# Public versus Private Care in the Military Health System: Evidence From Low Back Pain Patients

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## **ABSTRACT**

## **Introduction:**

There is a longstanding debate about whether health care is more efficiently provided by the public or private sector. The debate is particularly relevant to the Military Health System (MHS), which delivers care through a combination of publicly funded federal facilities and privately contracted providers. This study compares outcomes, treatments, and costs for MHS patients obtaining care for low back pain (LBP) from public versus private providers.

#### **Materials and Methods:**

A retrospective cohort study was completed using TRICARE Prime claims data from April 2015 to December 2018. The cohort was identified using International Classification of Diseases Ninth Revision and Tenth Revision diagnostic codes and then followed for 12 months after the index diagnosis to assess treatments, outcomes, and costs. Claims were classified as originating from either public or private providers. The primary outcome measure was resolution of LBP, defined as an absence of LBP diagnoses during the 6-to-12-month window following the index event. Instrumental variable models were used to assess the impact of care setting (i.e., private versus public), conditioning on the covariates. A regional measure of the fraction of private care was used as an instrument.

#### Results

Resolution of LBP was achieved for 79.7% of 144,866 patients in the cohort. No significant association was found between resolution of LBP and fraction of privately provided care. Higher fraction of private care was associated with a greater likelihood of opioid treatments (odds ratio, 1.22; 95% CI, 1.02-1.46) and a lower likelihood of benzodiazepine (odds ratio, 0.56; 95% CI, 0.45-0.70) and physical therapy (odds ratio 0.55; 95% CI, 0.42-0.74) treatments; manual therapy was not significantly associated with the fraction of private care. There was a significant negative association between the fraction of private care and cost (coefficient –0.27; 95% CI, –0.44, –0.10).

## **Conclusion:**

This study found that privately provided care was associated with significantly higher opioid prescribing, less use of benzodiazepines and physical therapy, and lower costs. No systematic differences in outcomes (as measured by resolved cases) were identified. The findings suggest that publicly funded health care within the MHS context can attain quality comparable to privately provided care, although differences in treatment choices and costs point to possibilities for improved care within both systems.

## INTRODUCTION

There is a long-standing debate over whether services for the public sector should be produced by the public sector or purchased from the private sector. This is a particularly important

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The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Institute for Defense Analyses, the DoD, or the U.S. Government.

doi:https://doi.org/10.1093/milmed/usae074

Published by Oxford University Press on behalf of the Association of Military Surgeons of the United States 2024. This work is written by (a) US Government employee(s) and is in the public domain in the US.

issue for the U.S. Military Health System (MHS), which is responsible for providing health care to all active duty and retired military personnel and their dependents. MHS beneficiaries can obtain care either within government-owned and operated facilities or from a network of privately managed contracted providers. Beneficiary experiences across the two types of care provide a unique opportunity to compare outcomes, costs, and clinical treatment decisions for publicly provided care versus privately provided care.

Two recent studies compared U.S. public and private health care within a similar context. One study examined outcomes for veterans transported via ambulance to emergency rooms at either government-operated Veteran's Affairs (VA) hospitals or at private hospitals, finding higher survival rates and lower costs within the public system. Another study examined differences in outcomes when mothers within the MHS gave birth multiple times in locations with varying access to nearby military treatment facilities (MTFs)<sup>2</sup>; in contrast they found better outcomes and slightly lower resource utilization in the private system.

This article examines public and private outcomes, costs, and treatments for beneficiaries in the MHS with a diagnosis of low back pain (LBP), a debilitating condition that is very common among active service members and of particular concern for combat readiness.<sup>3–5</sup> We instrument for the individual use of private or public care using the regional share of overall MHS spending on private care (relative to total spending) after excluding our LBP cohort.

## **OVERVIEW OF THE MILITARY HEALTH SYSTEM**

The MHS is a global, comprehensive, and integrated health care system, with nearly 10 million beneficiaries and annual spending over \$53 billion. Within the MHS, the TRICARE program is responsible for administering health benefits to active duty members, retirees, and dependents. It is comprised of two overarching programs, the direct care (public) system and the purchased care (private) system, which work in tandem to meet the needs of the population. Within the direct care system, large medical centers offer the entire breadth of clinical care in-house, but smaller community hospitals and outpatient clinics will frequently refer care to the private sector. The second program, the purchased care (private) system, allows beneficiaries to receive care from participating civilian providers.

