rate ratio of depot antipsychotic medications for patients without Psychotic Disorders is even higher without a corresponding reduction in admissions. This is noteworthy and should focus the attention of clinicians on whether appropriate clinical outcomes are being achieved within the context of CTO treatment. From an ethical perspective there may be tangible benefits for patients with-

out Psychotic Disorders on CTOs relating to increased contact with community services. However, negative consequences of involuntary depot medication and higher admission rates for this group constitute a powerful argument for the limited use of CTOs and depot medications in this group.

The findings of our study will help communication between clinicians and families. It is clear that CTOs are associated with increased care and greater uptake of medication. CTOs are also associated with reduced admissions for patients with Psychotic Disorders during times in which there are particular concerns about patient safety and wellbeing. The findings can also be interpreted in other ways. For example, some will conclude the data suggests the presence of a two tier system in which those under CTOs receive greater care from community services than voluntary patients. It can be argued that the marked increase in care is only associated with marginal benefits with respect to reducing inpatient admissions and the cost-benefit analysis for using a CTO is unfavourable. These views highlight the ethical dilemmas associated with compulsory treatment.

The views of clinicians may not be shared by patients required to accept compulsory treatment or other members of society. It is important to note that increasing compulsory contact with community psychiatric services and forced medication will be regarded by some as an unnecessary intrusion into private lives. Particularly when the clinical significance of the reduction in admission frequency and length was considered to be marginal for the

overall study population. This issue is further highlighted by the much higher rate of depot antipsychotic medication for patients without a psychotic disorder when on a CTO. In this group, CTOs were associated with increased admission frequency and length which suggests that one of the commonly stated goals for compulsory treatment is not being met. We therefore suggest that the role of CTOs should be questioned for patients without Psychotic Disorders.

This was a real world study analysing routinely collected data. The study design addresses some of the limitations of RCTs evaluating CTOs (the exclusion of violent patients, sample attrition, the provision of enhanced care, and the use of distant time points for outcome measurement). However, the observational nature of the study and lack of randomisation meant that we were unable to control for non-random elements in the study population over time. For example, it is likely that illness severity fluctuates over time and that CTOs are more likely to be in place when patients are most unwell. Therefore, if CTOs were an ineffective intervention, they would be associated with greater rather than fewer admissions due to the likelihood that CTOs are more likely to be used when psychiatric illness is most severe. As the opposite finding occurred, our data suggests that CTOs are having their desired impact by improving key outcome measures despite worsening illness when they are in place.

Although reviews of CTO studies have highlighted methodological differences and challenges for study design [5], it is also likely that that effectiveness of CTOs will vary according to the nature of clinical settings and jurisdictions in which they are applied. We were therefore interested in evaluating CTOs in New Zealand. Although an RCT is the best study design for clarifying CTO effectiveness, the ethical constraints that limited previous RCTs are considerable. Consequently, it seems unlikely that RCTs situated in real world settings will be undertaken. Given the varying results of previous studies, there are benefits in the completion of this and similar future studies to add to the pool of existing studies from which wider conclusions can be drawn using systematic and meta-analytic review.

There are limitations to the use of real world datasets. In this study, the PRIMHD dataset relies on clinical coders to provide diagnostic information. Issues that are reported in this context include the use of non-specific diagnostic codes and there is no requirement to submit a primary diagnosis within the first three months of treatment [30]. We considered these factors to have minimal implications for our study given the longer-term nature of disorders generally treated under CTOs. We believe that our categorisation of Psychotic Disorder is likely to be specific but not necessarily sensitive. As such, the findings relating to Psychotic Disorder are likely to represent a conservative estimation of effects relating to diagnosis. The Pharmaceutical Collection captures the vast majority of all scripts presented to pharmacies in New Zealand. Although dispensing data does not record compliance with medication, the change in frequency of dispensing according to CTO status in our study appears both statistically and clinically significant.

In conclusion, we have completed a large study evaluating the effectiveness of CTOs over a ten year period in New Zealand. CTOs were associated with statistically significant reductions in admission frequency and admission length, and clinically significant increases in community care and dispensing of medication. The presence of a Psychotic Disorder was a key determinant in understanding the overall effects of CTO application. Sub-group analyses demonstrated that the reductions in admission frequency and admission length were only present for those with a Psychotic Disorder. When it is considered that CTOs are used during periods of worsening illness, we regard these findings to be clinically significant and supportive of CTO use particularly for those with Psychotic Disorders in the New Zealand context.

Author contribution

Dr Beaglehole designed the study and accessed the data. Prof Frampton extracted and analysed the data and assisted with interpretation. Dr Beaglehole wrote the paper with input from Assoc. Prof Newton-Howes. Assoc. Prof Newton-Howes also contributed to study design and interpretation of data.

Data sharing statement

The corresponding author, Dr Beaglehole is happy to be approached for access to the aggregated dataset from which this article is written.

Declaration of Competing Interest

The authors have no conflicts of interest to disclose.

