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ORIGINAL RESEARCH

Health care utilization by veterans prescribed chronic opioids

Cynthia Kay[1,2]
Erica Wozniak[2]
Alice Ching[1]
Joanne Bernstein[1]

[1]Clement J Zablocki - Department of Medicine, [2]Center for Patient Care and Outcomes Research, Medical College of Wisconsin, Milwaukee, WI, USA

Purpose: Ambulatory resources such as telephone calls, secure messages, nurse visits, and telephone triage are vital to the management of patients on chronic opioid therapy (COT). They are also often overlooked as health care services and yet to be broadly studied. The aim of the present study was to describe the Veterans Affairs (VA) health care utilization by patients based on COT, type, and amount of opioids prescribed.

Patients and methods: A retrospective chart review was done on 617 patients on COT at a VA primary care clinic. Instances of health care utilization (emergency department visits [EDVs], hospitalizations, clinic visits, telephone triage calls, telephone calls/secure messages/nurse visits) were obtained.

Results: Patients were likely to have more telephone calls, secure messages, or nurse visits if they were prescribed a schedule II opioid or if they were on more than one opioid. Model-based results found that patients on COT were more likely to have EDVs, telephone triage calls, and clinic contact compared to patients who were not on chronic opioids.

Conclusion: The results are despite having a Patient Aligned Care Team, which is the VA's patient-centered medical home. This suggests that reducing health care utilization for patients on COT may not be possible with just a primary care involvement.

Keywords: opioids, Veterans Affairs, primary care, chronic pain

Introduction

The Veterans Health Administration (VHA) has a vested interest in the management of chronic pain for many reasons. For one, chronic pain is prevalent, affecting ~50 million Americans in 2012.[1] Furthermore, past works have shown that the veteran population tends to have more medical conditions and worse health compared to the non-veteran population.[2,3] Specifically, chronic pain and mental health disorders are more prevalent within the veteran population with the former having estimated rates twice those of the civilian population.[4–7] Given the association between mental health disorder and chronic pain, there is often an added layer of complexity with regard to chronic pain management.[8–10]

The Patient Aligned Care Team (PACT) is the VHA's patient-centered medical home (PCMH). Each PACT teamlet consists of the primary care provider, nurse, clinical associate (health technician, licensed practical nurse), and administrative associate.[11] Teamlets share a clinic pharmacist, social worker, and dietitian.[12] Some of the PACT goals include providing access to primary care through a variety of methods and improving health care outcomes and costs. Studies examining the effectiveness of the PACT have shown fewer emergency department visits (EDVs) and hospitalizations

Correspondence: Cynthia Kay
Medical College of Wisconsin, 8701
W Watertown Plank Road (CAP),
Milwaukee WI 53226, USA
Email ckay@mcw.edu

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with a coinciding increase in primary care visits and telephone encounters.[13,14] While mental health and substance use disorders were sometimes included in these studies, the presence of chronic pain has not been taken into account.

Prior studies have also shown that there is an association between chronic pain and increased health care utilization.[15–17] Many of these studies focused on common services, such as EDVs, hospitalizations, specialty cares, and prescription drugs. Little is known about the use of health care resources such as telephone calls and secure messages, which are not often mentioned or studied. These resources are integral parts of ambulatory medicine, especially primary care.

The objectives of this study were to describe Veterans Affairs (VA) health care utilization by patients based on chronic opioid therapy (COT) and the type and amount of opioids prescribed. It is hypothesized that: 1) patients on COT utilize more health care resources compared to those not on opioids; and 2) patients prescribed schedule II or more than one opioids have greater health care utilization compared with those on a lower schedule or a single opioid. We also examined the potential independent predictors of health care utilization in a multiple regression model.

Methods
Study design and setting
This was a retrospective chart review of primary care patients at the VA Medical Center in Milwaukee, WI, USA. Medical records were extracted from the Computerized Patient Record System (CPRS), the electronic medical record (EMR) utilized by the VHA system. This study met the criteria for minimal risk, and informed consent was waived. It was approved by the Zablocki VA Institutional Review Board.

Study sample
Potential patients were identified through the VA Informatics and Computing Infrastructure (VINCI). Patients were at least 18 years old and prescribed opioids chronically. COT was defined as at least three monthly prescriptions in the 12-month period between April 1, 2014 and April 1, 2015. The prescriptions did not have to be consecutive. This was based on the National Institutes of Health definition and criteria from prior studies.[18–20]

Patients with active cancer, on hospice, prescribed an opioid within 6 months of surgery, have not visited the clinic at least once during the established time frame, who died during the study period, or who no longer received primary care at this VA in the same time span were excluded. Charts were reviewed to ensure that the patients met the inclusion criteria. Patients on COT were matched by age and gender to controls who were not prescribed opioids.