## **METHODS**

## **Data Source and Study Population**

Data for the analysis were extracted from Military Health System Data Repository (MDR). The MDR contains encounter data from MTFs and claims data from contracted private providers. It includes all inpatient, outpatient, and pharmacy claims/encounters from both MTFs and private providers. The MDR also contains a patient's catchment area, a geographic variable that is analogous to hospital referral regions and defined as groups of zip codes located within a 40-mile radius of an MTF, or base realignment and closure site where an MTF used to operate. Zip codes further than 40 miles from any MTF are grouped into supplemental catchment areas defined at the state or sub-state level.

Following Lurie et al.,<sup>3</sup> we constructed a cohort of TRI-CARE Prime beneficiaries aged 19-64 years diagnosed with LBP between April 2015 and December 2018, with data on outcomes through December 2019. The LBP diagnoses were identified using International Classification of Diseases Ninth Revision (before October 2015) and Tenth Revision codes (October 2015 onwards). The onset of LBP was defined as the first claim date with an LBP inclusion diagnosis but with a 12-month "washout" without a prior LBP diagnosis; this approach is designed to identify acute cases or acute flares in chronic cases without ongoing visits/treatment.

In our analysis, we consider both the entire sample and, for sensitivity analysis, the sample limited to active duty personnel. Patients were excluded if they were eligible for Medicare or other health insurance, had overseas medical claims, did not have a primary duty station within the USA, had diagnoses of cancer or paralysis (between 3 months before 12 months after their index event), received 1 or more LBP treatments (described later) or an opioid or benzodiazepine prescription for any indication 0-3 months before their index event, or resided in a catchment area with fewer than 500 cohort members (see online Appendix A).

## **Exposure Variable**

The exposure variable is the patient's share of spending within 3 months of diagnosis on privately provided care for LBP relative to total (public plus private) or the private share. In our individual-level analysis, we wish to avoid bias arising from the unobserved severity of the patient's condition affecting public or private choice. We therefore instrument using the share of all MHS health care spending in the individual's catchment area that is privately provided (n = 3,172,911). In calculating this proportion, we exclude the LBP patient cohort to guard against the possibility that high-quality private (or public) clinics disproportionately attract LBP patients (thus inducing a correlation between quality of care and the private share).

## **Outcomes, Costs, and Treatments**

The primary quality outcome measure was an absence of claims/encounters for an LBP visit or hospital admission during the 6-to-12-month window following the index event. The secondary quality outcome measure was (1) meeting this primary outcome criterion and (2) not having any claims/encounters for LBP treatments (opioid or benzodiazepine prescription, physical or manual therapy, or more uncommonly spine surgery or cognitive behavioral therapy) during that 6-12-month period.

The cost outcome measure was defined as total costs for claims/encounters with an LBP diagnosis during the 12-month period following the index event. For direct care (public) encounters, MDR-generated patient-level cost accounting figures were used to measure cost. These patient-level cost accounting measures allocate patient care, support, and overhead costs to specific clinical services. For purchased care (private) claims, the cost was the total amount paid by TRI-CARE to the civilian provider (typically limited by Medicare reimbursement rates). Our cost measure focuses on episodic costs of care and does not account for any long-term effects of opioid addiction. <sup>6,7</sup>

Four different types of LBP treatments were used to examine public/private differences in clinical treatment decisions: opioid prescription, benzodiazepine prescription, physical therapy, and manual therapy (see online Appendix A). We exclude cognitive behavioral therapy (2% of enrollees) and spine surgery (<0.5%), owing to small numbers at the regional level. LBP treatments were identified through Current Procedural Terminology codes and National Drug Codes during the 3-month period following the index LBP diagnosis.

The use of opioid and benzodiazepine prescriptions for the treatment of LBP is not supported by clinical evidence and may lead to adverse consequences  $^{8,9}$ ; thus we consider these measures to indicate lower-quality care. By contrast, nonpharmacologic management of LBP through physical therapy and manual therapy has been shown to be effective in the treatment of LBP.  $^{10-12}$ 

#### Covariates

Baseline demographics from the TRICARE enrollment file included age (19-34, 35-44, 45-54, and 55+), sex, and beneficiary status (active, dependent, or retired/other). For risk adjustment, flags for 11 specific types of index month LBP diagnoses were included (see online Appendix A) with an additional variable flagging beneficiaries with 2 or more types of diagnoses (a measure of complexity). Finally, the index diagnosis year (2015, 2016, 2017, or 2018) was included to control for potential temporal trends.

