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Variation in health service use by veterans with an accepted disability of post-traumatic stress disorder who had a service record post 1975: a cluster analysis

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ABSTRACT

Background The use of health services is likely to vary among veterans with an accepted disability of post-traumatic stress disorder (PTSD), however, the extent of variation is not known. We aimed to determine the extent and type of health services used by veterans with an accepted disability of PTSD.

Methods The cohort included veterans who served post 1975, were eligible for all Australian Government Department of Veterans' Affairs funded health services, had PTSD as an accepted disability prior to July 2015 and were alive at the 30 June 2016. Veterans were assigned to groups based on their use of health services using K-means cluster analysis.

Results The cohort comprised five clusters involving 2286 veterans. The largest cluster (43%) were a younger, general practitioner (GP) managed cluster who saw their GP quarterly and the psychiatrist twice a year. The second GP cluster (30%) had higher levels of physical comorbidity. The psychiatrist managed cluster (14%) had a mean of 12 psychiatrist visits and one PTSD hospitalisation in the year. The remaining two clusters involved GP and allied healthcare, but no psychologist care. High levels of antidepressant use occurred in all clusters, ranging from 44% up to 69%. The psychiatrist managed cluster had 47% on antipsychotics and 58% on anxiolytics.

Conclusion Our study highlights the heterogeneity in health service use. These results identify the significant health utilisation required for up to one-sixth of veterans with PTSD and the significant role of primary care physicians in supporting veterans with PTSD.

INTRODUCTION

Serving in the military can provide unique exposure to danger and trauma, causing both physical and psychological injury, which may result in post-traumatic stress disorder (PTSD).[1] Estimates of the prevalence of PTSD following active service vary. A systematic review of 17 studies involving veterans with physical disability found prevalence estimates ranged from 2% to 59%,[2] while a systematic review of the point prevalence of PTSD within primary care, which included seven studies involving veterans, found a median prevalence among veterans of 24.5%.[3] A systematic review of eight studies of US veterans aged 65 years and over found a pooled prevalence rate of 8.4%.[4] For Australian veterans, the lifetime prevalence of PTSD in Australian Defence Force personnel who transitioned out of the forces between 2010 and 2014 was found

to be 24.9%.[5] This is similar to an earlier Australian study of Vietnam veterans which had a 30-year follow-up period, where the lifetime prevalence of PTSD was found to be 24.7%.[6]

PTSD can have a fluctuating course, with periods of remission or relapse.[7] The fluctuating course of PTSD means that Australian veterans with PTSD could be expected to require variable levels of healthcare at different times in the course of their illness, however, little is known about the extent of health service utilisation of veterans with an accepted disability of PTSD.

AIM

This study aimed to determine the extent and type of use of health services over a 12-month period by veterans with an accepted disability of PTSD.

METHODS

The data source for this study was the Australian Government Department of Veterans' Affairs (DVA) health claims data. The database contains details of all service-related accepted disabilities, pharmacy claims, primary care medical services claims, hospitalisation (both public and private) as well as allied health service claims. The dataset has a unique numeric patient identifier to enable linkage of records. The dataset includes patient demographics, including date of birth, gender and date of death. Medications are coded in the dataset

Key messages

► There is heterogeneity in health service access and treatment by veterans with an accepted disability of post-traumatic stress disorder (PTSD), with five discrete clusters of care identified.

► Clusters of care varied from low to high use of mental health services and treatment.

► The majority of post 1975 Australian veterans with an accepted disability of PTSD are predominantly managed in primary care.

► Fourteen per cent of post 1975 Australian veterans with an accepted disability of PTSD are frequent users of mental health services.

► Use of antidepressants is frequent among post 1975 Australian veterans with an accepted disability of PTSD; use of psychologists is infrequent.

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according to the WHO Anatomical and Therapeutic Chemical Classification, primary care services according the Australian Medicare Benefits Schedule and DVA schedule of fees. Hospital admissions are coded according to the WHO International Classification of Diseases Australian modification (ICD-10).

The cohort included veterans who served post 1975, were eligible for all DVA funded health services, had PTSD as an accepted disability prior to July 2015 and were alive at the 30 June 2016.

