Influence of law changes affecting synthetic cannabinoid availability and frequency of hospital presentations: 4-year national survey

Paul Glue, Julie Courts, Andrew Gray, Tess Patterson

ABSTRACT

AIMS: We previously reported that passage of the 2013 Psychoactive Substances Act (PSA), which limited retail availability of synthetic cannabinoids (SCs), was followed by reduced numbers of presentations to one psychiatric emergency service. This analysis examined national trends in hospital presentations associated with use of SCs, and how these changed after passage of laws in 2011, 2013 and 2014, that altered SC availability.

METHODS: Analysis of 2011–2015 Ministry of Health dataset of patients presenting to hospital associated with use of SCs. The relationship between changes in hospital presentations and the 3 legislative changes was evaluated using time series models.

RESULTS: Monthly hospital presentations peaked in mid-2011, 2013 and 2014. Steep declines in numbers of presentations occurred after law changes between August and September 2011 (current SCs removed from sale), July and August 2013 (reduced number of SC retail outlets), and May and June 2014 (all SCs banned). The 2013 reduction in supply was associated with mean monthly presentations decreasing by 10.6 (95% CI 1.5, 19.7; p=0.023). Patients were predominantly young males, and presented with a range of emotional, psychotic and behavioural symptoms.

CONCLUSIONS: Law changes that reduced SC availability were associated with reduced harms (hospitalisation) associated with use of SCs.

Availability of synthetic cannabinoids (SCs) in New Zealand has increased since the late 2000s, along with concerns about their toxicity. Safety concerns were initially raised by the New Zealand Ministry of Health in 2009. Since 2010, reports from acute inpatient and forensic mental health services, poisons centres, and telephone helplines described substantial mental health harms associated with use of SCs specifically, development or worsening of mood, psychotic or other behavioural symptoms. The New Zealand Government responded to this situation with 3 legislative changes: an amendment to the Misuse of Drugs Amendment Bill in August 2011, creating a Temporary Drug Class Notice to ban currently available SCs; the Psychoactive Substances Act (PSA) in August 2013, which restricted the number of SC products and reduced points of sale; and the Psychoactive Substances Amendment Bill in May 2014, which prohibited the sale and possession of SCs.

We previously reported a 50% reduction in numbers of patients using SCs presenting to one Emergency Psychiatric Service after implementation of the PSA in August 2013. This paper expands on the earlier report by examining 4-year national trends in hospital presentations associated with use of SCs, in particular changes around the time that legislative changes were implemented.
Methods

We requested a 4-year national dataset of patients presenting to hospital associated with use of synthetic cannabinoids from the New Zealand Ministry of Health’s National Minimal Dataset. The nonspecific ICD-10 code T43.8 is applied to use of synthetic cannabinoids (other psychotropic drugs, not elsewhere classified). The free text descriptors associated with each case were individually examined for mention of synthetic cannabis or brand names of specific products (eg, Kronic, K2, etc). The following data were also obtained: age; sex; ethnicity; length of hospital stay; and other diagnostic and symptoms codes. Data were described using summary statistics (means and SDs, medians and interquartile ranges (IQRs), or counts and percentages) prior to time series analysis. Differencing was used to produce a stationary time series before and after allowing for a linear trend. The stationary series was then investigated using autocorrelation and partial autocorrelation plots to identify the most appropriate Autoregressive Integrated Moving Average (ARIMA) model. Finally, each legislative event was separately added as an impact to the time series before all 3 were added in combination. Analysis was conducted using R 3.2.2, with two-sided p<0.05 considered statistically significant.

Results

The dataset provided was from March 2011 to June 2015. Of the 379 presentations coded T43.8, 326 (86%) referred to synthetic cannabis in free text fields, and were included in the analysis. There were approximately twice as many males as females (209:117, 64% male). Median (IQR) age at discharge was 21 (12) years. Ethnicity was not described for 3 patients and the remainder included 184 (57%) European, 107 (33%) Māori, 23 (7%) Pacific Islander, 7 (2%) Asian, and 2 (1%) Middle Eastern/Latin American/African. Over the entire sample, the mean (SD) duration of hospital stay was 1.2 (6.7) days, and amongst the 145 (44%) who were admitted, the mean (SD) was 2.6 (9.9) days. Of these, 8 (2%) were admitted for a week or longer, and the maximum duration was 116 days.

