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Naloxone prescribing practices in the Military Health System before and after policy implementation

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Abstract

Introduction: Despite public health campaigns, policies, and educational programs, naloxone prescription rates among people receiving opioids remains low. In June 2018, the U.S. Military Health System (MHS) released 2 policies to improve naloxone prescribing.

Objectives: The objective of this study was to examine whether the policies resulted in increased naloxone coprescription rates for patients who met the criteria for 1 or more risk indicators (eg, long-term opioid therapy, benzodiazepine coprescription, morphine equivalent daily dose ≥50 mg, and elevated overdose risk score) at the time of opioid dispense.

Methods: Prescription and risk indicator data from January 2017 to February 2021 were extracted from the MHS Data Repository. Naloxone coprescription rates from January 2017 to September 2018 were used to forecast prescribing rates from October 2018 to February 2021 overall and across risk indicators. Forecasted rates were compared with actual rates using Bayesian time series analyses.

Results: The probability of receiving a naloxone coprescription was higher for patients whose opioid prescriber and pharmacy were both within military treatment facilities vs both within the purchased-care network. Bayesian time series results indicated that the number of patients who met the criteria for any risk indicator decreased throughout the study period. Naloxone prescribing rates increased across the study period from <1% to 20% and did not significantly differ from the forecasted rates across any and each risk indicator (adjusted *P* values all >0.05).

Conclusion: Future analyses are needed to better understand naloxone prescribing practices and the impact of improvements to electronic health records, decision support tools, and policies.

Keywords: Naloxone, Opioid overdose risk, Patient safety, Healthcare policies, Health services research

1. Introduction

The U.S. Defense Health Agency implemented 2 policies in June 2018, pain management and opioid safety in the Military Health System[5] and naloxone prescribing and dispensing by pharmacists in military treatment facilities.[6] The policies outlined recommendations for prescribing naloxone to patients who meet the criteria for various risk indicators consistent with the Veterans Administration/Department of Defense clinical practice guidelines.[17] To support policy implementation, additional clinical decision support tools (eg, Look-Up Tool) demonstrated some benefits in improving naloxone prescribing practices within military treatment facilities.[14]

However, the Department of Defense Opioid Overdose Education and Naloxone Distribution (OEND) train-the-trainer program and the

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public-facing web site were not disseminated until in mid-2020, more than 2 years after policy release. This OEND program was developed based on the successful Veterans Administration's OEND program[9] and tailored for the Military Health System through a multiyear 2-phase implementation science approach. Therefore, it is unclear whether the Defense Health Agency policies produced meaningful increases in naloxone prescribing or when any meaningful changes in naloxone prescribing occurred.

The goal of this study was to examine whether policy and programmatic efforts resulted in increased naloxone coprescription rates for patients identified at elevated risk for opioid overdose from January 2017 to February 2020 and had not received a naloxone prescription within the year before opioid dispense. Study data also provided the unique opportunity to descriptively compare naloxone prescribing rates in patients who had prescribers and pharmacy dispense events in military treatment facilities (direct care), outside civilian network (purchased care), or a combination of both. We hypothesized that naloxone coprescription rates from October 2018 to February 2021 would be significantly greater than the forecasted rate, based on data from January 2017 to September 2018. The present analyses provide the first step in evaluating the success of the policies implemented in 2018 and present the opportunity to use Military Health System data and draw further descriptive conclusions regarding opioid and naloxone prescription patterns.

2. Methods

2.1. Data sources and record selection

The present retrospective observational study used data from a study protocol approved as exempted research by the Component Office for Human Research Protections at the Defense Health Agency Office of Research Protections (DHQ-20-2083). Data from the Military Health System Data Repository included opioid, and naloxone dispense records occurring between January 2016 to February 2020, corresponding to care encounters and prescription orders for adult (older than 17 years) patients who were enrolled in direct care at a military treatment facility. Patients included active duty service members, military retirees, and their family members. Patient records were included if they were dispensed an opioid prescription during the study period.

