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Does screening shorten delays to care for post-deployment mental disorders in military personnel? A longitudinal retrospective cohort study

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ABSTRACT

Objective To determine whether post-deployment screening is associated with a shorter delay to diagnosis and care among individuals identified with a deployment-related mental disorder.

Design Retrospective cohort study.

Setting Canadian military population.

Participants The cohort consisted of personnel (n=28460) with a deployment within the 2009 to 2014 time frame. A stratified random sample (n=3004) was selected for medical chart review. We restricted our analysis to individuals who had an opportunity to undergo screening and were subsequently diagnosed with a mental disorder that a clinician indicated was deployment-related (n=1157).

Interventions Post-deployment health screening.

Main outcome measure The outcome was delay to diagnosis and care, the latency from individuals’ deployment return to their mental disorder diagnosis date. Cox proportional hazards regression assessed screening’s influence on this outcome.

Results 74.4% of the study population had screened. Overall, the median delay to care was 766 days, 578 days among screeners and 928 days among non-screeners—a 350-day difference. Cox regression indicated that screeners had a significantly shorter delay to care (adjusted HR (aHR), 1.43 (95% CI, 1.11 to 1.86)). Screening findings had a substantial influence on delay to care. Identification of a mental health concern, whether a ‘major’ concern (aHR, 3.36 (95% CI, 2.38 to 4.73)) or a ‘minor’ concern (aHR, 1.46 (95% CI, 1.08 to 1.99)), and a recommendation for mental health services follow-up (aHR, 2.35 (95% CI, 1.73 to 3.21)) were strongly associated with shorter delays to care relative to non-screeners.

Conclusions Reduced delays to care are anticipated to lead to beneficial outcomes for both the individual and military organisation. We found that screening was associated with a shortened delay to care for mental disorders that were deployment-related. Future work will further explore this screening’s components and optimisation strategies.

INTRODUCTION

Military personnel encounter unique experiences during their service and some experiences, particularly those encountered on deployment, can increase individuals’ vulnerability to developing mental health problems. While effective mental health care is available, many service members with a mental health problem do not seek out needed services and only a small proportion do so in a timely manner. Barriers to treatment seeking have been extensively studied among military personnel in Canada and other countries. For instance, a failure to perceive a need for care, stigma, negative beliefs about mental disorders and associated treatments, concern over potential negative career consequences and systemic issues such as lengthy wait times and poor accessibility have been reported. Prior research among Canadian Armed Forces (CAF) personnel has identified a failure to perceive a need for care as their most prevalent barrier, reported...
by 84% to 97% of personnel depending on the care considered. In addition to barriers, a number of mental health care-seeking facilitators have also been identified, features that have a positive influence on barriers to care, such as the presence of a supportive organisational climate, social support and educational programmes that promote mental illness awareness and treatment seeking.

A number of countries have reinforced their military mental health systems in an effort to address these barriers and assist their personnel. For example, the CAF expanded its outpatient mental health system in an effort to reduce physical barriers to care and it introduced a resilience and mental health training programme to promote recognition of mental health services need, treatment seeking and stigma reduction. The CAF, and other countries such as the USA and Australia, has also introduced post-deployment health screening as a response to the growing awareness of the relatively high prevalence of post-deployment mental health concerns. This screening was initiated to reduce barriers and facilitate earlier care-seeking. Additionally, screening in Canada has been designed to provide feedback, guidance, education and advice on the post-deployment reintegration process, and to reduce stigma surrounding mental illness. Overall, screening aims to shorten delays to care in those with a need, a result that has been linked with a number of beneficial individual and organisational outcomes.

Accordingly, screening offers a theoretical value to service members but the available research on its putative value is somewhat inconclusive. Observational studies suggest a triage and care provision benefit from screening, as researchers have generally noted that a significant proportion of those who screen positive for mental health problems do initiate follow-up mental health services, but it is unknown whether those screening positive would have received equivalent and timely mental healthcare had they not screened. We identified a single randomised controlled study that compared a screening regimen relative to a ‘non-screened’ control. The authors reported that past-year mental health services use among participants who screened positive 6 to 12 weeks after deployment-return was comparable to those in the ‘non-screened’ group who would have been positive screeners and generally, identified screening to be ineffective. However, the method by which screening was implemented was substantially different from the approach used in Canada and elsewhere, limiting its generalisability.

The present study was designed to examine the effectiveness of the CAF approach to post-deployment screening within the context of the Canadian military mental health system. The primary objective is to determine whether screening is associated with a shorter delay to diagnosis and subsequent care among individuals who had been diagnosed with a mental disorder that was determined to be deployment service-related.

**METHODS**

**Post-deployment screening in the Canadian Armed Forces**

The CAF introduced post-deployment health screening in 2002 and currently service members who deploy for 60 days or longer on operations to most international locations are to complete screening 90 to 180 days following their deployment return. The screening process makes use of a questionnaire that assesses for health concerns using standardised instruments. Completedquestionnaires are reviewed by a mental health professional who, following the conduct of a semi-structured interview, makes recommendations for follow-up care. Further details on the screening process can be found elsewhere.

**Study population and sampling**

This study used a retrospective cohort study design. The cohort consisted of all CAF personnel (n=28460) who had a deployment within the 01 January 2009 to 31 December 2014 time frame. A stratified random sample consisting of 3004 individuals was selected for medical chart review. The study was powered to discern a delay to care difference of at least 50 days between screened and non-screened individuals with 85% power when employing a log-rank test. Sample size per stratum was determined using a Neyman optimal allocation approach. Further details on the sampling process can be found elsewhere.

The analysis in this paper was restricted to the sampled individuals who had the opportunity to undergo screening and were subsequently diagnosed with a mental disorder that a clinician indicated was deployment service-related (n=1157). While medical records were reviewed for 2978 individuals in the sample (ie, seven from the sample were inaccessible), 2598 had a deployment that required screening and, of these, 1240 individuals had a mental disorder that was deployment-related (18.2%; 95% CI, 16.6 to 19.8). An additional 83 individuals were excluded because they had minimal opportunity to undergo screening; that is, their diagnosis occurred during deployment (unweighted n=6 and weighted %=0.2) or <90 days after return (unweighted n=77 and weighted %=6.3) which is before the 90 to 180-day post-deployment screening period. These individuals are not the target of post-deployment screening even though some did screen (ie, 58 after diagnosis and 3 before diagnosis). More specifically, service members with persistent mental health concerns following their deployment are instructed to seek services and not wait to be screened; screening was designed to facilitate care-seeking in those with a need for care but who are hesitant or perceive a barrier to care-seeking. Nevertheless, the current screening policy mandates the screening of all eligible service members as part of its surveillance objective, even if they had already sought care.