Because of the fluctuating course of PTSD, veterans were aligned into groups using cluster analysis.[8] Cluster analysis is a data mining tool that groups people who have similar characteristics into clusters. The cohort was divided into clusters according to their use of mental health services, general practitioner (GP) visits and allied health services related to pain or mental health between 1 July 2015 and 30 June 2016. The following services were used to create the clusters: hospitalisations for PTSD (ICD-10[9] code 'F431'); hospitalisations for other mental health conditions (depression: 'F32' 'F33'; anxiety: 'F40', 'F41' 'F064'; psychosis 'F2': other mental health conditions: 'F34', 'F30', 'F31', 'F38','F44','F42','F45','F48', 'F6'); claims for psychology services (DVA allied health category level '09'); GP attendances (MBS category level two 'A01'); psychiatry attendances (MBS category level two 'A08'); consultations with a pain specialist (MBS service item codes '02801', '02806','02814', '02824', '02832', '02840' '02946','02949','02954','02958', '02972','02974','02978', '02984', '02988', '02992', '02996', '03000') ; physiotherapy services (DVA allied health category level'07') and exercise physiology services (DVA allied health category level '32'). We included pain-related services as pain is frequently comorbid in veterans with PTSD and the presence of pain may affect the frequency of health service use.[10]

The K-means procedure was used for the cluster analysis. Five clusters provided the best fit for the data. The elbow method and the canonical discriminant analysis were used to determine the ideal number of clusters. The concept of the elbow method is to undertake multiple k-means cluster analyses using a range of different numbers of clusters. Each time one cluster analysis is performed, the Cubic Clustering Criterion (CCC) and the pseudo F statistic are calculated. A plot is produced of the clusters and the CCC and pseudo F statistics. From these plots, the peak of each of these statistics (the elbow) is identified to determine how many clusters is ideal for the population. online supplemental Figure 1 provides the elbow plot for our analysis. The canonical discriminant analysis is a data reduction technique that creates a linear combination of the clustering variables, which then makes it possible to visually determine how much overlap there is between clusters (see online supplemental figure 2 showing a colour distribution of the clusters, which demonstrates there was limited overlap between clusters). After standardisation, veterans with extreme values on the variables presented in Table 1 were excluded from further analyses. An extreme value was determined as any value that was more than six SD above the mean. An analysis of variance model, for continuous variables and the logistic regression model, for binary variables, was used to assess if there was a significant difference between the clusters for each of the variables that appear in Tables 1–3.

After the clusters were defined, the frequency of use of the following medications and health services: opioids (ATC codes: N02A and R05DA04); paracetamol (N02BE01); oral non-steroidal anti-inflammatories (NSAIDs: M01A); gabapentin or pregabalin for neuropathic pain (PBS item codes: 4591P, 4592Q, 4593R, 4594T, 4595W or ATC code: N03A×16); antipsychotic medication (chlorpromazine, fluphenazine decanoate, trifluoperazine, periciazine, haloperidol, haloperidol decanoate, ziprasidone, lurasidone, flupentixol decanoate, zuclopenthixol decanoate, clozapine, olanzapine, quetiapine, asenapine, amisulpride, risperidone, aripiprazole, paliperidone) (ATC code: N05A (excluding N05AB04 and N05AN01)); antidepressants (fluoxetine, citalopram, paroxetine, sertraline, fluvoxamine, escitalopram, phenelzine, tranylcypromine, moclobemide, mianserin, mirtazapine, venlafaxine, reboxetine, duloxetine, desvenlafaxine) (excluding TCAs: N06AB01-N06AG02, N06A×03-N06A×11,N06A×13-N06A×18); anxiolytics (benzodiazepines, buspirone or escitalopram for generalised anxiety disorder (diazepam, oxazepam, bromazepam, alprazolam, buspirone, nitrazepam, flunitrazepam, temazepam) (ATC codes N05BA01-N05BA12, N05BE01 or PBS item codes: 09 432K,09433L,10181W), mood stabilisers (lamotrigine, sodium valproate, ATC codes N03A×09, N03AG01) propranolol (C07AA05), clonidine (C02AC01) and prazosin (C02CA01); claim for a GP care plan (MBS code A15); claim for GP mental health attendances MBS code A20); hospitalisation for back pain (ICD-10 codes: M40-M54, M96.0-M96.5, M99). Medicine use was identified between 1 July 2015 and 30 June 2016. We identified physical comorbidities based on the Rx-Risk, a validated comorbidity index using prescription data.[11] We reported frequencies for physical comorbidities where prevalence was greater than 1% in any cluster.