2.2. Variables of interest

2.2.1. Care systems

Although enrolled in direct care, some patients in this sample could receive prescriptions from health care prescribers and pharmacies in the purchased care network, including opioid prescriptions dispensed through mail order and retail pharmacies. Therefore, opioid dispense events were categorized into 3 categories corresponding to whether their prescribing provider and pharmacy were in the direct (within a military treatment facility) or purchased health care systems as follows: direct care only (direct care group), purchased care prescriber with direct care pharmacy (mixed care group), and purchased care only (purchased care group). The main group of interest was the direct care group.

2.2.2. Risk indicators

Patient records were categorized per risk indicators. At the time of opioid dispense, patients could meet the criteria for 1 or more of the 4 risk indicators. Risk indicators were defined as long-term opioid therapy (LOT, having at least 90 days opioid supply within the past 180 day period), coprescription of benzodiazepine (benzodiazepine, having at least 1 day of overlapping opioid and benzodiazepine prescriptions), a morphine equivalent daily dose (MEDD) $\geq$ 50 mg, and an elevated risk index for serious prescription opioid-induced respiratory depression or overdose (RIOSORD) (eg, RIOSORD $>$ 32)[19] at the time of opioid dispense. The RIOSORD cut-off score ($>$32) was selected arbitrarily when implemented within the Military Health System. Per the validation study using data from patients receiving care within the Veterans Administration, this cutoff was associated with a $>$23% predicted probability of identifying patient records with a documented overdose event.

2.2.3. Naloxone eligible criteria and naloxone prescribing

Patient records were categorized per their naloxone dispense history. Patients were naloxone-eligible if they (1) had not received a naloxone prescription within 365 days preceding the opioid dispense date and (2) met the criteria for 1 or more of the risk indicators at the time of opioid dispense. The naloxone prescribing rates referred to the proportion of patients who were naloxone-eligible and who were dispensed a naloxone prescription on the day of opioid dispense or within 30 days after. The 30-day period was selected as prescribers and pharmacists are encouraged to, in the event a patient did not receive naloxone when indicated, use existing clinical decision support tools to identify patients who have recently dispensed an opioid prescription and should have received a naloxone prescription, but did not.

2.2.4. Covariates

Additional medical record data included sex assigned in the medical record (male or female), age group (younger than 65 years or older than 65 years), beneficiary type (active duty service member, military retiree, family member, or other), and race and ethnicity (Asian, American Indian/Alaska Native, Black, Latino, other, white, or unknown).

2.3. Analytic plan

Outcomes and covariates were aggregated at the monthly level. The primary outcome was the proportion of patients who were naloxone-eligible, met criteria for one or more risk indicators, and were dispensed a naloxone prescription on or within 30 days of the opioid dispense date within the direct care group. Secondary outcomes included each of the 4 risk indicators in separate models.

After exploring the longitudinal relationships and patterns of naloxone prescribing rates, analyses examined whether naloxone prescribing rates in the direct care group from October 2018 to February 2020 varied from the forecasted estimates based on naloxone rates and covariates from January 2017 to September 2018. The delineation point between September and October 2018 was selected to account for a 3-month implementation phase after release of the policies. Bayesian structural time series models were used to estimate the forecasted direct care group naloxone prescribing rates. Models included semilocal linear and seasonal trend components to ensure forecasted values were not static and level but instead reflected the direction and intensity of changes in direct care group naloxone prescribing rates before the postperiod.

Models were first analyzed without covariates and then compared with models that contained covariates. Potential

covariates included (1) the overall number of patients in the direct group dispensed an opioid; overall (2) proportions of direct-care group patients with the applicable risk indicator at the time of opioid dispense, regardless of naloxone eligibility; (3) naloxone prescribing rates of purchased care naloxone prescribing rates corresponding to the applicable risk indicator category; and the proportions of naloxone eligible direct group patients who were (4) identified as male in the medical record, (5) active duty service members, (6) 65 years or older, and (7) white.