## Statistical Analysis

For each outcome variable, instrumental variable (IV) models were used to assess the impact of the private or public treatment decision, conditioning on the covariates. Results are reported for reduced form models and 2-stage estimators. For the reduced form models, logistic models were estimated for the binary outcomes, and a linear model was estimated for the continuous cost outcome. For the 2-stage estimators, linear models were estimated for all outcomes. Errors were clustered by catchment area; STATA 17 was used for statistical analysis. In addition to the IV models, catchment area-level scatter plots were developed (with indirect adjustment by age, sex, and beneficiary category) to assess the reduced form relationships between private spending share and treatments, outcomes, and cost.

## **RESULTS**

The final LBP cohort comprised 144,866 beneficiaries—34% active duty, 15% dependents, and 51% retired/other (Table I). Beneficiaries were more likely to be male (56%) with ages evenly distributed across our categories. The dominant index diagnosis type was lumbago/backache (72%), followed by dorsalgia (15%) and sciatica (10%). Fourteen percent of beneficiaries had more than 1 type of index diagnosis. The primary quality endpoint of no LBP diagnosis 6-12 months after the index event was satisfied for 80% of beneficiaries.

The dominant treatments received were physical therapy (27%), opioids (21%), and manual therapy (17%). Active duty beneficiaries were more likely to receive physical or manual therapy treatments and less likely to receive opioids. The median (IQR) total cost of LBP care 0-12 months after the index event was \$435 (\$203-\$944), or \$513 (\$253-\$1,116) for active duty beneficiaries. The mean (SD) proportion of

LBP-related spending in months 0-3 that was purchased (i.e., private) was 0.38 (0.47) for all beneficiaries and 0.18 (0.36) for active duty beneficiaries. The mean (SD) proportion of all spending within the beneficiary's catchment area that was private was 0.49 (0.25).

We begin with a simple graphical analysis at the catchment area level (n = 68). Figure 1 displays the association between private market share and adjusted opioid, benzodiazepine, physical therapy, and manual therapy treatment rates. Opioid rates vary widely across catchment areas (ranging from 15% to 42%) and are positively associated with purchased share (r = 0.56, P < .001). Benzodiazepine prescriptions are used far less commonly than opioid prescriptions (averaging just 5%) but they are negatively associated with the private share (r = -0.45, P < 0.001). Finally, in the bottom 2 panels of Fig. 1, we show again the wide variation in physical therapy utilization (from 15% to 42% across catchment areas) and manual therapy utilization (from less than 10% to 25%). For physical therapy, there is a strong negative association with purchased share (r = -0.62, P < .001), and for manual therapy a weaker (and non-significant) association (r = -0.14, P = .25).

Figure 2 displays associations between private market share, outcomes, and costs. There is considerable variation in both of our outcome measures. Importantly, there is no significant association at the catchment level between the purchased share and either outcome measure. There is, however, a significant negative association between the purchased share and 1 year adjusted costs (r = -0.35, P = .003).

We next consider these associations at the individual level, with regression results displayed in Table II (reduced form IV regression) and online Appendix B (2-stage IV regression). In Table II, each row reports the estimated odds ratios associated with the private spending share for 7 different dependent variables, for both all enrollees and active duty enrollees, each with a full set of covariates. Regarding the 4 clinical treatments, for the entire sample, a catchment with a higher private market share is associated with a greater likelihood of opioid (odds ratio 1.22, 95% CI 1.02, 1.46) and a lower likelihood of benzodiazepines (0.56, 95% CI 0.45, 0.70) and physical therapy (0.55, 95% CI 0.42, 0.74) treatments; manual therapy is not significantly associated with the private share. Similar results hold for active duty enrollees, with a slightly higher odds ratio for the association between opioid use and the private share (1.38, 95% CI 1.15, 1.65).

Rows 5 and 6 in Table II demonstrate a generally null association between health outcomes and the private share; the exception is a marginally significant positive association for the secondary definition of a lack of LBP diagnosis combined with the absence of treatments (odds ratio 1.16, 95% CI 1.03, 1.31). Finally, there is a negative association between the private share and cost (-0.27, 95% CI -0.44, -0.10) although this pattern does not hold for active duty enrollees (0.03, 95% CI -0.24, 0.31).