**Data collection**

Deployment details came from deployment tasking (extract date: 30 March 2016), deployment-related pay (extract date: 30 March 2016) and human resources
(extract date: 01 August 2017) administrative databases. Mental disorder diagnoses, diagnosis date, mental disorder history and clinician-identified attributions to service (ie, see outcome measure) were abstracted from medical records over the period of 06 February 2017 to 01 May 2018. Screening data were obtained from the medical record review and this was supplemented with electronic data from the screening programme (extract date: 01 August 2012). Additional data on sociodemographic and military characteristics were obtained from human resources administrative data (extract date: 01 August 2017).

Outcome measure
The outcome was delay to care for individuals diagnosed with a mental disorder that was determined by a clinician to be deployment service-related, hereafter referred to as deployment-related mental disorder. This delay to care was defined as the latency from individuals’ most recent deployment return date to their mental disorder diagnosis date. In some instances individuals received more than one mental health diagnostic assessment. For these individuals the date of diagnosis was taken from the first assessment but other details were taken from the more recent assessment. The deployment return date was a proxy for symptom onset and services need in those with a subsequent mental disorder that was determined to be deployment-related. While it is possible that an unknown number of our study participants could have had undiagnosed or subclinical mental health problems prior to deployment, this number is expected to be small. Additionally, military personnel in the CAF undergo a health and occupational screening prior to their official deployment approval which has the potential to identify pre-deployment mental health concerns.

We chose delay to care for a mental disorder diagnosis over other mental health indicators of need and delayed services use because it is incontrovertible that such disorders require professional help. While some individuals may have received some form of care prior to their mental disorder diagnosis, definitive treatment of the disorder can’t be provided until a diagnosis is confirmed.

Deployment-related attribution: Almost all participants received a mental disorder diagnosis at one of the CAFs Operational Trauma and Stress Support Centres. The mental health diagnostic assessments at these centres are highly structured. Clinicians conducting these assessments collect a personal history that includes military and deployment experiences and ultimately, when a diagnosis is made an attribution is also typically indicated. This attribution was used to determine whether or not a diagnosed mental disorder was deployment-related in those with such an assessment. Similarly, in the few situations in which individuals only had mental health diagnostic assessments that occurred outside of these centres, a deployment-related attribution was assigned to a diagnosis only when this was indicated in the medical record.

Screening covariates of interest
Screening status: The primary covariate of interest was completion of a required screening. A completed screening occurred only when service members completed both the questionnaire and subsequent interview with a mental health professional, as determined by documentation in the medical record. The interview date determined the date of screening completion. Non-screeners were determined by the absence of screening documentation. Additionally, 44 individuals (3.0%) who screened after they were diagnosed were assigned a non-screening status and handled the same as other non-screening individuals.

Screening findings: Screened individuals were further categorised based on the interviewer’s impressions recorded in the medical record:
1. Type of concern indicated, categorised as ‘major’ or ‘minor’ mental health concerns, physical health concerns (but no mental health concerns), ‘other’ concerns (but no mental or physical health concerns) or none;
2. Mental health concern indicated, categorised as ‘major’ concerns, ‘minor’ concerns only or none;
3. Any follow-up care recommended (ie, general practitioner, mental health, psychosocial or ‘other’), categorised as present/absent; and
4. Mental health follow-up care recommended, categorised as present/absent.

Mental health concerns included post-traumatic stress disorder (PTSD) symptoms, depressive symptoms, anxiety symptoms or substance use. Physical health concerns included post-concussive symptoms or other physical health issues. ‘Other’ concerns included family/marital problems, workplace conflict or ‘other’ concerns.

Potentially confounding covariates
Based on previous research, the potential confounders that we identified for this study included: mental disorder diagnosis-related variables; sex; age (19 to 24, 25 to 34, 35 to 44 or 45 to 60 years); service (Army, Navy or Air Force); component (Regular or Reserve Force); rank category (Junior Non-Commissioned Member (NCM), Senior NCM (SNCM) or Officer); combat arms military trade/occupation; years of service (≤4, 5 to 9, 10 to 19 or ≥20 years); marital status (married/common law, divorced/separated/widowed or single - never married); and first official language (English or French). Deployment-related information was also assessed and these covariates included deployment location (Afghanistan or ‘other’), post-deployment era (2009 to 2011, 2012 to 2014 or 2015 to 2017) and deployment length (≤180 days or >180 days). Variable categorisations were based on the data’s distribution and previous work with this population.

The mental disorder diagnosis-related covariates included indications in the medical record of a past mental disorder diagnosis, specifics on the recent post-deployment mental disorder diagnosis and the presence of a general medical condition that was deemed relevant.
to the recent mental disorder. Among the 1157 individuals with a mental disorder diagnosis that was deployment-related, the Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV was predominantly specified as the classification used (n=773) but DSM-V was used for some (n=32) and for others, it was unspecified (n=352).

Both the past mental disorder and relevant general medical condition covariates were captured as ‘present’ or ‘none indicated’. The recent post-deployment mental disorder diagnoses were categorised into six groups: three single diagnosis categories of PTSD, depressive disorder (ie, major depression or dysthymic disorder) or single ‘other’ disorder, and three comorbid categories of PTSD and depressive disorder only, all other comorbid combinations with PTSD and any other non-PTSD comorbidity combination, which could include depressive disorders. The ‘other’ single disorders included non-PTSD anxiety disorders, mood disorders other than major depression and dysthymic disorder, adjustment disorder, somatoform disorder, substance-related disorders and substance-induced disorders.

**Statistical analysis**

The data were analysed using SAS for Windows, V.9.4 (SAS Institute Inc, North Carolina). We applied the sample design weights to determine descriptive and regression statistics and Taylor Series Linearisation was used to generate the associated SE estimates and 95% CIs. There were no missing values among the assessed covariates.

We used time-to-event analysis methods. Zero-time was defined as the most recent deployment return date prior to diagnosis; the median deployment return date was 21 November 2010, ranging from 16 January 2009 to 17 July 2015. Event-time was the diagnosis date of individuals’ deployment-related mental disorder; the median diagnosis date was 01 May 2013, ranging from 23 June 2009 to 15 December 2017. Among those who completed screening before diagnosis, the median diagnosis date was 26 April 2013, ranging from 31 August 2009 to 15 December 2017 and among non-screeners the median diagnosis date was 17 June 2013, ranging from 23 June 2009 to 03 October 2017. No individuals were censored.

The covariates for post-deployment era, screening status and screening findings were handled as time-dependent. Diagnosis-related covariates were captured at individuals’ date of diagnosis. The remaining covariates were assessed relative to deployment return date; however, marital status was assessed on the human resources administrative data extract date, the only option.