References

- [1] Callaghan S, Newton-Howes G. Coercive community treatment in mental health: an idea whose time has passed? *J Law Med* 2017;24(4):900–14.
- [2] Barkhuizen W, Cullen AE, Shetty H, Pritchard M, Stewart R, McGuire P, et al. Community treatment orders and associations with readmission rates and duration of psychiatric hospital admission: a controlled electronic case register study. *BMJ Open* 2020;10(3):e035121.
- [3] Dey S, Mellso G, Obertova Z, Jenkins M. Sociodemographic and clinical variables associated with discharge under compulsory treatment orders. *Australas Psychiatry* 2021;29(2):163–8.
- [4] RANZCP. RANZCP Mental health legislation-comparison tables at at 30 June 2017 2017 [Available from: https://www.ranzcp.org/files/resources/college_statements/mental-health-legislation-tables/mental-health-acts-comparative-tables.aspx].
- [5] Rugkasa J, Dawson J, Burns T. CTOs: what is the state of the evidence? *Soc Psychiatry Psychiatr Epidemiol* 2014;49(12):1861–71.
- [6] Kisely SR, Campbell LA, O'Reilly R. Compulsory community and involuntary outpatient treatment for people with severe mental disorders. *Cochrane Database Syst Rev* 2017;3:CD004408.
- [7] O'Brien AJ. Community treatment orders in New Zealand: regional variability and international comparisons. *Australas Psychiatry* 2014;22(4):352–6.
- [8] Light E, Kerridge I, Ryan C, Robertson M. Community treatment orders in Australia: rates and patterns of use. *Australas Psychiatry* 2012;20(6):478–82.
- [9] Swartz MS, Swanson JW, Wagner HR, Burns BJ, Hiday VA, Borum R. Can involuntary outpatient commitment reduce hospital recidivism?: findings from a randomized trial with severely mentally ill individuals. *Am J Psychiatry* 1999;156(12):1968–75.
- [10] Steadman HJ, Gounis K, Dennis D, Hopper K, Roche B, Swartz M, et al. Assessing the New York City involuntary outpatient commitment pilot program. *Psychiatr Serv* 2001;52(3):330–6.
- [11] Burns T, Rugkasa J, Molodynski A, Dawson J, Yeeles K, Vazquez-Montes M, et al. Community treatment orders for patients with psychosis (OCTET): a randomised controlled trial. *Lancet* 2013;381(9878):1627–33.
- [12] Harris A, Chen W, Jones S, Hulme M, Burgess P, Sara G. Community treatment orders increase community care and delay readmission while in force: results from a large population-based study. *Aust N Z J Psychiatry* 2019;53(3):228–35.
- [13] Swartz MS, Wilder CM, Swanson JW, Van Dorn RA, Robbins PC, Steadman HJ, et al. Assessing outcomes for consumers in New York's assisted outpatient treatment program. *Psychiatr Serv* 2010;61(10):976–81.
- [14] Taylor M, Macpherson M, Macleod C, Lyons D. Community treatment orders and reduced time in hospital: a nationwide study, 2007–2012. *BJPsych Bull* 2016;40(3):124–6.
- [15] Barnett P, Matthews H, Lloyd-Evans B, Mackay E, Pilling S, Johnson S. Compulsory community treatment to reduce readmission to hospital and increase engagement with community care in people with mental illness: a systematic review and meta-analysis. *The Lancet Psychiatry* 2018;5(12):1013–22.
- [16] Lambert TJ, Singh BS, Patel MX. Community treatment orders and antipsychotic long-acting injections. *Br J Psychiatry Suppl* 2009;52:S57–62.
- [17] Kisely SR, Xiao J, Preston NJ. Impact of compulsory community treatment on admission rates: survival analysis using linked mental health and offender databases. *Br J Psychiatry* 2004;184:432–8.
- [18] Ito H, Setoya Y, Suzuki Y. Lessons learned in developing community mental health care in East and South East Asia. *World Psychiatry* 2012;11(3):186–90.
- [19] Corring D, O'Reilly R, Sommerdyk C. A systematic review of the views and experiences of subjects of community treatment orders. *Int J Law Psychiatry* 2017;52:74–80.
- [20] Newton-Howes G, Banks D. The subjective experience of community treatment orders: patients' views and clinical correlations. *The International journal of social psychiatry* 2014;60(5):474–81.
- [21] Wells JE, Browne MA, Scott KM, McGee MA, Baxter J, Kokaua J, et al. Prevalence, interference with life and severity of 12 month DSM-IV disorders in Te

- Rau Hinengaro: the New Zealand Mental Health Survey. *Aust N Z J Psychiatry* 2006;40(10):845–54.
- [22] Health Mo. Office of the Director of Mental Health and Addiction Services: Annual Report 2017. 2019.
- [23] Kumar S, Ng B, Simpson A, Fischer J, Robinson E. No evidence for restrictive care practices in Maori admitted to a New Zealand psychiatric inpatient unit: do specialist cultural teams have a role? *Soc Psychiatry Psychiatr Epidemiol* 2008;43(5):387–91.
- [24] Ministry of Health New Zealand. PRIMHD - Mental health data Wellington: Ministry of Health, New Zealand; 2016 [Available from: <http://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/primhd-mental-health-data>].
- [25] Ministry of Health N. NZDep2013 Index of Deprivation [21.6.2021]. Available from: <https://www.health.govt.nz/publication/nzdep2013-index-deprivation>.
- [26] Ministry of Health N. Pharmaceutical Collection. 2019.
- [27] Sahai H, Khurshid A. Formulas and tables for the determination of sample sizes and power in clinical trials for testing differences in proportions for the matched pair design: a review. *Fundam Clin Pharmacol* 1996;10(6):554–63.
- [28] StatsNZ. Subnational population estimates (DHB, DHB constituency), by age and sex, at 30 June 1996-2020 (2020 boundaries) [Available from: <http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE7509>].
- [29] Higashi K, Medic G, Littlewood KJ, Diez T, Granstrom O, De Hert M. Medication adherence in schizophrenia: factors influencing adherence and consequences of nonadherence, a systematic literature review. *Ther Adv Psychopharmacol* 2013;3(4):200–18.
- [30] Ministry of Health N. PRIMHD Classification - Summary and Metadata. 2018.