Table 1 Prevalence of characteristics used to develop the clusters within each cluster

	Younger GP managed cluster n=979	Older GP managed cluster n=695	Psychiatrist managed cluster n=320	GP managed physiotherapy cluster n=159	GP managed exercise physiology cluster n=133	P value
Age, mean (SD)	43 (5.9)	60 (5.7)	45 (7.9)	48 (10.4)	53 (9.7)	<0.0001
Male, % (95% CI)	96 (95 to 97)	97 (96 to 98)	92 (89 to 95)	94 (90 to 98)	94 (90 to 98)	0.007
Psychiatrist claims, mean per person (SD)	2 (3.6)	2 (3.4)	12 (11.5)	4 (5.1)	4 (5.2)	<0.0001
GP claims, mean per person (SD)	4 (3.5)	7 (4.7)	16 (8.1)	10 (6.8)	10 (6.1)	<0.0001
PTSD hospitalisation, mean per person (SD)	0 (0.6)	0 (0.8)	1 (2.2)	0 (1.0)	0 (1.3)	<0.0001
Other hospitalisations for mental health, mean per person (SD)	0 (0.4)	0 (0.3)	0 (1.1)	0 (0.5)	0 (0.5)	<0.0001
Psychologist claims, mean per person (SD)	1 (2.4)	0 (1.8)	5 (9.2)	2 (5.2)	2 (4.8)	<0.0001
Physiotherapy claims, mean per person (SD)	2 (5.6)	3 (7.1)	6 (10.1)	61 (22.3)	10 (15.7)	<0.0001
Exercise physiologist claims, mean per person (SD)	1 (4.8)	2 (6.6)	4 (9.8)	11 (22.5)	74 (25.4)	<0.0001
Pain specialist consultation claims, mean per person (SD)	0 (0.2)	0 (0.3)	0 (0.7)	0 (0.4)	0 (0.5)	<0.0001

GP, general practitioner; PTSD, post-traumatic stress disorder.

Table 2   Prevalence of GP care planning, medicine use for mental health and pain, and back pain across clusters

Care plans and medicine use	GP managed cluster, younger n=979	GP managed cluster, older n=695	Psychiatrist managed cluster n=320	GP physiotherapy cluster n=159	GP exercise physiology cluster n=133	P value
Average number of comorbidities* n (SD)	2 (1.9)	4 (2.3)	5 (2.6)	3 (2.4)	4 (2.5)	<0.0001
Back pain requiring hospital admission, % (95% CI)	10 (9 to 12)	13 (11 to 16)	31 (26 to 36)	26 (19 to 33)	17 (10 to 23)	<0.0001
GP mental health consultations, % (95% CI)	12 (10 to 14)	7 (5 to 9)	24 (20 to 29)	14 (8 to 19)	10 (5 to 15)	<0.0001
GP care plans, % (95% CI)	15 (13 to 18)	27 (23 to 30)	27 (22 to 32)	28 (21 to 35)	32 (24 to 40)	<0.0001
Antidepressants, % (95% CI)	44 (41 to 47)	53 (50 to 57)	69 (64 to 74)	51 (43 to 59)	51 (43 to 60)	<0.0001
Antianxiety agents, % (95% CI)	21 (18 to 24)	15 (12 to 17)	58 (53 to 64)	24 (17 to 31)	23 (16 to 31)	<0.0001
Antipsychotics, % (95% CI)	16 (14 to 18)	12 (9 to 14)	47 (41 to 52)	18 (12 to 24)	16 (10 to 22)	<0.0001
Mood stabilisers, % (95% CI)	7 (5 to 8)	4 (2 to 5)	18 (13 to 22)	6 (2 to 10)	8 (3 to 12)	<0.001
Propranolol, % (95% CI)	2 (1 to 3)	2 (1 to 3)	5 (2 to 7)	<2	6 (2 to 10)	0.0095
Clonidine, % (95% CI)	<2	<2	3 (1 to 5)	<2	0	0.0012
Prazosin, % (95% CI)	5 (3 to 6)	5 (3 to 6)	19 (15 to 24)	10 (5 to 15)	5 (1 to 9)	<0.001
Opioids,% (95% CI)	14 (12 to 16)	17 (14 to 20)	49 (44 to 55)	36 (29 to 44)	25 (17 to 32)	<0.0001
Non-steroidal anti-inflammatory agents, % (95% CI)	21 (19 to 24)	36 (32 to 39)	44 (39 to 50)	50 (42 to 58)	46 (37 to 54)	<0.0001
Paracetamol, % (95% CI)	7 (5 to 9)	23 (20 to 26)	21 (17 to 26)	18 (12 to 24)	22 (15 to 29)	<0.0001
Gabapentin or pregabalin for neuropathic pain, % (95% CI)	8 (6 to 9)	8 (6 to 10)	24 (19 to 28)	22 (16 to 29)	11 (6 to 17)	<0.0001

*Number of comorbidities measured by prescription dispensing records using Rx-Risk.[11]
GP, general practitioner.