**TABLE I.** Summary Statistics

	All enrolees ( <i>n</i> = 144,866)	Active duty enrolees ( $n = 49,088$
Age		
19-34	27.2%	54.3%
35-44	24.5%	36.2%
45-54	28.9%	8.9%
55+	19.4%	0.6%
Beneficiary type		
Dependent	15.0%	0.0%
Retired/other	51.1%	0.0%
Active duty	33.9%	100.0%
Sex		
Female	43.5%	15.7%
Male	56.5%	84.3%
Index diagnosis (Dx)		
Dx = lumbosacral spondylosis without myelopathy	3.5%	1.5%
Dx = displacement of thoracolumbar, lumbar or lumbosacral intervertebral disc	2.4%	2.0%
Dx = degeneration of thoracolumbar, lumbar or lumbosacral intervertebral disc	4.6%	2.6%
Dx = other thoracolumbar, lumbar, or lumbosacral disc disorder	0.2%	0.1%
Dx = lumbago/backache	72.1%	78.8%
Dx = sciatica	9.5%	5.6%
Dx = thoracic or lumbosacral neuritis or radiculitis; radiculopathy	5.1%	2.8%
Dx = spondylolysis, site unspecified	0.2%	0.2%
Dx = spondylolisthesis, site unspecified	4.2%	2.4%
Dx = dorsalgia	15.2%	15.0%
Dx = lumbar sprain/strain	2.9%	2.8%
Two or more qualifying index diagnoses	13.9%	10.4%
No LBP diagnosis 6-12 months after index event	79.7%	74.8%
No LBP diagnosis, surgery, or treatment 6-12 months after index event	61.0%	55.0%
Received opioid prescription 0-3 months after index event	21.2%	15.0%
Received benzodiazepine prescription 0-3 months after index event	5.1%	4.3%
Received physical therapy 0-3 months after index event	27.1%	40.8%
Received manual therapy 0-3 months after index event	16.6%	23.5%
Total cost of care 0-12 months after index event (\$1,000) (median (IQR))	0.44 (0.20, 0.94)	0.51 (0.25, 1.12)
Private proportion of individual spending, 0-3 months after index event (mean (SD))	0.38 (0.47)	0.18 (0.36)
Catchment area private market share during four-year study period (calculated after omitting LBP cohort) (mean (SD))	0.49 (0.25)	0.47 (0.24)

Authors' analysis of TRICARE claims data.

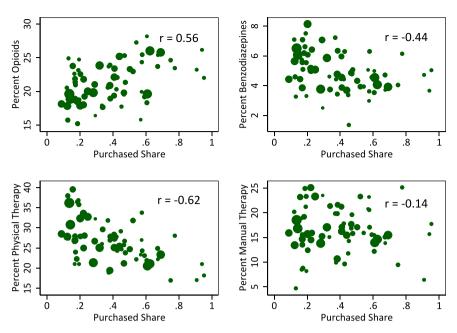
There is a decline in sample size between 2015 and 2018 because beneficiaries only appear once in the analysis; once they have been included because of an LBP diagnosis, they are not included in subsequent years even if they have another qualifying diagnosis. Beneficiaries were not divided into mutually exclusive public and private subgroups, as individuals can receive care from both systems.

Abbreviation:

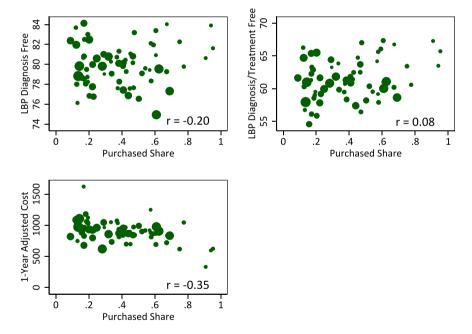
Results for the 2-stage IV regressions are largely consistent with the reduced form results in Table II (online Appendix B), as are results for a sensitivity analysis limited to the diagnosis of backache/lumbago (online Appendix C). With regard to the 4 clinical treatments, for the entire sample, higher private spending is associated with a greater likelihood of opioid treatment (second stage coefficient of 0.06, 95% CI 0.02, 0.10) and a lower likelihood of benzodiazepine (-0.04, 95% CI -0.05, -0.02) and physical therapy (-0.18, 95% CI -0.23, -0.14) treatments; manual therapy is not significantly associated with private spending. The 2-stage IV regressions generally show no association between private spending and health outcomes and a negative association between private share and cost (-0.42, 95% CI -0.58, -0.26).