The *bsts* R package[15] uses a spike-and-slab priors approach to covariate inclusion, whereby each model with covariates was reiterated 10,000 times to produce the posterior inclusion probabilities for each covariate. The posterior inclusion probabilities and the scaled valuative absolute errors across months were compared between models. The set of covariate(s) with the lower absolute errors was selected. Forecasted prescribing rates (95% CI) from these models were compared with actual values using the *Causal Impact* R package.[4] Visualizations were constructed using the *ggplot2* R package,[18] with accessible color palette selection derived from the Adobe Color Blind Safe Accessibility Tool. Planned subgroup analyses examined the naloxone coprescription rates for patients who met the criteria for each of the 4 identified risk indicators (LOT, benzodiazepine, MEDD ≥ 50 mg, and RIOSORD > 32). Given the multiple related outcomes, the Benjamini–Hochberg procedure was applied to *P* values using the *rstatix* R package[9] to reduce the likelihood of a type I error in the correlated outcome models.[1]

3. Results

The number of patients enrolled in direct care who were dispensed opioids decreased in the direct and mixed care groups across time, whereas increased then decreased in the purchased care group (Supplementary Table 1, available at http://links.lww.com/PR9/A151). Similar patterns were demonstrated for the number of patients who were dispensed opioids and who met the criteria for any and each risk indicator (Supplementary Table 1, available at http://links.lww.com/PR9/A151). Additional aggregated monthly data for demographic covariates are also reported in Supplementary Table 1 (available at http://links.lww.com/PR9/A151).

As shown in Supplementary Table 2 (available at http://links.lww.com/PR9/A151) and **Figure 1**, naloxone prescribing rates in naloxone-eligible patients increased across the direct care, mixed care, and purchased care groups during the study period. The results from Bayesian time series model comparisons indicated that 1 covariate (naloxone prescribing rates of the naloxone-eligible and purchased care group corresponding to analyzed risk indicator) should be included in the Causal Impact models. However, the posterior probabilities for the covariate's inclusion ranged from 26% (any risk model) to 57% (RIOSORD > 32 model). In the Causal Impact models, there was a lack of evidence indicating the actual postpolicy naloxone prescribing rates varied from the forecasted values (adjusted *P* values all >0.05). The Causal Impact model results are presented in **Table 1**. On inspection (**Fig. 2**), the actual values do not seem to deviate beyond the predicted 95% CI until the second half of 2021.

4. Discussion

In the present analysis, naloxone prescribing rates steadily increased from 2017 through mid-2020, suggesting that the policies alone did not significantly affect the increase in naloxone prescribing. Less than 1% of the target population (eg, naloxone eligible) were dispensed a naloxone prescription in January 2017. By February 2021, the naloxone prescribing rate increased to approximately 21% for patients whose prescribers and pharmacies were in military treatment facilities and approximately 13% for