Data collection
Patient demographics (age, gender, and race), diagnoses, provider characteristics (physician and advanced practitioner), mental health provider, service connection, and health care utilization counts (EDVs, hospitalizations, clinic visits, telephone triage calls, and telephone calls/secure messages) were obtained through a manual review of the charts by the study team members (AC and CK). For patients on COT, the opioid regimen at the end of the study period was collected. Data were entered and stored in REDCap (Research Electronic Data Capture), which is a secure, web-based application designed to support data capture for research studies.[21]

State policy
At the time of this study, Wisconsin did not require a minimum number of clinic visits for patients on COT and did not require providers to access the state's prescription drug monitoring program (PDMP) prior to prescribing opioids.

Measures
The examined measures of health care utilization included counts of EDVs, hospitalizations, primary care visits, telephone triage calls, telephone calls or secure messages, and nurse visits. Telephone triage is the VA's answering service. It is a 24-hour advice line staffed by nurses. Hospital discharge follow-up calls were not included as these are done per protocol.

Instances of each utilization variable were counted manually through chart review. Telephone calls, secure messages, and nurse visits were combined into a single measure as these represent methods to contact and communicate with providers or the PACT team. At this specific VA, patients may request to be seen by their PACT nurse at any time during the workday.

The morphine equivalent dose (MED) was calculated for each patient on long-term opioids. The Oregon Health & Science University calculator was used to convert each patient's opioid regimen to a daily morphine milligram equivalent.[22] The calculator's conversion factor's have been used in previous studies.[23,24]

Analysis
Demographic and clinical characteristics were compared between the COT and the non-opioid groups using chi-squared and independent samples *t*-tests for categorical and continuous variables, respectively. Descriptive statistics and bivariate

analyses (chi-squared or Fisher's exact tests, where appropriate) were used to compare instances of health care utilization as counts by opioid status. Logistic regression was used to jointly assess the predictors of each health care utilization outcome, with hospitalizations and telephone triage calls (any vs none) as binary outcomes and EDVs (0, 1, 2+), office visits (1, 2–3, 4+), and nurse visits/messages (0–2, 3–5, 6+) as ordinal outcomes. Adjacent categories of the ordinal outcomes were pooled where cell sizes were small or the mean of the chronic pain indicator was similar across categories. Stepwise variable selection was used on 50 bootstrap sample replicates of a complete list of variables collected by chart review, including demographic, pain characteristic, diagnosis, and prescription information. The stepwise model was chosen to build parsimonious lists of independent predictors for each model since a large number of diagnosis, prescription, and demographic indicators were collected. Significant differences were observed between the pain and the non-pain groups for many of these indicators when calculating bivariate statistics. Due to the large number of potential predictors, stepwise selection was an effective method to reduce the models. Furthermore, resampling methods were used in model selection to lessen the effect of some of the drawbacks known to be associated with stepwise selection methods, such as the inclusion of noise variables and potential exclusion of authentic predictors. Variables were retained in each bootstrap sample using a significance cutoff of 0.2. The final model included only those that were retained in at least 20 (40%) bootstrap samples. From these models, odds ratios and corresponding predicted probabilities for each outcome were calculated to examine the effect of COT on utilization, controlling for relevant covariates, such as age, gender, and the presence of psychiatric disorders. Statistical significance was set at $P<0.05$.

Results

Initial screening through VINCI yielded 2,484 patients. The first 635 patients who met the inclusion criteria were included to meet statistical power requirements. These patients were those who were prescribed opioids chronically. The mean age of the patients on COT was 62 years (SD 12.6) and 625 (98.4%) were male. The majority of patients on COT was white (n=443, 69.7%) and had a psychiatric diagnosis (n=451, 71.0%). Overall characteristics of patients on COT compared with patients not on opioids are presented in Table 1.

COT versus no opioid

Patients on COT were more likely to have any psychiatric diagnosis, depression, anxiety, a mental health provider/

Table 1 Patient characteristics by chronic opioid therapy

	Non-opioid group (N=565)	Opioid group (N=617)	P-value
Age, mean (SD)	62.5 (12.5)	61.9 (12.6)	0.44
Race			
White	369 (65.3%)	430 (69.7%)	0.12
Gender			
Male	558 (98.8%)	607 (98.4%)	0.76
Provider type			
Physician	314 (55.6%)	354 (57.4%)	0.57
Mental health team	151 (26.7%)	280 (45.5%)	<0.001
Psychiatric diagnosis	275 (48.7%)	443 (71.8%)	<0.001
Depression	122 (21.6%)	262 (42.5%)	<0.001
Diabetes	189 (33.5%)	204 (33.1%)	0.94
Anxiety	50 (8.8%)	81 (13.1%)	0.02
PTSD	99 (17.5%)	135 (21.9%)	0.06
Hypertension	383 (67.8%)	436 (70.7%)	0.31
CKD/ESRD	44 (7.8%)	68 (11.0%)	0.07
COPD/asthma	81 (14.3%)	116 (18.8%)	0.05
CAD/CHF	116 (20.5%)	143 (23.2%)	0.30
Neuropathy	53 (9.4%)	77 (12.5%)	0.11
Obesity	227 (40.2%)	241 (39.1%)	0.74
Arthritis/spinal stenosis	133 (23.5%)	311 (50.4%)	<0.001
History of substance use disorder	68 (12.0%)	112 (18.2%)	0.004
Tobacco use	121 (21.4%)	204 (33.1%)	<0.001
Service connection	259 (45.8%)	366 (59.3%)	<0.001