RESULTS

There were 2286 veterans who met criteria for inclusion in the study. The cohort were aligned into five clusters based on the K-means procedure (Table 1) The largest cluster, which comprised 43% of the study cohort, had an average age of 43 years (SD 5.9) and was predominantly managed by a GP. They had, on average, four claims for a GP visit over the year, and infrequent use of other services. The second biggest cluster, comprising 30% of

Table 3   Comorbidities, as identified by medicine use, across clusters

Comorbidity	GP managed cluster, younger n=979	GP managed cluster, older n=695	Psychiatrist managed cluster n=320	GP physiotherapy cluster n=159	GP exercise physiology cluster n=133	P value
Alcohol dependence % (95% CI)	0.4 (0.0 to 0.8)	0.4 (0 to 0.9)	4 (2 to 7)	3 (0 to 6)	3 (0 to 6)	<0.0001
Allergies % (95% CI)	3 (2 to 4)	5 (4 to 7)	8 (5 to 11)	8 (3 to 12)	10 (5 to 15)	<0.0001
Anticoagulants % (95% CI)	1 (0 to 1)	5 (4 to 7)	6 (3 to 9)	4 (1 to 8)	6 (2 to 10)	<0.0001
Antiplatelet agents % (95% CI)	1 (1 to 2)	11 (9 to 14)	6 (3 to 8)	6 (2 to 10)	13 (7 to 19)	<0.0001
Arrhythmia % (95% CI)	0	2 (1 to 3)	1 (0 to 1)	0	2 (0 to 4)	<0.0001
Congestive heart failure % (95% CI)	0.2 (0 to 0.5)	2 (1 to 4)	1 (0 to 1)	0	5 (1 to 9)	<0.0001
Diabetes % (95% CI)	4 (3 to 6)	13 (10 to 15)	8 (5 to 11)	6 (2 to 10)	10 (5 to 15)	<0.0001
Gastro-oesophageal reflux disorder % (95% CI)	19 (17 to 22)	37 (33 to 40)	39 (34 to 44)	30 (23 to 37)	38 (29 to 46)	<0.0001
Glaucoma % (95% CI)	0.2 (0 to 0.5)	2 (1 to 3)	1 (0 to 2)	1 (0 to 2)	2 (0 to 5)	0.001
Gout % (95% CI)	2 (1 to 3)	9 (7 to 11)	6 (3 to 8)	4 (1 to 8)	9 (4 to 14)	<0.0001
Hyperlipidaemia % (95% CI)	12 (10 to 15)	43 (40 to 47)	23 (18 to 27)	25 (18 to 32)	41 (32 to 49)	<0.0001
Hypertension % (95% CI)	9 (7 to 11)	36 (32 to 40)	18 (13 to 22)	16 (10 to 21)	23 (16 to 31)	<0.0001
Hypothyroidism % (95% CI)	1 (0 to 2)	3 (2 to 4)	4 (2 to 6)	1 (0 to 3)	2 (0 to 4)	0.013
Ischaemic heart disease-angina % (95% CI)	0.2 (0 to 0.5)	2 (1 to 4)	1 (0 to 2)	1 (0 to 3)	2 (0 to 4)	0.0003
Ischaemic heart disease-hypertension % (95% CI)	6 (5 to 8)	21 (18 to 24)	11 (8 to 15)	10 (5 to 15)	17 (11 to 24)	<0.0001
Malignancies % (95% CI)	1 (0 to 1)	4 (2 to 5)	2 (0 to 3)	0	3 (0 to 6)	<0.0001
Migraine % (95% CI)	2 (1 to 2)	1 (0 to 1)	2 (0 to 3)	1 (0 to 3)	0	0.280
Parkinsons % (95% CI)	1 (0 to 1)	1 (1 to 2)	3 (1 to 5)	1 (0 to 2)	1 (0 to 2)	0.007
Chronic airways disease % (95% CI)	4 (3 to 6)	10 (8 to 12)	12 (9 to 16)	14 (9 to 20)	11 (6 to 17)	<0.0001
Steroid responsive diseases % (95% CI)	3 (2 to 4)	6 (4 to 8)	8 (5 to 11)	8 (3 to 12)	8 (3 to 12)	<0.0001

