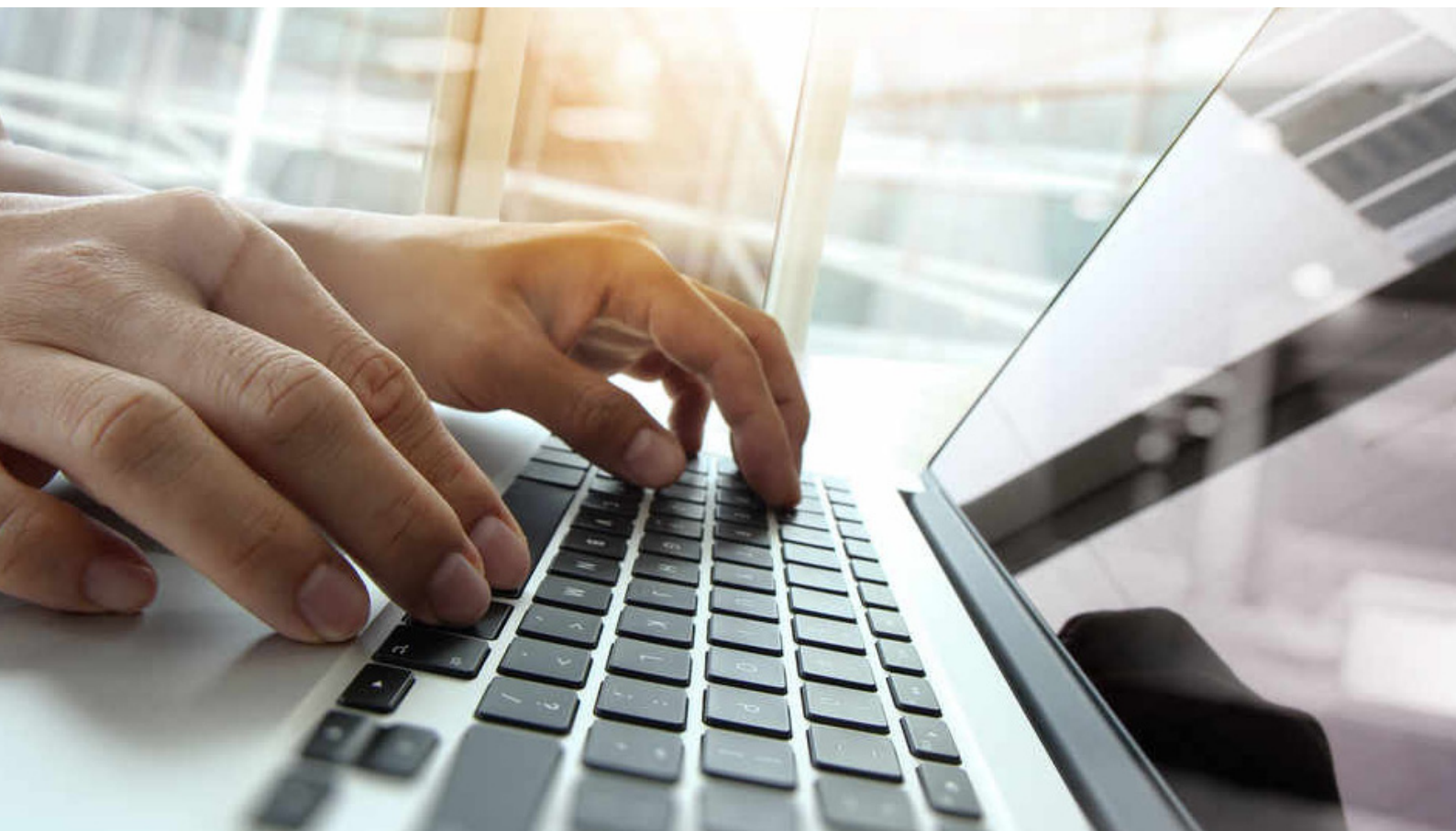


The Military Service Identification Tool:

A utility, feasibility and validation study for identifying veterans from a secondary mental health case register and comparing their sociodemographic, diagnostic and service utilisation characteristics to civilians and Combat Stress veterans

October 2022



Executive Summary

Introduction

A considerable number of military veterans affected by mental health problems fail to seek professional help for their difficulties. Previous research on United Kingdom (UK) veterans who engage in treatment tells us mainly about those accessing primary care services. Although it is useful to investigate the profile of veterans who initiate their mental health treatment through primary care, there is a relative lack of quantitative evidence concerning those who accessed secondary mental health care services – that is, more specialist mental health care, frequently delivered in higher intensity therapeutic specialist clinics or hospitals.

Research objectives

This research used an electronic health record (EHR) Case Register to explore the utility and feasibility of identifying veterans who accessed secondary mental health care services within the UK. The identification of veterans was validated by contacting patients classified as veterans/civilians and confirming their status via self-reported surveys. In addition, the report compared the sociodemographic profiles and the types of mental health diagnoses among veterans who engage in secondary mental health care services compared to their matched civilian

counterparts. An additional aim was to explore the service utilisation of both veterans and civilians, however a large volume of missing data made this impracticable. We were, however, able to compare use of the Mental Health Act (1983) in veterans and civilians. To provide comparison to other veteran services, a sub-set of veterans identified through the Case Register were compared to a veteran sample at Combat Stress, a national veterans charity, and analysed.

Method

The South London and Maudsley (SLaM) Biomedical Research Centre (BRC) Case Register, an EHR database, provided data on civilians and veterans who had accessed secondary mental health care services through the SLaM National Health Service (NHS) Foundation Trust. The study procedure involved:

- 1) developing a manual approach to identifying veterans from the SLaM BRC Case Register;
- 2) developing a Natural Language Processing (NLP) Military Service Identification Tool (MSIT) to automatically detect veterans from the SLaM BRC Case Register;
- 3) describing the utility and feasibility of identifying veterans using a manual approach and MSIT;



- 4) using self-reported surveys to validate whether the veterans/civilians identified by MSIT in the SLaM BRC Case Register had in fact been correctly identified;
- 5) matching veterans from the SLaM BRC Case Register to a civilian sample on age and gender;
- 6) matching veterans from the SLaM BRC Case register to a cohort of veterans from Combat Stress on age and gender;
- 7) extracting data on sociodemographic, diagnostic, clinical and treatment characteristics;
- 8) backfilling missing data on key sociodemographic variables; and
- 9) describing the similarities and differences between civilians and veterans in those who had accessed secondary mental health care services.

Utility, feasibility and validation results

This study developed two complementary methods to identify veterans from the SLaM BRC Case Register. The first used a manual approach identifying keywords that are commonly used to describe military service within free-text clinical notes. The second, MSIT, used NLP and machine learning to automatically analyse and classify free-text clinical notes. We found that both approaches were feasible in identifying veterans. However, practical limitations were present: accessing the Case Register was lengthy and involved various administrative hurdles and data security issues.

Manual identification of veterans from the SLaM BRC Case Register was particularly labour intensive. It involved systematically searching the database, using military-related phrases and exclusion criteria, and scrutinising individual records one-by-one. In contrast, MSIT was able to search through large volumes of free-text clinical notes and identify veterans with high precision and, in a few cases, with better accuracy than human coders.

A total of 1,600 individual records were manually evaluated, with the percentage of true veterans identified (i.e. as opposed to the percentage of non-veterans identified) being 43% overall. The study team was cautious regarding who to classify as a veteran by reading through

all free-text clinical notes at least twice and only confirmed veteran status when an explicit statement about the patient serving in the Armed Forces was reported by the clinician. The term 'Royal Air Force' correctly identified veterans most often during the searches. Using MSIT, 150,000 individual records were inspected, automatically, with the percentage of true veterans identified being 88% overall.