## **DISCUSSION**

Since at least the early 1990s, the MHS has considered whether it is more cost effective to "make" care in its own facilities from uniformed providers, or to "buy" care from the civilian sector. Cost is hardly the sole consideration, but few studies have sought to account for local markets for health care and how hybrid public and private systems of care affect spending and outcomes. We use regional-level variation to assess the association between purchased (private) care and quality, total spending, and clinical treatment choices. Although we find little association between private spending and the resolution of the index LBP, we find a strong positive association between the share of private care and the use of opioid treatments, as well as a strong negative association



**FIGURE 1.** Scatter plot of risk-adjusted treatment rates by the share purchased outside of the Military Health Service, by catchment area. Source: Authors' analysis of TRICARE claims data, 2023. Notes: Treatment types are opioid and benzodiazepine prescribing and physical and manual therapy; the size of each dot is proportional to the sample size of enrollees. The correlation coefficient (weighted by catchment area number of employees) is presented in the upper right hand of the graph; all are strongly significant at the P < .01 level except for manual therapy, where P = .25.



**FIGURE 2.** Scatter plot of risk-adjusted outcomes and costs by the share purchased outside of the Military Health Service (MHS), by catchment area. Source: Authors' analysis of TRICARE claims data, 2023. Notes: Outcomes are the percentage of enrollees who are (a) free from a low back pain (LBP) diagnosis, or (b) free from an LBP and with an absence of any treatment during the 6-12 months after initial diagnosis. The costs are for the entire 12-month period and combined MHS and purchased care. The size of each dot is proportional to the sample size of enrollees. The correlation coefficient (weighted by catchment area number of enrollees) is presented in the bottom right hand of the graph; neither outcome measure is significantly different from zero (at the P = .05 level), but the correlation between cost and the purchased share is significant at the P = .003 level.

between private care and physical therapy. Interestingly, there is a negative association between benzodiazepine treatments and the private share, although the frequency of their use is low.

The existing evidence on the association between private share and quality of care is mixed. A study focusing on emergency ambulance transport to either Veteran's Affairs (VA) or private hospitals for beneficiaries aged 65 and over found

**TABLE II.** Reduced Form Estimates Associated with Catchment Area Private Market Share

	Coefficient (cost variable) or odds ratio (all other variables) associated with catchment area private market share (95% CI)		
Dependent variable in model	All enrollees ( <i>n</i> = 144,866)	Active duty enrollees $(n = 49,088)$	
No LBP diagnosis 6- 12 months after index event	1.04 (0.88, 1.24)	0.97 (0.78,1.21)	
No LBP diagnosis, surgery, or treatment 6-12 months after index event	1.16 (1.03, 1.31)	1.16 (0.98, 1.38)	
Total cost of care 0- 12 months after index event (\$1,000)	-0.27 (-0.44, -0.10)	0.03 (-0.24,0.31)	
Received opioid prescrip- tion 0-3 months after index event	1.22 (1.02, 1.46)	1.38 (1.15, 1.65)	
Received benzodiazepine prescription 0-3 months after index event	0.56 (0.45, 0.70)	0.64 (0.49, 0.84)	
Received physical therapy 0-3 months after index event	0.55 (0.42, 0.74)	0.65 (0.48, 0.89)	
Received manual therapy 0-3 months after index event	0.83 (0.64, 1.06)	0.93 (0.66, 1.32)	

Authors' analysis of TRICARE claims data, 2023.