GP, general practitioner.

the study population, had an average age of 60 years (SD 5.7 years) and averaged seven GP consultations across the year, with infrequent use of mental health services. There was a psychiatrist managed cohort, comprising 320 persons (14%) which had the most claims for mental health treatment, with an average of one hospitalisation for PTSD in the year, monthly psychiatrist claims and on average 16 claims for GP visits in the year. The final two clusters were relatively small clusters, comprising 6% and 7% of the study cohort. Both clusters had, on average, four claims for the psychiatrist per year, almost monthly GP claims, averaging ten per year, but differed in their use of allied health services, with one cluster having almost weekly claims for exercise physiology services, while the other cluster had almost weekly claims for physiotherapy services.

GP provision of mental health consultations varied across the clusters from 7% up to 24% (Table 2), while rates of GP care planning varied from 15% up to 32%. With regard to medicine use for mental health and pain (Table 2), there were high levels of antidepressant use in all clusters, ranging from 44% up to 69%. The psychiatrist managed cluster had highest levels of antipsychotic and antianxiety medicine use, with 47% on antipsychotics and 58% on anxiolytics. Anxiolytic use ranged from 15% to 58% across the clusters. Use of mood stabilisers and prazosin was 18% and 19%, respectively, in the psychiatrist managed cluster. Clonidine use was less than 3% and propranolol use was less than 5% in the psychiatrist managed cluster. Use of pain medicines was common in all clusters. In general, the clusters with more claims for mental healthcare as measured by psychiatrist visits also had more claims for pain medicine, particularly opioids. Back pain requiring hospital admission was identified in 26% of those in the GP managed physiotherapy cluster and in 17% of veterans in the GP managed exercise physiology cluster. The physical comorbidities of veterans according to cluster, as measured by prescription medicine use, are presented in Table 3. The GP managed exercise physiology cluster had higher rates of heart disease than the other clusters.

DISCUSSION

This is the first Australian study to describe health service utilisation among the cohort of veterans who have served post 1975 and had a service-related accepted disability of PTSD. We found this cohort could be characterised into five clusters based on their use of health services. The largest cohort (n=979, 43% of cohort) (the younger, GP managed cluster) appeared relatively well, seeing their GP, on average, quarterly. The second largest cluster (the older, GP managed cluster) was characterised by higher levels of physical comorbidity, particularly cardiovascular and gastrointestinal comorbidities compared with the younger, GP managed cluster. The psychiatrist managed cluster, representing 14% of the study cohort, appeared to have the greatest levels of mental illness. The psychiatrist managed cluster was a similar age to the younger, GP managed cluster but had much higher numbers of comorbidity (5 vs 2) with higher levels of physical comorbidity including pain, treatments for gastro-oesophageal reflux, hypertension and airways disease. Veterans with frequent physiotherapy visits also had high levels of pain and had the highest use of NSAIDs and medicines for chronic airways disease, while veterans with frequent exercise physiologist visits had the highest use of medicines for cardiovascular conditions.

In all the clusters, GPs' attendance was frequent, at least quarterly, however, GP care planning was identified in only one-third of patients. The Australian guidelines for PTSD note '*Where a*

number of practitioners are involved in care, the general practitioner is well placed to assume overall management of care, making appropriate referrals and coordinating the contribution of other practitioners'.[1] Use of care plans may be a way to further support GPs in this role, particularly for veterans with an accepted disability of PTSD, medical comorbidity, chronic pain and less frequent mental health contacts.

The utilisation of psychology services found in our study seems low given trauma focused psychotherapy is advocated as evidence-based first-line treatment.[12–14] The average number of psychology sessions per person (0–5 sessions) does not constitute what would be seen as a minimum sufficient dose of cognitive behavioural therapy, which is 8–15 sessions. It should be noted that psychological services funded by DVA were analysed in this study, however, psychological services provided by Open Arms, a veteran service that provides confidential counselling and related mental health services, are not captured in this data set.

The patterns of medication use identified in this study were difficult to critically examine given our lack of data on why medicines were used. Guidelines from the US Veterans Affairs/Department of Defence recommend psychotherapeutic interventions and SSRI/SNRI antidepressant monotherapy as first-line treatment in the management of chronic PTSD.[12] These recommendations were made based on favourable efficacy versus tolerability ratios. It was encouraging to note that in all clusters, antidepressants were the most utilised psychotropic agents.

