pills, strength of the tablet, and refill numbers. These presets could have been initiated at about 2011 and reduced the number of pills prescribed, assuming most providers defaulted to using those prescribing presets. Because military hospitals do not report data to state databases, the implementation of prescription drug monitoring programs likely did not contribute to decreased prescribing. Finally, military providers operate in one unified federal health system, allowing consistency in prescribing habits. However, other attempts at instilling new clinical changes across the military enterprise have not been as successful; thus, a better understanding of the rapidity of this practice change may impart useful lessons in other areas.

**Limitations**

The analyses presented must be considered in light of limitations. Prescription fills are used as a proxy for medication use; however, this does not guarantee the medication was consumed as indicated nor consumed by the person for whom it was intended.

Our data included prescription histories of active duty members receiving TRICARE benefits for at least 11 of 12 months. A few ADSM may have left active duty service before completing these 11 months because of retirement, separation, death, or medical disability; these people would not be included in our population. Additionally, prescriptions filled in combat regions were not included in our data. We corrected for this situation by subtracting the count of ADSM deployed in combat areas from the total ADSM counts. Prescriptions given in a combat region would tend to be of short duration, since any need for long-term duration opioid use would require the individual be sent home. Our analyses also exclude prescriptions written or filled outside of the TRICARE network and paid for in cash; these prescriptions are not tracked in the M2 DataMart. For these reasons, our results are conservatively analyzed and should be considered a lower bound for the actual results.
Civilian prescription data were obtained from IMS health data, which monitors most prescriptions filled through retail pharmacies. While these data is widely used in the opioid literature, other routes to filling prescriptions were excluded. Additional population-level research in opioid use could be very useful for comparing different populations.

It is unclear if the seasonal effect observed is a remnant of the 11 out of 12-month TRICARE enrollment requirement or some other factor. However, we included a seasonal factor in each time series analysis. This analysis excluded veterans or family members of ADSM receiving TRICARE benefits. Family members and veterans may have different opioid use trajectories more akin to civilian than ADSM populations.

**Conclusion**

We detected a significant reduction in opioid use patterns after December 2011 in both civilian and ADSM (non-deployed) populations, which was more pronounced in the military than civilian populations. Many factors, such as fewer wounded in action counts, may be reasons for these findings. Our results likely reflect a complex combination of many factors inside and outside of the military, including policy directives and cultural changes.

Disclaimer: The views expressed are those of the author(s)/presenter(s) and do not reflect the official views or policy of the Department of Defense or its Components.
Bibliography


2. IMS Health. IMS’s National Prescription Audit (NPA) & Vector One ®: National (VONA), 1997-2013, 2014


Figure 1. Yearly prescription counts from TRICARE (active duty military) and IMS (civilian retail) pharmacies.
Figure 2. Percent change from previous year for non-deployed active duty military and civilian (IMS) populations (TRICARE and IMS databases, respectively).

Civilian vs Military Percent Change from Previous Year

- US Total Retail Prescriptions (IMS Health) — Active Duty Service Members Total Prescriptions (TRICARE)
Figure 3. Monthly forecasted number versus actual proportion of active duty members receiving at least one opioid prescription during 2006-2014.
Table 1. Interrupted time series analysis of military system-level variables

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
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Goodness of Fit

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Significance: ***0.001 **0.01 *0.05
Funding

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March 10, 2017
William H.J. Haffner, M.D., CAPT, USPHS (Ret)
Editor-in-Chief
Military Medicine
9320 Old Georgetown Rd
Bethesda, MD 20814

Dear Dr. Haffner,

We are pleased to submit our manuscript titled "Opioid use patterns among active duty service members and civilians: 2006-2014" for consideration for publication in Military Medicine. Mr. Kazanis (first author) presented the data during a poster presentation at the Military Health Research Symposium in 2016, and we are pleased to be able to follow up with a completed manuscript.