The monthly number of hospital presentations associated with synthetic cannabis use was irregular, with 3 peaks,
in mid-2011, from mid-2012 to mid-2013, and mid-2014 (Figure 1). Steep declines in numbers of presentations occurred between August and September 2011 (A in Figure 1), July and August 2013 (Figure 1, B), and May and June 2014 (Figure 1, C). These coincided with three law changes: the passage of an amendment to the Misuse of Drugs Amendment Bill in August 2011, banning the sale of existing SCs; passage of the PSA in August 2013, which limited the number of SC products available for sale, and reduced numbers of retail outlets; and passage of the Psychoactive Substances Amendment Act in May 2014, which stopped sale of all SC retail products.

The time series models included only differencing and drift, effectively giving ARIMA (0,1,0) with constant models. As shown in Table 1, all three events had estimated effects indicating decreases in presentation, but only the reduction in supply from August 2013 was statistically significant, being associated with a reduction of over 10 presentations per month (unadjusted p=0.037, adjusted p=0.023). There was also a tendency for reductions of over 8 presentations per month following the outright ban from June 2014 (unadjusted p=0.099, adjusted p=0.065). Similar results were obtained if the series was treated as difference stationary with the trend removed (results not shown).

The most commonly reported symptoms included tachycardia (15%); restlessness/agitation (14%); convulsions (11%), syncope or collapse (11%); somnolence (11%); psychosis was reported in 6% of cases. Overall 25% of patients had mental health disorder diagnoses associated with their hospital contact.

### Discussion

This analysis shows a relationship between number of hospital presentations associated with use of SCs and legislation affecting SC availability. When SCs were available, either as unregulated (pre-2011) or regulated products (until May 2014), hospital presentations associated with SC use tended to increase over time, presumably reflecting changes in patterns of use and/or marketing.

Legislation that reduced availability of SC products (2011, 2013) produced immediate, but temporary, reductions in hospital presentations. Even after all retail SC products were banned (May 2014), small numbers of hospitalisations associated with SCs still occurred, presumably reflecting their black market availability. Our modelling suggests that legislative changes were effective in decreasing presentations with statistically significant effects following the reduction in supply from August 2013 (by 10.6 per month), and a non-significant tendency for decreases following sales restriction in 2011 (by 7.6 per month) and the outright ban from June 2014 (by 8.6 per month).

The demographics and signs/symptoms reported by patients affected by SCs are consistent with our earlier reports.\(^4,5\) Patients presenting to hospital services tend to be younger males, with a range of emotional, psychological, behavioural and physiological symptoms, and contact with treatment services is brief.

The potential shortcomings of this audit should be acknowledged. This was a retrospective analysis of a central dataset. Use of SCs was established by self-report (ie, not based on toxicological...
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analysis), and thus their involvement in hospital presentations is likely to be an underestimate. Symptoms at presentation were based on coding of clinical notes and thus may have missed more subtle observations.

In conclusion, we have identified substantial monthly changes in numbers of patients presenting to hospital services with toxicity associated with use of SCs, related to law changes around SC availability. The present findings and earlier reports\(^1\)\(^\text{-}^6\) identify that SCs marketed in New Zealand until now have clearly been unsafe, and thus it is not surprising that we observed reduced harms when their availability was reduced. The PSA offers a pathway for applicant companies to register psychotropics for recreational use.\(^1\)\(^2\) If there is still political will to allow regulatory approval and sale of recreational psychoactive drugs via the process described in PSA and related documents, the onus must be for manufacturers to demonstrate their safety before they are marketed.

Competing interests:
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Author information:
Paul Glue, Department of Psychological Medicine, University of Otago, Dunedin and Southern District Health Board, Dunedin; Julie Courts, Department of Psychological Medicine, University of Otago, Dunedin and Southern District Health Board, Dunedin; Andrew Gray, Preventive and Social Medicine, University of Otago, Dunedin and Tess Patterson, Department of Psychological Medicine, University of Otago, Dunedin.

Corresponding author:
Paul Glue, Hazel Buckland Chair of Psychological Medicine, School of Medical Sciences, University of Otago, PO Box 913, Dunedin, New Zealand.
paul.glue@otago.ac.nz

URL:

REFERENCES:

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Corresponding author:
Paul Glue, Hazel Buckland Chair of Psychological Medicine, School of Medical Sciences, University of Otago, PO Box 913, Dunedin, New Zealand.
paul.glue@otago.ac.nz

URL:

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