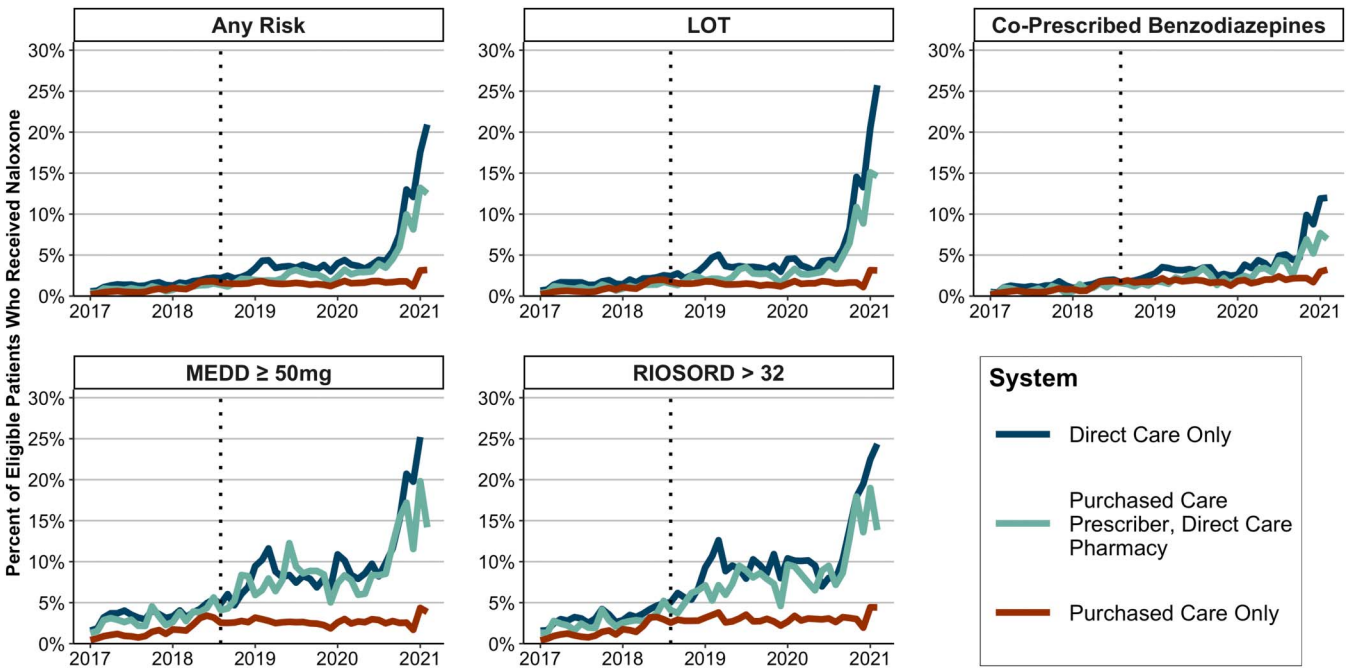

Figure 1. Monthly percent of patients without a past-year naloxone prescription dispensed an opioid and met the criteria for risk indicators who received naloxone, by risk indicator and care system. CI, confidence interval; Direct Care Only, direct care opioid prescriber and dispensing pharmacy; MEDD, morphine equivalent daily dose; Purchased Care Only, purchased care opioid prescriber and dispensing pharmacy; RIOSORD, risk index for serious prescription opioid-induced respiratory depression or overdose.

Table 1

Results from Bayesian time series analyses examining the difference between forecasted and actual naloxone prescribing rates.

Outcome	Actual frequency	Predicted frequency	Absolute difference	Relative effect	*P* value (adjusted *P*)
Any risk	6%	4% (2%, 6%)	2% (0%, 4%)	48% (−14%, 102%)	0.05 (0.13)
Benzodiazepine	4%	2% (0%, 4%)	2% (0%, 4%)	86% (−8%, 178%)	0.03 (0.13)
MEDD ≥ 50	10%	10% (2%, 18%)	2% (−6%, 10%)	20% (−76%, 98%)	0.26 (0.26)
RIOSORD > 32	10%	8% (2%, 16%)	2% (−4%, 8%)	30% (−52%, 100%)	0.16 (0.20)
Long-term opioid therapy	6%	4% (2%, 6%)	2% (−2%, 4%)	46% (−24%, 114%)	0.08 (0.13)

Adjusted *P* values were calculated using the Benjamini–Hochberg procedure.
MEDD, morphine equivalent daily dose; RIOSORD, risk index for serious prescription opioid-induced respiratory depression or overdose.

patients with a purchased care prescriber and an opioid dispense within a military treatment facility. However, the naloxone prescribing rates remained relatively lower (<1% to 3%) during the entire study period for patients with both purchased care prescribers and pharmacies.

As shown in the figures, the greatest increases in direct care naloxone prescribing rates occurred after mid-June 2020, corresponding to the dissemination of the OEND train-the-trainer program and public-facing web site (health.mil/oend). In addition to the OEND program, the available Look-Up Tool decision support tool also displayed the MEDD, RIOSORD, and a benzodiazepine coprescription flag but did not include a LOT flag until late October 2020. We note that the Look-Up Tool data update nightly, and therefore, OEND training includes additional education and encouragement to check RIOSORD scoring in the event additional items need to be added to the day's score. As such, the differences in prescribing rates across the different risk indicators may reflect differences in programming, dissemination efforts, and utilization of decision support tools by pharmacists, relative to opioid prescribing providers.[14]

Descriptively, naloxone prescribing rates for patients who met the criteria for LOT, elevated MEDD, and elevated RIOSORD exceeded 20% by the end of the study period, whereas naloxone prescribing rates for patients coprescribed benzodiazepines did not surpass 12%. During the Department of Defense OEND program implementation, some prescribers have questioned the utility of prescribing naloxone for patients who receive a 1-day supply of benzodiazepine that overlaps with a postprocedural opioid prescription (eg, refractory surgery and vasectomies). However, because current risk stratification tools (eg, RIOSORD) may not adequately capture overdose risk in a military beneficiary population, prescribers are encouraged to prescribe naloxone in the event of an accidental overdose while decreasing naloxone stigma and increasing naloxone normalization. The present results suggest that targeted evaluation and coaching efforts may be needed.