We further validated MSIT by surveying a subsample of patients within the Clinical Record Interactive Search (CRIS) system (n=146) to determine their self-reported veteran/civilian status and compared this to the MSIT's classifications. We found that 83.6% of the sample were accurately categorised by MSIT. The overall sensitivity of the tool (that is, the ability to detect true civilians) was found to be 0.83, and the specificity was 0.92 (that is, the ability to detect true veterans). An examination of the exceptional cases where MSIT misclassified veteran/civilian status showed that MSIT tended to categorise civilians as veterans (n=23 compared to n=1 veteran inaccurately categorised as a civilian). A manual search of the misclassifications identified keywords to further train the tool to prevent misclassifications of false veterans, e.g. mentions of Salvation Army. Due to the high sensitivity and specificity (>0.80), no substantial changes to the tool were required.

MSIT therefore represents a large saving in human resources, cost, time and manpower required to identify who is a veteran; MSIT is able to run in minutes, whereas manual annotation can take between 6 – 16 minutes on average per individual. Whilst MSIT could be a valuable research tool for future use in SLaM and potentially other trusts, we acknowledge that applying MSIT presents logistical and technical challenges. Examples of these include the unavoidable reliance upon the SLaM NHS Foundation Trust's administration teams to run the tool and extract the data on our behalf; the lengthy and iterative processes required for researchers to obtain ethical approvals, and potentially amendments, from the NHS and relevant Research & Development offices and to obtain access to the patient databases.

Applying the MSIT and the manual approach to the SLaM Case Register identified 2,922 veterans who accessed secondary mental health care services through the SLaM NHS Foundation Trust. Of this sample, 1,288 served in the Armed Forces after National Service conscription was phased out in May 1963. To provide new insights, post National Service era veterans were matched on age and gender to known civilian counterparts for comparison. The final sample size for analyses of sociodemographic, diagnostic, clinical and treatment characteristics was 1,288 civilians and 1,288 veterans.

Extracting, cleaning and analysing data from the SLaM Case Register revealed large amounts of missing data. For example, only 63% of the sociodemographic variables were complete. In order to make optimal use of the notes available in the Case Register, including free-text clinical notes, clinical events and admission notes, variables were systematically backfilled by the research team in a bespoke database, increasing completeness for sociodemographic data to 76% which were then used for analyses.

Veteran group comparison results

Most of the age and gender matched civilians and veterans who accessed secondary mental health care through SLaM NHS Foundation Trust were white, single or separated, with a median age of 41 years.

In terms of sociodemographic variables, many civilians and veterans reported living alone. Veterans were significantly more than likely to live with a partner and/or child than civilians and were significantly less likely to live with their parents.

Veterans were significantly more likely to be given an anxiety, stress, depressive, psychosis or personality disorder diagnosis, whereas civilians were significantly more likely to be given a drug disorder diagnosis. The analysis further indicated that veterans were significantly more likely to have been sectioned under the Mental Health Act (1983) when compared to civilians. Further research is required to ascertain if veterans are at higher risk of being sectioned nationally.

Combat Stress comparison results

A total of 189 veterans identified from the SLaM Case Register were matched on age and gender to 189 veterans from Combat Stress. Most of the age and gender matched veterans who accessed secondary mental health care through both the SLaM NHS Foundation Trust and through Combat Stress were male, which is unsurprising given the mainly male demographic composition of the military. SLaM veterans and Combat Stress veterans had a median age of 40 years.

Analyses indicated that SLaM veterans were significantly more likely to live alone and to be single than Combat Stress veterans. Combat Stress veterans were significantly more likely to live with their partner/children and to be in a relationship than SLaM veterans. Combat Stress veterans were significantly more likely to be of British ethnicity than SLaM veterans.