Opioid analgesic prescriptions have increased among active duty service members. As a result of the increase, the Department of Defense and other regulating agencies have implemented policies regarding safe opioid prescribing and proper pain management care. However, little is known about the effects of combat operations and military health policies on the trends of opioid use among active duty service members. Therefore, we sought to characterize opioid trends among the active duty population between 2006 to 2014, compare the trends to civilian patterns, and investigate whether military specific factors influenced opioid use. This manuscript demonstrates that a confluence of factors, both civilian and military, may contribute to changes in opioid use. Indeed, the structural system of the military may facilitate policy implementation.

This manuscript has not been previously published and is not under consideration in the same or similar form in any other peer-reviewed media. This paper was written by William Kazanis, M.S., Capt Mary Jo Pugh, USAF, Ph.D., NC (RET), Claudina Tami, B.S., Maj Joseph K.
Maddry, USAF, M.D., MC, Lt Col Vikhyat S. Bebarta, Colorado Air National Guard, M.D., MC, Erin P. Finley, Ph.D, M.P.H, Don D. McGearry, Ph.D, Col David H. Carnahan, USAF, M.D., MCSE, and Jennifer Sharpe Potter, Ph.D, M.P.H. All of the authors listed have made a significant contribution to this study and manuscript, and all authors have approved this manuscript for submission. We claim no possible financial or other conflicts of interests.

Our project was determined exempt by the Institutional Review Board at San Antonio Military Center, Wilford Hall Ambulatory Surgical Center, and the University of Texas Health Science Center at San Antonio. I have obtained written permission from all persons named in the Acknowledgment.

As corresponding author, I am happy to answer any questions you may have. Please feel free to contact me at potterjs@uthscsa.edu or 210-567-0611.

Thank you for your consideration, and we look forward to hearing from you.

Sincerely,

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Structured Summary

Introduction

Between 2001 and 2009, opioid analgesic prescriptions in the Military Health System (MHS) quadrupled to 3.8 million. The sheer quantity of opioid analgesics available set the stage for issues related to misuse, abuse, and diversion. To address this issue, the Department of Defense (DoD) implemented several directives and clinical guidelines to improve access to appropriate pain care and safe opioid prescribing. Unfortunately, little has been done to characterize changing patterns of opioid use in active duty service members (ADSM), so little is known about how combat operations and military health care policy may have influenced this significant problem. We examined changes in opioid use for ADSM between 2006 and 2014, compared trends to the civilian population, and explored the potential role of military-specific factors in changes in opioid use in the MHS.

Materials and Methods

After obtaining IRB approval, administrative prescription records (Pharmacy Data Transaction Records) for non-deployed ADSM were used to determine the number of opioid prescriptions dispensed each year and the proportion of ADSM who received at least one prescription per month between 2006 and 2014. Based on observation and the literature, we identified December 2011 as the demarcation point (the optimal point to identify the downturn in opioid use) and used it to compare opioid use trends before and after. We used an autoregressive forecast model to verify changes in opioid use patterns before and after 2011. Several interrupted time series models examined whether military system-level factors were associated with changes in opioid use.
Results

Between 2006 and 2014, 1,516,979 ADSM filled 7,119,945 opioid prescriptions, either in military treatment facilities or purchased through TRICARE. Both active duty and civilian populations showed signs of decreasing use after 2011, but this change was much more pronounced among ADSM. The forecast model showed a significant difference after 2011 between the projected and actual proportion of ADSM filling an opioid prescription, confirming 2011 as a point of divergence in opioid use. Interrupted time series models showed the deflection point was associated with significant decreases. A significant increase of .261% in opioid prescriptions was seen for every one thousand wounded in action service members in a given month. Troops returning from Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), or Operation New Dawn (OND) did not appear to influence the rates of use. Even after accounting for returning troops from OEF/OIF/OND and wounded in action counts, the deflection point was associated with a lower proportion of ADSM who filled an opioid prescription, leading to a decrease of 1.61% by the end of the observation period (December 2014).

Conclusion

After December 2011, opioid use patterns significantly decreased in both civilian and ADSM populations, but more so in the military population. Many factors, such as numbers of those wounded in action and structural organization of the MHS, may have caused the decline, although more than likely that the decrease was influenced by many factors inside and outside of the military, including policy directives and cultural changes.