Extended Kaplan-Meier methods generated event probabilities for screening status as a time-dependent covariate. Cox regression assessed delay to care differences for covariates and results were expressed as HRs and their 95% CIs. Initially, Cox regressions assessed the unadjusted relationship between each potential confounder and delay to care; covariates with a Wald test p value <0.25 were retained. The primary screening-associated covariates of interest were individually forced into a regression model that included these retained potential confounders. Regression diagnostic plots were reviewed with respect to the proportional hazards assumption.

**Patient and public involvement**

CAF service members, patients and/or the public were not involved in developing the research question, the study design or in the conduct of the study. The findings from this study and the larger research project will be shared with CAF service members and other interested stakeholders through targeted conference venues, CAF community newsletters or communiques and other venues.

**RESULTS**

**Study population characteristics**

Table 1 summarises, overall and by screening status, the sociodemographic, military and clinical characteristics among the study population. Overall, the diagnoses were predominantly PTSD (ie, 69.7%), either alone or comorbid, 36.2% had a general medical condition that was deemed relevant to their mental disorder, and 9.8% had a past mental health problem. Individuals were predominantly English speaking, married, men, Regular Force members, in the Junior NCM rank category and in Army service. At deployment return, the mean age of individuals was 34 years, just over half had less than 10 years of military service and the majority were in non-combat arms occupations.

Screening was undertaken by 74.4% (95% CI: 71.1 to 77.8) of the study population (table 1). Additionally, the distribution of the covariates for age, marital status, years of military service, service type, combat arms occupation, deployment location and mental disorder case-mix differed by screening status.

**Delay to care**

Individuals who returned from deployment and had a subsequent mental disorder diagnosis that was deployment-related comprised the study population and their diagnosis date was the end-point for our delay to care calculation. The median delay to care for each of our covariates and their unadjusted HR’s are summarised in table 2. In our analysis HR’s are analogous to relative care-seeking rates and a HR above 1.0 implies a shorter delay to care.

The unadjusted HR’s suggest that a shorter delay to care was associated with females, non-Afghanistan deployments, the 2015 to 2017 post-deployment period, certain diagnoses, presence of a relevant general medical conditions and screeners (table 2). Additionally, the unadjusted HR’s suggest that the delay was generally shorter for older (ie, 45 to 60) individuals and those who were single; however, the Wald test p values for the age and marital status covariates were greater than 0.05 (ie, 0.074 and 0.110, respectively).
Table 1 Summary of sociodemographic, military and clinical characteristics by screening status

|                | Not screened | Screened | Overall          |
|----------------|--------------|----------|------------------|
|                | Sample N/weighted N | % (95% CI) | Sample N/weighted N | % (95% CI) | Sample N/weighted N | % (95% CI) |
| **Age category** |              |          |                  |
| 19–24          | 20/34        | 3.2 (2.0 to 4.3) | 94/539            | 17.3 (12.0 to 22.6) | 114/573 | 13.7 (9.7 to 17.7) |
| 25–34          | 169/386      | 36.1 (29.0 to 43.2) | 287/1372          | 44.0 (38.0 to 50.0) | 456/1758 | 42.0 (37.2 to 46.8) |
| 35–44          | 186/407      | 38.0 (30.8 to 45.2) | 225/870           | 27.9 (23.6 to 32.2) | 411/1277 | 30.5 (26.7 to 34.3) |
| 45–60          | 107/243      | 22.7 (15.6 to 29.8) | 69/336            | 10.8 (7.0 to 14.6) | 176/579  | 13.8 (10.5 to 17.2) |
| **Sex**        |              |          |                  |
| Female         | 49/85        | 8.0 (6.0 to 10.0) | 74/302            | 9.7 (6.5 to 12.8) | 123/388  | 9.3 (6.9 to 11.6)  |
| Male           | 433/985      | 92.0 (90.0 to 94.0) | 601/2815          | 90.3 (87.2 to 93.5) | 1034/3799 | 90.7 (88.4 to 93.1) |
| **First official language** |              |          |                  |
| English        | 333/736      | 68.8 (63.1 to 74.5) | 464/2197          | 70.5 (65.0 to 76.0) | 797/2934 | 70.1 (65.8 to 74.4) |
| French         | 149/334      | 31.2 (25.5 to 36.9) | 211/920           | 29.5 (24.0 to 35.0) | 360/1253 | 29.9 (25.6 to 34.2) |
| **Marital status** |              |          |                  |
| Married/common law | 360/826   | 77.2 (71.4 to 83.0) | 449/1978          | 63.5 (57.6 to 69.4) | 809/2805 | 67.0 (62.3 to 71.7) |
| Divorces/separated/widowed | 53/91     | 8.5 (5.9 to 11.1) | 77/260            | 8.3 (6.1 to 10.6) | 130/351  | 8.4 (6.6 to 10.2)  |
| Single         | 69/153       | 14.3 (9.0 to 19.6) | 149/879           | 28.2 (22.4 to 34.0) | 218/1032 | 24.6 (20.1 to 29.2) |
| **Rank category** † |              |          |                  |
| JNCM           | 286/647      | 60.4 (53.2 to 67.7) | 456/2167          | 69.5 (64.5 to 74.6) | 742/2814 | 67.2 (63.0 to 71.5) |
| SNCM           | 125/243      | 22.7 (18.0 to 27.4) | 159/667           | 21.4 (17.0 to 25.8) | 284/910  | 21.7 (18.3 to 25.2) |
| Officer        | 71/180       | 16.9 (10.1 to 23.6) | 60/283            | 9.1 (5.4 to 12.8) | 131/463  | 11.1 (7.7 to 14.4) |
| **Years of military service** * |              |          |                  |
| <5 years       | 30/74        | 6.9 (2.1 to 11.7) | 147/936           | 30.0 (24.7 to 35.3) | 177/1010 | 24.1 (19.9 to 28.3) |
| 5 to 9 years   | 135/340      | 31.8 (24.3 to 39.3) | 224/870           | 27.9 (23.2 to 32.6) | 359/1210 | 28.9 (24.8 to 33.0) |
| 10 to 19 years | 192/408      | 38.1 (31.3 to 44.9) | 200/826           | 26.5 (21.7 to 31.3) | 392/1234 | 29.5 (25.6 to 33.4) |
| ≥20 years      | 125/248      | 23.2 (17.4 to 29.0) | 104/485           | 15.5 (11.3 to 19.8) | 229/733  | 17.5 (14.0 to 21.0) |
| **Component**  |              |          |                  |
| Regular Force  | 456/996      | 93.1 (88.2 to 98.0) | 639/2819          | 90.4 (86.0 to 94.9) | 1095/3815 | 91.1 (87.6 to 94.6) |
| Reserve Force  | 26/74        | 6.9 (2.0 to 11.8) | 36/298            | 9.6 (5.1 to 14.0) | 62/372  | 8.9 (5.4 to 12.4)  |
| **Service** *  |              |          |                  |
| Army           | 328/801      | 74.9 (70.0 to 79.8) | 562/2701          | 86.7 (83.5 to 89.8) | 890/3502 | 83.6 (81.1 to 86.2) |
| Air Force      | 91/155       | 14.5 (10.9 to 18.1) | 92/351            | 11.3 (8.2 to 14.3) | 183/506  | 12.1 (9.7 to 14.5) |