In evaluation of potential covariates, the number of opioid prescriptions dispensed, number of patients meeting the criteria for risk indicators, direct care enrollment numbers, and demographic information did not improve model fit and therefore were not included in the Causal Impact models. However, the number of opioid prescriptions dispensed and the number of patients meeting the criteria for risk indicators decreased across time. These results are consistent with findings indicating the overall rates of opioid prescribing have been decreasing in the Military Health System,[8] including high-dose opioid prescribing. Naloxone prescribing policies and programs may be effective at various levels of intervention.

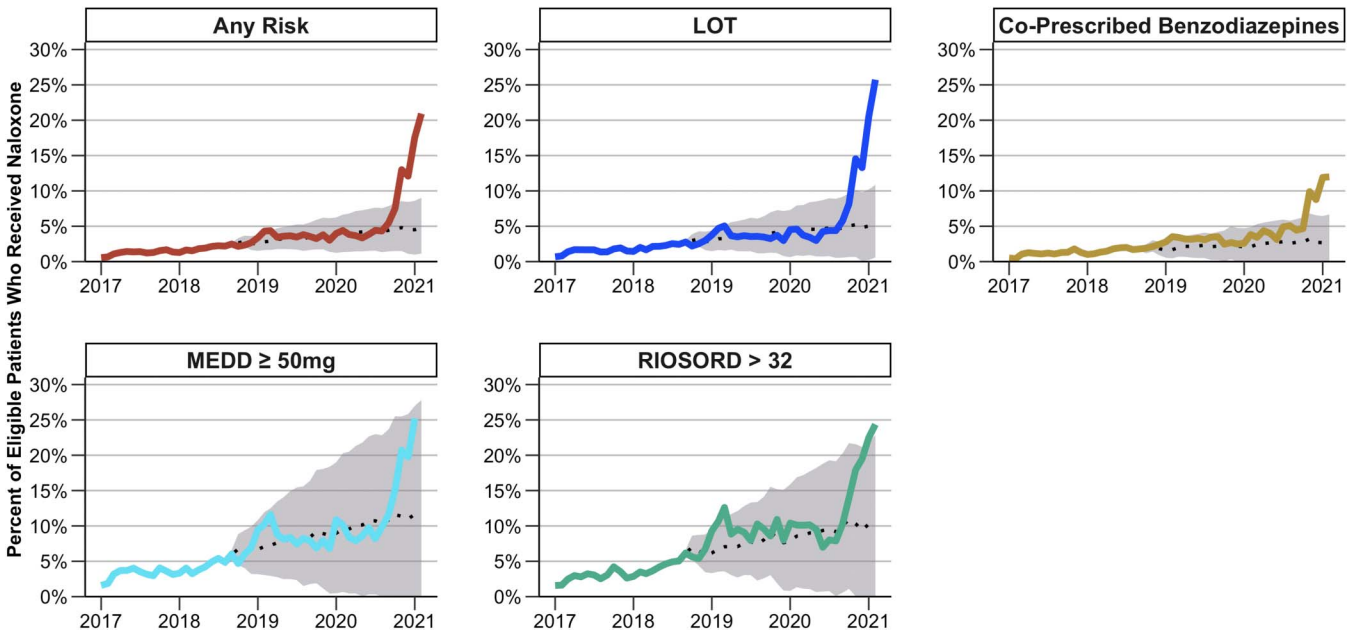

Figure 2. Monthly percent of patients without a past-year naloxone prescription dispensed an opioid and met the criteria for risk indicators who received a naloxone prescription, by risk indicator. The dashed black line and grey-shaded area indicate the forecasted values and 95% CI, respectively. CI, confidence interval; MEDD, morphine equivalent daily dose; RIOSORD, risk index for serious prescription opioid-induced respiratory depression or overdose.