SLaM veterans were significantly more likely to be given a drug disorder diagnosis, whereas Combat Stress veterans were significantly more likely to be given a depressive, anxiety, stress or alcohol disorder diagnosis.

Discussion

This study is the first in the UK to identify military veterans and to explore veterans and matched civilians who have sought help from a secondary mental health care Trust in England. This research used a Case Register to explore the utility and feasibility of identifying veterans who accessed secondary mental health care services, using manual and automated approaches.

MSIT's predictions of veteran/civilian status were manually checked against electronic healthcare records, and were 97% accurate. When MSIT predictions were compared to participants' disclosed veteran/civilian status, 84% of MSIT's classifications were accurate. MSIT is therefore substantially better than other approaches available, such as using a Structured Query Language search strategy to manually search healthcare records (accuracy= 43%).

Once veterans had been identified, they were matched on age and gender to a civilian cohort

extracted from the Case Register. Comparing these two samples presented interesting findings.

More than half of those in secondary mental health care services for both civilians and veterans were White British, and the majority male. This follows a similar profile of the Armed Forces (Fear et al., 2010; Hotopf et al., 2006; Stevelink et al., 2018). Most civilians and veterans reported living alone; previous research has indicated that those who live alone utilise health care services more frequently (Dreyer et al., 2018). Whilst the mechanisms driving higher utilisation are not yet known, it is possible that formal support is sought in the absence of immediate informal support networks.

There is emerging evidence that where people live is an important factor in determining and sustaining inequalities in mental health outcomes (Fone et al., 2007). Just over half of civilians and veterans lived in an area of severe deprivation, which may have impacted negatively on their mental health outcomes (Fone & Dunstan, 2006).

This study found that SLaM veterans were more likely to be given stress, depressive, anxiety, psychosis and personality disorders than civilians. However, we did not find any differences in alcohol use disorder between civilians and veterans despite the literature showing alcohol use is more prevalent in this group (Rhead et al., 2019; Stevelink et al., 2019).

Finally, this study suggested significant differences between civilians and veterans for use of Mental Health Act (1983) sectioning powers, with veterans being significantly more likely to be sectioned than civilians. This could be due to veterans experiencing a higher number of comorbidities, seeking help only at crisis point, having known risk factors for mental health problems (i.e. isolation, living alone, unemployed) and being perceived to be riskier in their behaviours (Stevelink et al., 2018; Stevelink et al., 2019; Rhead et al., 2019).

Recommendations

The results of this research have implications for the ways in which veterans receive secondary mental health care services, and in our understanding of how they use these kinds of services. To ensure a broad and realistic discussion of the implications of this research, a stakeholder event was held towards

the end of this project. Representatives from secondary mental health care providers, providers of veterans' mental health treatment and support and academics attended. As a result of this event, and the finding of this report, this study suggests the following:

- 1 We recommend improving the accuracy and efficiency of identifying veterans from the Case Register by ensuring that serving status is asked when a patient is registered;
- 2 We recommend that the collection of core socio-demographic variables is mandated for all Case Registers;
- 3 We recommend the implementation of new techniques to minimise missing data, such as mandatory fields in forms and the routine sharing of information between hospital systems;
- 4 We recommend accelerating the methodology for identifying veterans from the Case Register through further development of the Military Service Identification Tool. Further points for development of the tool are outlined on p. 48 in the main report;
- 5 We recommend conducting further analysis on the prevalence of mental health problems and how they compare to civilians and further statistical tests on data points available within the Case Register to understand patients' transition between different secondary mental health care services;
- 6 We recommend conducting further research to assess the generalizability and scalability of our findings at a local, regional and national level;
- 7 We recommend that future work is conducted to explore the needs of National Service Era veterans;
- 8 We recommend increasing the number of veterans identified from the Case Register by including a larger number of patient records. This will ensure a large enough sample size for more complex civilian and veteran comparisons;
- 9 We recommend developing an educational tool for those involved in the care of veterans to highlight their mental health needs.

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