Continued
| Table 1 Continued | Not screened | Screened | Overall |
|------------------|-------------|----------|---------|
|                  | Sample N/weighted N | % (95% CI) | Sample N/weighted N | % (95% CI) | Sample N/weighted N | % (95% CI) |
| Navy             | 63/114       | 10.6 (7.4 to 13.9) | 21/65       | 2.1 (1.3 to 2.9) | 84/179       | 4.3 (3.3 to 5.2) |
| Combat arms occupation* | 385/843 78.8 (72.9 to 84.6) | 416/1921 61.6 (55.5 to 67.8) | 801/2764 66.0 (61.2 to 70.9) |
|                   | 97/227 21.2 (15.4 to 27.1) | 259/1196 38.4 (32.2 to 44.5) | 356/1423 34.0 (29.1 to 38.8) |
| Deployment location* | 74/188 17.5 (11.3 to 23.8) | 13/44 1.4 (0.7 to 2.1) | 87/232 5.5 (3.7 to 7.4) |
|                   | 408/882 82.5 (76.2 to 88.7) | 662/3073 98.6 (97.9 to 99.3) | 1070/3955 94.5 (92.6 to 96.3) |
| Deployment length | 149/311 29.1 (22.6 to 35.5) | 137/693 22.2 (16.8 to 27.7) | 286/1005 24.0 (19.7 to 28.3) |
| ≤180 days        | 333/759 70.9 (64.5 to 77.4) | 538/2424 77.8 (72.3 to 83.2) | 871/3182 76.0 (71.7 to 80.3) |
| >180 days        | 416/927 86.6 (81.6 to 91.7) | 607/2851 91.5 (88.5 to 94.4) | 1023/3778 90.2 (87.6 to 92.8) |
| >180 days        | 66/143 13.4 (8.3 to 18.4) | 68/266 8.5 (5.6 to 11.5) | 134/409 9.8 (7.2 to 12.4) |
| A past mental health problem | 24/40 3.8 (2.5 to 5.0) | 42/227 7.3 (3.9 to 10.6) | 66/267 6.4 (3.8 to 8.9) |
|                   | 50/146 13.7 (7.0 to 20.3) | 68/341 10.9 (6.8 to 15.1) | 118/487 11.6 (8.1 to 15.2) |
| Disorder case-mix‡ | 75/214 20.0 (13.0 to 27.0) | 113/624 20.0 (15.1 to 24.9) | 188/838 20.0 (15.9 to 24.1) |
| PTSD only         | 121/251 23.4 (17.2 to 29.6) | 120/417 13.4 (10.5 to 16.3) | 241/668 16.0 (13.2 to 18.7) |
| PTSD and depressive disorder only | 162/328 30.7 (24.5 to 36.8) | 257/1083 34.8 (29.1 to 40.5) | 419/1411 33.7 (29.2 to 38.2) |
| PTSD and ‘other’ mix | 50/91 8.5 (5.8 to 11.2) | 75/425 13.6 (9.0 to 18.3) | 125/515 12.3 (8.7 to 15.9) |
| Single ‘other’    | 124/277 25.9 (19.1 to 32.7) | 185/993 31.8 (26.0 to 37.7) | 309/1270 30.3 (25.7 to 35.0) |
| Any PTSD          | 358/793 74.1 (67.3 to 80.9) | 490/2124 68.2 (62.3 to 74.0) | 848/2917 69.7 (65.0 to 74.3) |
| DSM IV or V       | 334/625 58.4 (50.9 to 66.0) | 439/1759 56.4 (51.1 to 61.8) | 773/2385 57.0 (52.7 to 61.2) |
| IV               | 10/15 1.4 (0.8 to 2.1) | 22/118 3.8 (1.1 to 6.5) | 32/133 3.2 (1.2 to 5.2) |
| V                | 138/429 40.1 (32.5 to 47.7) | 214/1240 39.8 (34.1 to 45.4) | 352/1669 39.9 (35.4 to 44.3) |
| Relevant general medical condition indicated | 255/671 62.7 (56.7 to 68.7) | 381/2003 64.2 (59.2 to 69.3) | 636/2673 68.3 (59.9 to 71.8) |
|                   | 227/399 37.3 (31.3 to 43.3) | 294/1114 35.8 (30.7 to 40.8) | 521/1514 36.2 (32.2 to 40.1) |

*Boulos D, Garber B. BMJ Open 2020;10:e037853. doi:10.1136/bmjopen-2020-037853*
The covariates for first official language, rank, years of military service, component, service, combat arms occupation and deployment length were dropped from the final assessment model because they had Wald $\chi^2$ test $p$ values $\geq 0.25$.

**Post-deployment screening**

Extended Kaplan-Meier curves were generated to characterise delay to care by screening status (figure 1); these curves incorporate this covariate’s time-varying nature. Noting that all individuals had a mental disorder diagnosis, this figure quantifies the cumulative proportion of diagnoses that were identified as time increases. The slopes of these curves equate to the rate at which care-seeking occurs and early curve separation was observed. Early on, diagnoses, or care-seeking, occurred at a much faster rate among screeners and this faster rate, as exemplified by this curve’s steeper slope, continued until approximately 2 years post-deployment. In comparison, the cumulative fraction diagnosed among non-screeners only became comparable to that of screeners at approximately 3 to 5 years post-deployment. Moreover, while the median delay to care was 766 days overall, these curves reveal a median delay of 578 days among screeners and 928 days among non-screeners (figure 1), a 350-day difference.

Looking a little more closely at the temporal sequence of events from individuals’ deployment return to screening and from screening to subsequent mental disorder diagnosis provides some insight into screening’s influence on delay to care (table 3). The median latency from deployment return to screening was 151 days overall and this median varied very little with screening findings. In contrast, and as expected, the median latency from screening to diagnosis was shorter when a ‘major’ concern was identified and when follow-up care was recommended, particularly when these were for mental health problems; however, the median latency from screening to diagnosis was much longer (ie, approximately 1000 days) when these findings were absent.