Although state laws have strengthened the motivation to prescribe naloxone (eg, mandatory naloxone prescribing guidelines), additional policies and programs are needed at the health care system level. Leading the way in naloxone prescribing practices, the Veterans Administration's multiyear, expansive efforts to improve naloxone prescribing through their OEND program included both policy and robust dissemination and implementation programming.[13] As part of the Veterans Administration programming, providers who engaged in academic detailing services were significantly more likely to prescribe naloxone, relative to those who did not.[3] Because the Military Health System implements their OEND program through a train-the-trainer approach and based on the Veterans Administration OEND program, future comparative analyses are warranted because the Military Health System does not have academic detailing services. In addition to programming improvements, health care systems may need to consider additional mechanisms to increase naloxone prescribing practices.

Enhancing health care system clinical decision support tools may bolster naloxone prescribing at the point of care, including improvements to electronic medical record alerts, provider dashboards, and state prescription drug monitoring program data displays. In 1 health care system, implementation of an electronic medical record naloxone prescribing prompts increased naloxone prescribing volume.[16] Similar to this study, naloxone prescribing volume varied across patients with different risk indicators (eg, MEDD $\geq$ 50 mg).[16] In addition to developing the RIOSORD, the Veterans Administration has also implemented a provider dashboard that displays a variety of opioid risks and mitigation options, including a composite risk scores for suicide *and* opioid overdose events.[12] Such a dashboard, implemented within the Military Health System, could not only support naloxone prescribing to patients who meet the criteria for risk indicators at the time of opioid dispense but also naloxone prescribing for patients with an elevated suicide/overdose composite risk score. Future work is needed to expand decision support tools to allow for more robust composite risk indicators and timely recommendations for equitable, risk mitigation practices. Finally, state prescription drug monitoring program data do not currently display a flag or indicator of naloxone dispense events and, therefore, are largely a database of risk indicators (eg, scheduled medication dispense events). Future state and federal policy may be needed to modify and enhance prescription drug monitoring program displays to support naloxone prescribing.

Although naloxone prescribing rates increased, it is unclear the degree to which appropriate and effective patient education occurred or whether patients declined naloxone prescriptions. Qualitative research indicates that factors such as patient stigma may increase the probability of declining naloxone.[2] Although both the Department of Defense and Veterans Administration OEND programs include patient education (eg, handouts and videos) and social media (eg, infographics) dissemination materials to normalize and destigmatize naloxone, more research is needed to better understand barriers to naloxone receipt to build evidence-based, patient-centered education materials.

This study had inherent limitations associated with time series data. Analyses did not include patient-level characteristics beyond the 4 risk indicators, and data were analyzed on a monthly aggregated level. Thus, generalizations may be limited. For example, evidence indicates that naloxone distribution may not be equitable across marginalized patient populations and those at highest risk for overdose,[7,10,11] and it is unclear whether the 4 risk indicators used in this study are equitably predictive of overdose risk in marginalized patients. As such, the risk indicators are nonexhaustive, and analyses did not stratify patients by intersecting identities (eg, race, sex assigned, gender identity, and age). Given previously documented evidence of structural racism in naloxone prescribing,[7,10,11] additional and more robust analyses are needed to identify inequities and intervene, as indicated. Based on descriptive inspection of the trends, naloxone prescribing rates were increasing before policy implementation. Therefore, causal implications of the analyses are approached with caution.

This study included data from patients enrolled for care at a military treatment facility who were naloxone-eligible. However, a significant portion of care delivered by the Defense Health Agency is purchased from the commercial network. Future work is needed to understand whether TRICARE Pharmacy contracts with Managed Care Support contractors could incentivize naloxone prescribing through bonus payments leveraging the Centers for Medicare and Medicaid Services Star Rating Program framework. Overall, naloxone prescribing rates increased from January 2017 to February 2021, with the greatest change occurring in the past 6 months of the study period. Analyses suggested that the increases in naloxone prescribing after releasing 2 Defense Health Agency policies did not significantly vary from the forecasted values. Future analyses are needed to better understand naloxone prescribing practices and inequities, optimized patient and provider education, and evidence-based policy and program improvements.

Disclosures

The authors have no conflicts of interest to declare.

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Appendix A. Supplemental digital content

Supplemental digital content associated with this article can be found online at http://links.lww.com/PR9/A151.

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