Covariates: index year (2015, 2016, 2017, or 2018), sex, age (19-34, 35-44, 45-54, 55+), beneficiary category (active duty, dependent, or retired/other), type of index diagnosis (11 binary variables), flag for 2 or more types of index diagnosis. Private market share calculated over 4-year study period using all beneficiaries in catchment area other than those in LBP cohort. Beneficiaries were not divided into mutually exclusive public and private subgroups, as individuals can receive care from both systems. Abbreviation:

better 28-day survival rates at VA hospitals. In contrast, an examination of birth outcomes for mothers delivering in locations with varying levels of access to MHS facilities found higher quality care at private facilities.<sup>2</sup> These 2 studies and ours differ markedly with regard to the specific populations, clinical context, and institutional context. The better quality observed in the VA system is likely owing to their coordinated health information technology (IT) system and continuity of care, although the MHS electronic health record could provide better monitoring of opioid prescribing compared to private providers. These private hospitals providing better quality obstetrics care are likely related to the greater relative expertise and volume of private hospitals with high-volume birthing centers. In sum, it seems likely that differences in relative expertise and coordination across health markets, rather than private versus public provision per se, can potentially explain the wide range of findings.

Costs were significantly lower for privately provided LBP care overall, but not for active duty enrollees. One reason for finding higher costs for public facilities is because the fixed cost of a medical facility's overhead is allocated across encounters, although in private facilities the TRICARE contracts are statutorily indexed to Medicare prices, which do not typically cover commercial hospital fixed costs. <sup>13</sup> Furthermore, the public military system is designed to do more than deliver routine care efficiently; its mission is to support military operations, including casualty care, patient evacuation, rehabilitation, and medical training.

Finally, the wide regional variability in treatment patterns may provide opportunities for improvements in care. For example, the adjusted opioid prescription rate for the highest 10% of catchment areas (26%) is over one-third higher than the adjusted opioid prescription rate for the lowest 10% of catchment areas (17%). Similarly, the highest 10% of catchment areas have benzodiazepine prescription rates (7%) more than double those in the bottom 10% (3%), with particularly large potential for improvement in military settings.

There are several limitations to the study. First, the measure of successful resolution of back pain may be imperfect if enrollees with unresolved back pain fail to return for LBPrelated visits. If this failure to return is systematically related to the proportion of care provided privately, then results could be susceptible to bias, but we know of no evidence for such a correlation. Second, we are not able to capture features of local markets, which could include the distribution of medical personnel, competitiveness of the surrounding civilian market, and the physical capital of the direct care system. Third, the analysis is limited to LBP, and thus may not generalize to a wider range of treatments. Fourth, it may be the case that back pain in some catchment areas is more severe conditional on diagnosis, or conversely that enrollees in some areas are more likely to seek care for their back pain. Finally, the analvsis relies on claims data from 2015 to 2019, a time period predating some later restrictions on opioid prescribing and the Covid-19 pandemic.<sup>14</sup>

## CONCLUSION

For a cohort of enrollees in the TRICARE insurance system with LBP, there was wide variation in outcomes, costs, and treatments across MHS catchment areas. Greater private provision of health care was associated with similar health outcomes, lower costs (except for active duty personnel), higher opioid use, and lower utilization of benzodiazepines and physician therapy. The variation in utilization and outcomes further points to potential inefficiencies and opportunities for system-level improvements.

## **ACKNOWLEDGMENTS**

None declared.

## **CLINICAL TRIAL REGISTRATION**

Not applicable.

## INSTITUTIONAL REVIEW BOARD (HUMAN SUBJECTS)

This study was approved by the Dartmouth College Institutional Review Board (IRB).

## INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

Not applicable.

#### INDIVIDUAL AUTHOR CONTRIBUTION STATEMENT

J.S., W.P.L., and J.D.L. designed the research. W.P.L. extracted the initial cohort. C.G.L. and R.O.S. conducted the data analysis and model estimation. C.G.L. developed the draft manuscript. J.S., W.P.L., and R.O.S. reviewed and revised the manuscript. All authors read and approved the final manuscript.

## **INSTITUTIONAL CLEARANCE**

Not applicable.

#### SUPPLEMENTARY MATERIAL

Supplementary material is available at Military Medicine online.

#### **FUNDING**

Military Health System Research (MHSR) Program, Defense Health Agency, U.S. DoD, Jonathan Skinner PI, Contract HT94022210005; U.S. DoD, David Goodman PI, Contract HQ00342010001.

## CONFLICT OF INTEREST STATEMENT

Dr Lurie reports royalty income from UpToDate (Wolters Kluwer, Alphen aan den Rijn, Netherlands) and equity in Spinol. Dr Skinner reports consulting income from Sutter Health and equity in Dorsata, Inc.

#### **DATA AVAILABILITY**

The data underlying this article cannot be shared publicly because of Health Insurance Portability and Accountability Act (HIPAA) regulations.

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