Moreover, we noted a few inconsistent observations among the screening findings. Of those that were eventually diagnosed with a deployment-related mental disorder (and had been screened post-deployment) 41.8% had no mental health concerns identified at screening and 69.8% had no recommendation for mental health services follow-up. Additionally, 36.2% of those with an identified ‘major’ mental health concern at screening did not have a mental health services follow-up recommendation and this was not influenced by indications that individuals were already in some form of care for their concern.

**Cox proportional hazards regression results**

The final multivariable model that assessed the screening covariates (table 4) indicated that delay to care was
Table 2  Median delay to care for assessed sociodemographic, military and clinical characteristics and their unadjusted association with delay to care

| Age category* | Sample N/weighted N | Delay (days) to care (median (IQR)) | Wald $\chi^2$ P value | Unadjusted HR (95% CI) | HR P value |
|---------------|---------------------|-------------------------------------|------------------------|------------------------|-----------|
| 19–24         | 114/573             | 642 (401 to 1397)                  | 0.0741                 | 0.82 (0.56 to 1.19)    | 0.2901    |
| 25–34         | 456/1758            | 783 (381 to 1490)                  | 0.66 (0.47 to 0.92)    | 0.015                  |
| 35–44         | 411/1277            | 815 (333 to 1654)                  | 0.70 (0.50 to 0.99)    | 0.0429                 |
| 45–60         | 176/579             | 709 (261 to 959)                   | Reference              |                        |

| Sex†          |                      |                                    |                        |                        |           |
|---------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| Female        | 123/388              | 437 (190 to 1027)                  | 0.0118                 | 1.41 (1.08 to 1.85)    | 0.0118    |
| Male          | 1034/3799            | 829 (369 to 1521)                  | Reference              |                        |

| First official language |                      |                                    |                        |                        |           |
|-------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| English                 | 797/2934             | 739 (328 to 1475)                  | 0.539                  | Reference              |
| French                  | 360/1253             | 852 (406 to 1511)                  | 0.93 (0.75 to 1.17)    | 0.539                  |

| Marital status         |                      |                                    |                        |                        |           |
|------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| Married/common law     | 809/2805             | 908 (342 to 1624)                  | 0.1103                 | Reference              |
| Divorces/separated/widowed | 130/351             | 642 (302 to 1268)                  | 1.24 (0.90 to 1.70)    | 0.1995                 |
| Single                 | 218/1032             | 636 (376 to 1220)                  | 1.32 (1.00 to 1.74)    | 0.0518                 |

| Rank category          |                      |                                    |                        |                        |           |
|------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| JNCM                   | 742/2814             | 773 (379 to 1497)                  | 0.8911                 | Reference              |
| SNCM                   | 284/910              | 830 (340 to 1427)                  | 1.07 (0.79 to 1.45)    | 0.658                  |
| Officer                | 131/463              | 630 (224 to 1269)                  | 1.06 (0.68 to 1.64)    | 0.7995                 |

| Years of military service |                      |                                    |                        |                        |           |
|---------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| <5 years                  | 177/1010             | 849 (406 to 1425)                  | 0.4003                 | 0.81 (0.56 to 1.16)    | 0.2463    |
| 5 to 9 years              | 359/1210             | 754 (384 to 1568)                  | 0.76 (0.54 to 1.07)    | 0.1216                 |
| 10 to 19 years            | 392/1234             | 843 (326 to 1554)                  | 0.76 (0.53 to 1.09)    | 0.1348                 |
| ≥ 20 years                | 229/733              | 540 (262 to 1248)                  | Reference              |                        |

| Component                |                      |                                    |                        |                        |           |
|--------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| Regular Force            | 1095/3815            | 816 (368 to 1497)                  | 0.6939                 | Reference              |
| Reserve Force            | 62/372               | 406 (190 to 891)                   | 1.16 (0.55 to 2.45)    | 0.6939                 |

| Service                  |                      |                                    |                        |                        |           |
|--------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| Army                     | 890/3502             | 782 (362 to 1476)                  | 0.9669                 | Reference              |
| Air Force                | 183/506              | 727 (349 to 1521)                  | 1.01 (0.77 to 1.31)    | 0.9599                 |
| Navy                     | 84/179               | 489 (203 to 1074)                  | 1.09 (0.56 to 2.11)    | 0.7957                 |

| Combat arms occupation   |                      |                                    |                        |                        |           |
|--------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| No                       | 801/2764             | 743 (320 to 1459)                  | 0.7807                 | Reference              |
| Yes                      | 356/1423             | 805 (404 to 1546)                  | 0.96 (0.75 to 1.25)    | 0.7807                 |

| Deployment location†‡    |                      |                                    |                        |                        |           |
|--------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| Other                    | 87/232               | 719 (341 to 1160)                  | 0.0497                 | Reference              |
| Afghanistan              | 1070/3955            | 769 (345 to 1476)                  | 0.80 (0.64 to 1.00)    | 0.0497                 |

| Deployment length        |                      |                                    |                        |                        |           |
|--------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| ≤ 180 days               | 286/1005             | 847 (442 to 1476)                  | 0.4996                 | Reference              |
| > 180 days               | 871/3182             | 741 (329 to 1447)                  | 0.92 (0.73 to 1.16)    | 0.4996                 |

| Post-deployment era†‡    |                      |                                    |                        |                        |           |
|--------------------------|----------------------|------------------------------------|------------------------|------------------------|-----------|
| 2009–2011                |                      |                                    | 0.0002                 | Reference              |
| 2012–2014                |                      |                                    | 0.87 (0.67 to 1.14)    | 0.3131                 |
| 2015–2017                |                      |                                    | 1.65 (1.08 to 2.53)    | 0.0211                 |

Continued
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**Table 2**  Continued