Antianxiety agents, predominantly benzodiazepines, were being utilised in 15%–58% of veterans depending on cluster. The US VA/DoD Guidelines recommend against the use of benzodiazepines as monotherapy or augmentation due to lack of efficacy and the risk of tolerance and dependence.[12] Both the US VA/DoD and the Phoenix Australia Guidelines mention that benzodiazepines reduce the efficacy of exposure-based therapy.[12 14] The finding that almost 60% of the PTSD cohort in this study with the highest mental health needs were receiving agents which inhibit the impact of a first-line evidence-based therapy is concerning and may highlight the need for further education for prescribers.

Antipsychotic agents continue to demonstrate extensive off-label use in veterans with chronic PTSD.[15] As such, the prescription rates noted in this paper (12%–47%) were not surprising. These agents are not recommended for use as monotherapy given their potential for adverse side effects combined with their questionable efficacy, but have been endorsed as augmentation agents.[12 14] Given US VA data on concerning polypharmacy rates among US veterans,[16] it was significant to note the frequent use of antianxiety, antipsychotic, opioid and neuropathic pain agents in the clusters. All of these medicines are sedating and coadministration leads to known medicine interactions and a compounding sedative effect.

We could not find any comparable research looking at the types and frequency of health service use within a cohort with PTSD as an accepted disability, however, significant international research confirms the heterogeneity of PTSD symptoms and treatments, as well as changing trajectories over time. A US study, using latent trajectory analysis, examined the frequency of any mental health encounter for veterans with PTSD and, consistent with our findings, identified five clusters.[17] The clusters included no mental healthcare, low care and high care clusters within the PTSD population, with trajectory analysis showing both an increasing care cluster and a decreasing care cluster.[17] Further confirmation of the heterogeneity of PTSD symptoms comes from a UK study that used latent class analysis

and identified six clusters, with variation encompassing low symptom, high symptom and four moderate symptom clusters.[18] Research also shows variation in symptom trajectory over time. A UK study that assessed the trajectory of PTSD symptoms over 14 years found resilient, improving and deteriorating clusters.[19] These results are consistent with another UK study that showed variation in treatment efficacy over 12 months, with the majority (71%) of veterans having a positive trajectory, but 27% appearing to be treatment resistant.[20]

Previous Australian research looking at mental health service utilisation by veterans with mental health conditions compared with the general population has been limited to self-report and lifetime access of at least one mental health service[21] as well as identifying that there are higher levels of health service use or medicine use in veterans with PTSD than veterans without PTSD.[22] A US study used administrative claims data to examine use of outpatient health services among veterans with PTSD, however, veterans were assessed in only two cohorts, those with and without traumatic brain injury.[23] The US study showed veterans with PTSD and no traumatic brain injury had a mean of three primary care visits per year and 11 mental health consultations, as well as five rehabilitation consultations. Veterans within this study are likely to have had active periods of PTSD during the study period as PTSD had to be recorded as a diagnosis during the study year.[23] Another US study, also using administrative claims records involving veterans with a diagnosis of PTSD during the 10-year study period found, on average, five primary healthcare encounters and nine mental health encounters in the year, as well as between 10 and 14 specialty care encounters per year.[24] A UK study assessed the extent of physical comorbidities in veterans with PTSD or mental health conditions found chronic pain and reduced mobility the most prevalent conditions at 41% and 34%, respectively.[25] These results are in keeping with our findings which, while varying by cluster, showed analgesic use up to 50% in some clusters, with high levels of analgesic use and back pain in the psychiatrist managed cluster and two clusters characterised by physiotherapy or exercise physiologist visits.

A strength of our study is the complete capture of health records for the cohort, however, ex-Australian defence force personnel not registered with DVA would not be captured. This means that we are missing the undiagnosed cohort of veterans with PTSD. A limitation of our study is the lack of recording the reason for primary care encounter, our inability to identify the severity of PTSD or the level of psychiatric comorbidity during the 12-month study duration and thus, the inability to judge the appropriateness of the levels of care provided. PTSD severity is associated with levels of care received.[10]

Our study highlights the heterogeneity in health service use by post-1975 veterans with an accepted disability of PTSD. These results have important implications for healthcare planning and resource allocation, identifying the significant health utilisation required for up to one-sixth of veterans with PTSD and identifying the significant role that primary care physicians play in supporting veterans with PTSD, with more than half of the cohort predominantly managed by their GP. In addition, our results highlight the need for integrated services across mental and physical health with relatively high levels of physical comorbidity observed in the cluster receiving the highest rates of mental health services.

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