| Sample N/ weighted N | Delay (days) to care (median (IQR)) | Wald $\chi^2$ | Unadjusted HR (95% CI) | HR P value |
|----------------------|-------------------------------------|--------------|------------------------|------------|
|                      |                                     | P value      |                        |            |
| **A past mental health problem** |                                     |              |                        |            |
| No                   | 1023/3778                           | 796 (368 to 1476) | 0.1329                 | Reference  |
| Yes                  | 134/409                             | 589 (202 to 1347) | 1.30 (0.92 to 1.84)    | 0.1329     |
| **Disorder case-mix†‡§** |                                     |              |                        |            |
| Depressive disorder only | 66/267                             | 669 (276 to 1182) | 0.0016                 | 1.66 (1.10 to 2.52) | 0.0172     |
| ‘Other’ mix-no PTSD    | 118/487                             | 635 (352 to 1181) | 1.47 (0.83 to 2.59)    | 0.1898     |
| PTSD only             | 188/838                             | 1127 (603 to 2018) | Reference             |            |
| PTSD and depressive disorder | 241/668                           | 825 (312 to 1289) | 1.62 (1.29 to 2.02)    | <0.0001    |
| PTSD and ‘other’ mix  | 419/1411                            | 652 (341 to 1392) | 1.45 (1.09 to 1.92)    | 0.0099     |
| Single ‘other’        | 125/515                             | 563 (317 to 1219) | 1.29 (0.82 to 2.03)    | 0.2761     |
| **Any PTSD**          |                                     |              |                        |            |
| No                   | 309/1270                            | 636 (327 to 1188) | 0.5961                 | Reference  |
| Yes                  | 848/2917                            | 860 (370 to 1536) | 0.92 (0.68 to 1.24)    | 0.5961     |
| **Relevant general medical condition indicated†** | | | | |
| No                   | 636/2673                            | 959 (449 to 1829) | <0.0001                | Reference  |
| Yes                  | 521/1514                            | 456 (260 to 947) | 2.44 (2.03 to 2.95)    | <0.0001    |
| **Post-deployment screening status†‡** | | | | |
| Not screened         | 482/1070                            | 928¶ (465 to 1547) | 0.0345                 | Reference  |
| Screened             | 675/3117                            | 578¶ (209 to 1300) | 1.33 (1.02 to 1.73)    | 0.0345     |

*Significant at 0.05<p≤0.10.†Significant at p<0.05.‡Handled as a time-dependent covariate.
§Depressive disorder includes either major depression or dysthymic disorder. The ‘other’ single disorders included non-PTSD anxiety disorders, mood disorders other than major depression and dysthymic disorder, adjustment disorder, somatoform disorder, substance-related disorders and substance-induced disorders; however, the ‘other’ mix disorders could also include major depression or dysthymic disorder.
¶The median delay to care for post-deployment screening was taken from the Kaplan-Meier event probabilities that were generated taking into account this covariate’s time-dependent nature.
**IQR, interquartile range; JNCM, Junior Non-Commissioned Member; PTSD, post-traumatic stress disorder; SNCM, Senior NCM.

**Figure 1** Cumulative proportion of mental disorder diagnoses that were identified as time since deployment return increased, and by post-deployment screening status, among service members with a mental disorder that was deemed deployment service-related.
Table 3  Post-deployment screening summary findings and latency from deployment return to screening relative and screening to mental disorder diagnosis for screened individuals in the study population

| Post-deployment screening status                  | Sample N/ weighted N | %        | 95% CI     | Deployment return to screening (days) | Screening to diagnosis (days) |
|------------------------------------------------|----------------------|----------|------------|--------------------------------------|------------------------------|
| Not screened                                    | 482/1070             | 25.6     | 22.2 to 28.9 | –                                     | –                            |
| Screened                                        | 675/3117             | 74.4     | 71.1 to 77.8 | 151                                   | 121 to 187                   |
| Overall                                         | 1157/4187            | 100      | –           | –                                     | –                            |
| **Mental health concern indicated**              |                      |          |            |                                       |                              |
| ‘Major’ concern                                 | 198/788              | 25.3     | 20.4 to 30.1 | 146                                   | 116 to 180                   |
| ‘Minor’ only                                     | 220/1026             | 32.9     | 27.1 to 38.7 | 160                                   | 127 to 200                   |
| None                                            | 257/1304             | 41.8     | 35.7 to 47.9 | 148                                   | 119 to 170                   |
| **Mental health or other concern**               |                      |          |            |                                       |                              |
| ‘Major’ concern                                 | 293/1214             | 38.9     | 33.3 to 44.5 | 156                                   | 123 to 193                   |
| ‘Minor’ only                                     | 221/1004             | 32.2     | 26.5 to 37.9 | 144                                   | 122 to 199                   |
| None                                            | 161/899              | 28.9     | 22.8 to 34.9 | 150                                   | 119 to 166                   |
| **Concern type indicated**                       |                      |          |            |                                       |                              |
| ‘Major’ mental health concern                    | 198/788              | 25.3     | 20.4 to 30.1 | 146                                   | 116 to 180                   |
| ‘Minor’ mental health concern only               | 220/1026             | 32.9     | 27.1 to 38.7 | 160                                   | 127 to 200                   |
| Physical health concern (no mental health)       | 71/297               | 9.5      | 6.2 to 12.9  | 132                                   | 126 to 195                   |
| ‘Other’ concern (no mental or physical)          | 25/108               | 3.4      | 1.3 to 5.6   | 128                                   | 96 to 169                    |
| None                                            | 161/899              | 28.9     | 22.8 to 34.9 | 150                                   | 119 to 166                   |
| **Any follow-up indicated**                      |                      |          |            |                                       |                              |
| Yes                                             | 392/1689             | 54.2     | 48.2 to 60.1 | 154                                   | 125 to 193                   |
| No                                              | 283/1428             | 45.8     | 39.9 to 51.8 | 149                                   | 118 to 174                   |
| **Any mental health follow-up indicated**        |                      |          |            |                                       |                              |
| Yes                                             | 222/940              | 30.2     | 24.8 to 35.5 | 155                                   | 121 to 193                   |
| No                                              | 453/2177             | 69.8     | 64.5 to 75.2 | 149                                   | 121 to 180                   |

IQR, interquartile range.
Table 4 Proportional hazards modelling results for the assessment of the influence of post-deployment screening status and specific screening findings on delay to care

| Age category | Adjusted HR* | P value |
|--------------|-------------|---------|
| 19–24        | 0.81 (0.56 to 1.16) | 0.2462 |
| 25–34        | 0.68 (0.52 to 0.88)  | 0.0043 |
| 35–44        | 0.76 (0.59 to 0.97)  | 0.0261 |
| 45–60        | Reference      |         |

| Sex          | Adjusted HR* | P value |
|--------------|-------------|---------|
| Female       | 1.25 (0.95 to 1.64) | 0.1114 |
| Male         | Reference   |         |

| Marital status | Adjusted HR* | P value |
|----------------|-------------|---------|
| Married/common law | Reference |         |
| Divorces/separated/widowed | 1.24 (0.95 to 1.63) | 0.1206 |
| Single        | 1.32 (1.02 to 1.71) | 0.0375 |

| Deployment location | Adjusted HR* | P value |
|---------------------|-------------|---------|
| Other               | Reference   |         |
| Afghanistan         | 0.78 (0.59 to 1.03) | 0.0782 |

| Post-deployment era† | Adjusted HR* | P value |
|----------------------|-------------|---------|
| 2009–2011            | Reference   |         |
| 2012–2014            | 0.96 (0.74 to 1.24) | 0.7623 |
| 2015–2017            | 2.00 (1.31 to 3.06) | 0.0013 |

| A past mental health problem | Adjusted HR* | P value |
|-------------------------------|-------------|---------|
| No                            | Reference   |         |
| Yes                           | 1.16 (0.86 to 1.57) | 0.3318 |

| Disorder case-mix‡             | Adjusted HR* | P value |
|--------------------------------|-------------|---------|
| Depressive disorder only       | 1.47 (0.96 to 2.26) | 0.0761 |
| ‘Other’ mix-no PTSD            | 1.50 (0.95 to 2.37) | 0.0802 |
| PTSD only                      | Reference   |         |
| PTSD and depressive disorder   | 1.49 (1.17 to 1.90) | 0.0011 |
| PTSD and ‘other’ mix           | 1.37 (1.06 to 1.78) | 0.0166 |
| Single ‘other’                 | 1.40 (0.92 to 2.15) | 0.1178 |

| Relevant general medical condition indicated | Adjusted HR* | P value |
|----------------------------------------------|-------------|---------|
| No                                           | Reference   |         |
| Yes                                          | 2.36 (1.94 to 2.87) | <0.0001 |

| Post-deployment screening status†           | Adjusted HR* | P value |
|---------------------------------------------|-------------|---------|
| Not screened                                | Reference   |         |
| Screened                                    | 1.43 (1.11 to 1.86) | 0.0067 |

| Screening findings                         | Adjusted HR* | P value |
|--------------------------------------------|-------------|---------|
| Mental health concern indicated†           |             |         |
| ‘Major’ concern                            | 3.36 (2.38 to 4.73) | <0.0001 |
| ‘Minor’ concern only                       | 1.46 (1.08 to 1.99) | 0.0152 |
| None                                        | 0.98 (0.72 to 1.33) | 0.8975 |
| Not screened                                | Reference   |         |

| Mental health or other concern†            | Adjusted HR* | P value |
|--------------------------------------------|-------------|---------|
| ‘Major’ concern                            | 2.33 (1.73 to 3.13) | <0.0001 |
| ‘Minor’ only                               | 1.30 (0.97 to 1.74) | 0.075  |
| None                                        | 1.01 (0.72 to 1.41) | 0.9746 |
| Not screened                                | Reference   |         |

Table 4 Continued

| Concern type indicated†                    | Adjusted HR* | P value |
|--------------------------------------------|-------------|---------|
| ‘Major’ mental health concern              |             |         |
| ‘Minor’ mental health concern only         | 1.47 (1.08 to 2.00) | 0.0136 |
| Physical health concern (no mental health) | 1.13 (0.81 to 1.58) | 0.4719 |
| ‘Other’ concern (no mental or physical health) | 0.76 (0.45 to 1.29) | 0.3049 |
| None                                        | 0.97 (0.69 to 1.38) | 0.8771 |
| Not screened                                | Reference   |         |

| Any follow-up indicated†                   | Adjusted HR* | P value |
|--------------------------------------------|-------------|---------|
| Yes                                        | 2.05 (1.55 to 2.71) | <0.0001 |
| No                                         | 1.04 (0.78 to 1.40) | 0.7889 |
| Not screened                                | Reference   |         |

| Any mental health follow-up indicated†     | Adjusted HR* | P value |
|--------------------------------------------|-------------|---------|
| Yes                                        | 2.35 (1.73 to 3.21) | <0.0001 |
| No                                         | 1.20 (0.91 to 1.59) | 0.1912 |
| Not screened                                | Reference   |         |

*Adjusted for: age category, sex, marital status, deployment location, post-deployment era, a past mental health problem, disorder case-mix and relevant general medical condition. Covariates dropped from consideration: first official language, rank category, years of military service, component, service, combat arms occupation and deployment length.†Handled as a time-dependent covariate.‡Depressive disorder includes either major depression or dysthymic disorder. The ‘other’ single disorders included non-PTSD anxiety disorders, mood disorders other than major depression and dysthymic disorder, adjustment disorder, somatoform disorder, substance-related disorders and substance-induced disorders; however, the ‘other’ mix disorders could also include major depression or dysthymic disorder. PTSD, post-traumatic stress disorder.

Moreover, among the covariates included as potential confounders, delay to care was determined to be generally shorter for individuals who were older (45 to 60 years), single, whose post-deployment era was more recent (2015 to 2017), whose diagnosis was not PTSD alone and whose diagnosis identified a relevant general medical condition to be present (table 4). Individuals whose deployment location was not Afghanistan had a marginally significant shorter delay to care (0.05≤p≤0.10).
DISCUSSION

Key findings
The primary objective of this study was to determine whether the CAFs post-deployment screening programme was associated with a shortened delay to diagnosis and care for individuals with a mental disorder that was deployment-related. We found that this delay was shorter by almost a year among screeners relative to non-screeners. After controlling for potential confounders, screened individuals had a delay to care that was 43% shorter. Additionally, the screening findings had a substantial influence on this observed effect. The screening interviewers’ identification of a ‘major’ mental health concern and/or their recommendation of mental health services follow-up (both proxy measures of symptom severity) were strongly associated with a shortened delay to diagnosis and care.

Comparison with other research
There has been limited research on the value of conducting routine post-deployment screening in military populations, and what has been published provides mixed results regarding a tangible benefit. Screening in the US military consists of an initial post-deployment health assessment shortly after a deployment ends and a second assessment 90 to 180 days after deployment return. This latter assessment is similar to screening in Canada and it similarly makes use of standardised screening questionnaires and a meeting with a health-care provider. There are a few studies from the USA that report on care-seeking after service members screen positive for concerns. One study, assessing service members who completed screening in 2005/2006, identified that 61% of screened individuals who were referred for a mental health assessment were seen within 90 days (50.5% within 30 days) and, additionally, 74% of participants who accessed mental healthcare had not been referred, possibly primed to a need for services as a result of screening even though they screened negative. Another US study assessed a large Army Reserve population that completed screening after a 2008 to 2011 service release. The authors reported that follow-up care was more likely among members who screened positive for PTSD and depression. A third US study assessed a population that released from service after 11 September 2001 and sought care in 2004 to 2006. The authors reported that while only 45% underwent screening, 61% screened positive for mental health problems but only 46% of those with a positive screen had a mental health clinic visit scheduled within 30 days of the screen. However, when the follow-up period was extended beyond 90 days this increased to 73% of positive screeners who had a mental health appointment compared with only 32% among negative or non-screeners. Taken together, these findings suggest that a positive screening in the USA leads to expedited mental healthcare, but it is unknown whether individuals who received services following screening would have sought such care in a comparable time frame had they not screened. Additionally, these findings suggest that some negative screeners will still seek mental health services, but it is unknown how their delay to care compares to those not screened. Moreover, none of these studies explicitly examined whether or not screening had a beneficial effect of shortening delay to diagnosis and care for those with a deployment-related mental disorder compared with an unscreened group with a comparable need.

A recently published report that assessed post-deployment screening among Royal Marines and Army personnel in the UK after their return from deployment to Afghanistan raises some doubt about the value of screening. The study used a cluster randomised controlled trial to assess post-deployment screening that offered tailored help-seeking advice relative to a ‘non-screened’ control group that received general mental health advice. The authors reported that past-year mental health services use among participants who screened positive 6 to 12 weeks after deployment-return was comparable to services use in the ‘non-screened’ group and generally, identified screening to be ineffective. Specifically, 33% of the 207 individuals that screened positive and 36% of the 129 individuals in the control group who would have been considered positive screens reported a past-year mental health services use during follow-up. It is difficult to extrapolate these findings to the Canadian context because of the non-comparable way screening was operationalised in the study. These differences include the screening method employed (eg, the short time-to-screening relative to deployment-return, the sole use of self-administered instruments), the sometimes short and variable follow-up period (ie, 10 to 24 months after screening) and the low number with an apparent need for mental health services (ie, low power to detect differences). Consequently, the UK findings do little to inform on the value of Canada’s post-deployment screening programme within its system of care.

In contrast, our study is the first to demonstrate a substantial reduction in the delay to diagnosis of deployment-related mental disorders that was associated with mass screening. As expected, this effect was driven by the outcome of screening. When service members had an apparent need for mental health services, a positive screening was associated with a shorter delay to care relative to non-screeners; however, individuals who screened negative did not have this benefit.

Limitations
The primary limitation of our study relates to it being a retrospective observational study and its reliance on administrative data. It is possible that, although we assessed and controlled for several potential confounders, other unmeasured characteristics that were associated with screening status may have had an influence on our findings. For example, although post-deployment screening is mandatory (but not fully enforced) it is possible that individuals with more symptomology had received greater encouragement to screen and consequently, such...
individuals may have been more motivated to seek care. However, a fraction of the motivated care-seekers with high symptomology would have been directed to care rather than initially screening and among those who screened, such individuals would have still benefitted from screening as the means that aided their expedited care-seeking.

Additionally, we limited our investigation to individuals with a mental disorder diagnosis that was deployment-related, raising the possibility of limited generalisability to screened individuals with mental health concerns that were not related to a prior deployment. While it’s possible that some individuals with non-deployment related disorders may have had care management facilitated by screening, the study was not designed to assess this. Finally, it is possible that some deployment-related attribution errors were made; however, clinicians in the CAFs mental health system, particularly those in the Operational Trauma and Stress Support Centres, routinely evaluate for such an attribution during the diagnostic assessment and it is expected that any errors would have been randomly distributed between screened and non-screened groups.

**Interpretation**

The CAFs post-deployment screening programme, with its focus on facilitating early care-seeking, has been in operation since 2002 yet there has been very little data available to assess whether it has had an influence on care-seeking. In the intervening period the CAF has attempted to remove barriers to seeking mental healthcare by building a comprehensive outpatient mental health clinical programme and it addressed stigma through a variety of programmes such as the Road to Mental Readiness. Some have questioned whether post-deployment screening has outlived its usefulness in this augmented setting—could these other efforts facilitate earlier care-seeking without screening. Indeed, we did observe that a small fraction of individuals were diagnosed either prior to the recommended screening window (6.5%) or prior to the eventual completion of their mandatory screening (3.0%). However, the collective prevalence of this early care-seeking that occurred before screening was sufficiently low in the study population that its occurrence does not negate our observed screening benefit.

We found that screening was strongly associated with a shortened delay to a definitive mental disorder diagnosis and this is aligned with the primary objective of post-deployment screening; however, there is little evidence available that quantifies what an optimal delay threshold should be in order to improve clinical outcomes. Nonetheless, several beneficial individual and organisational outcomes have been implied or found to be associated with shorter delays to care: a greater likelihood of symptom improvement, more favourable occupational outcomes, reduced health services costs and a reduced risk of individuals developing additional health problems and impairments to interpersonal and work-related functioning. Such benefits are consequential and reinforce the value of screening.

Our findings also reinforce what has been proposed by others, that the net effectiveness of a screening programme is largely dependent on a series of events occurring as planned. The core components of what has been proposed includes: (1) a target group that is sufficiently compliant with screening; (2) participants that are able to recognise and honestly disclose their symptoms and impairments during screening; (3) screening tools that have good sensitivity and specificity; (4) clinicians that accurately interpret the screening tools and participants’ reported symptoms to make sound follow-up recommendations; and (5) participants that follow through, adhering to the recommended services. At this point we have not determined whether all of these components of the CAFs programme are performing as intended. However, it is highly likely that some of them are not. For example, compliance with the screening requirement is suboptimal. A related study found that only 67% of members returning from deployment completed a screening, and only 43% did so within the recommended post-deployment time frame. We also observed some incongruence between the assessment results and follow-up recommendations: 36.2% of those with a ‘major’ mental health concern identified at screening had no mental health services follow-up recommendations by clinicians who conducted the screening interview, yet this could not be explained by individuals already being in some form of mental healthcare at the time of screening. This warrants a closer examination of clinician decisions that are made as a result of a service member’s screening interview, specifically regarding their follow-up recommendations; if screening identifies an issue but there is no follow-up recommended by the clinician then screening falls short of its intended benefit of optimally shortening the delay to care.

The implementation of any large scale health intervention will be imperfect. Consequently, our findings reflect the operationalisation of a post-deployment screening programme in real-world conditions. Benefits associated with a shortened delay to care are anticipated (ie, symptom improvement, occupational retention, treatment cost-reduction, reduced risk of further impairments and quality of life) but this is reliant on an unbroken series of screening events occurring as planned. Moreover, the full potential of such a programme can only be realised when all of its components function as intended. Further work that delves into these elements and their optimisation is warranted.

**Conclusions**

The CAF and other military organisations have invested in post-deployment screening programmes in an effort to reduce delays to mental healthcare. These reductions are anticipated to result in beneficial outcomes for both the individual and the military organisation. Our study found
that screening was associated with a shortened delay to diagnosis for mental disorders that were deployment-related; the median delay was shorter by almost 1 year. Further work to investigate optimising the screening process and its individual components is warranted.

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Contributors DB had full access to all data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis. DB is the guarantor and principal investigator of the study. DB wrote the initial draft of the manuscript and both DB and BG contributed to the interpretation of the results as well as the writing and revising of the manuscript. DB and BG have read and agree with the manuscript’s final content.

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