Abbreviations: PTSD, post-traumatic stress disorder; CKD, chronic kidney disease; ESRD, end-stage renal disease; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease; CHF, congestive heart failure.

team, arthritis/spinal stenosis, tobacco use, and service connection than patients not on opioids (all $P<0.05$). Patients on COT were more likely to have a history of substance abuse ($P=0.004$). Substance abuse, as defined by the World Health Organization, includes the abuse of alcohol or any illicit drugs.[25] There were no significant differences between groups for the presence of post-traumatic stress disorder, diabetes, hypertension, or coronary artery disease (CAD)/ congestive heart failure (CHF) (Table 1). Patients prescribed chronic opioids had more EDVs, clinic visits, telephone triage encounters, telephone calls/secure message/nurse visits (all $P<0.001$), and hospitalizations ($P=0.003$) compared with patients not prescribed opioids (Table 2).

MED

All opioids were included in the determination of each patient's total daily MED if they were on the patient's medication list as of April 1, 2015. Two MED groups (<50 mg vs >50 mg) were formed based on the 2016 Centers for Disease Control and Prevention (CDC)'s opioid guideline.[26] Most patients had a total daily MED of <50 mg (n=353, 64.7%).

No significant differences were found in any of the health care utilization measures based on MED.

Controlled medication schedule

Schedule III and IV controlled medications were combined into a single category given the relatively small numbers of each individually. Patients on schedule II medications were

Table 2 Health care utilization by chronic pain

	Non-pain group (N=565)	Pain group (N=617)	P-value
ED visits			
0	405 (71.7%)	340 (55.1%)	<0.001
1	89 (15.8%)	114 (18.5%)	
2+	71 (12.6%)	163 (26.4%)	
Hospitalizations			
0	493 (87.3%)	495 (80.2%)	0.001
1+	72 (12.7%)	122 (19.8%)	
Clinic visits			
1	170 (30.1%)	131 (21.2%)	<0.001
2–3	319 (56.5%)	347 (56.2%)	
4+	76 (13.5%)	139 (22.5%)	
Telephone triage			
0	442 (78.2%)	420 (68.1%)	<0.001
1+	123 (21.8%)	197 (31.9%)	
Telephone/secure			
message/nurse visit	381 (67.4%)	322 (52.2%)	<0.001
0–2	111 (19.7%)	160 (25.9%)	
3–5	73 (12.9%)	135 (21.9%)	
6+			

Abbreviation: ED, emergency department.

more likely to have a higher number of telephone calls, secure messages, or nurse visits in a year (P=0.001) compared with patients on schedule III or IV medications. There were no significant differences in the other health care utilization measures (Table 3).

Number of opioids

The majority of patients on COT were prescribed a single opioid (n=477, 87%). Patients prescribed more than one opioid had more telephone calls, secure messages, or nurse visits (P=0.03). There were no significant differences in total EDVs, hospitalizations, telephone triage calls, and clinic visits (Table 3).

Logistic regression – predictors of utilization

Model-based results show that controlling for relevant demographic and clinical characteristics, patients on COT were more likely to have a higher number of EDVs than non-opioid control patients, with an adjusted common odds ratio of 1.9 (95% CI 1.4–2.4). Similarly, patients on COT were more likely to have an increased number of telephone triage encounters (adjusted common odds ratio 1.4 [95% CI 1.0–1.9]) as well as telephone calls, secure messages, or nurse visits (adjusted common odds ratio 1.6 [95% CI 1.2–2.0]) (Table 4). After adjusting for demographic indicators, diagnoses, and other clinical characteristics, patients on

Table 3 Health care utilization by schedule and number of opioids

	Opioid schedule (N=546)[a]			Number of opioids (N=546)[b]		
	II (N=320)	III or IV (N=226)	P-value	1 (N=477)	II or III (N=69)	P-value
ED visits						
0	181 (56.6%)	131 (58.0%)	0.92	266 (55.8%)	46 (66.7%)	0.22
1	59 (18.4%)	42 (18.6%)		92 (19.3%)	9 (13.0%)	
2+	80 (25.0%)	53 (23.5%)		119 (25.0%)	14 (20.3%)	
Hospitalizations						
≥1	69 (21.6%)	36 (15.9%)	0.13	98 (20.6%)	7 (10.1%)	0.06
Clinic visits						
1	62 (19.4%)	55 (24.3%)	0.29	103 (21.6%)	14 (20.3%)	0.95
2–3	185 (58.0%)	129 (57.1%)		273 (57.4%)	41 (59.4%)	
4+	72 (22.6%)	42 (18.6%)		100 (21.0%)	14 (20.3%)	
Phone triage						
≥1	101 (31.6%)	64 (28.4%)	0.49	190 (31.2%)	53 (33.3%)	0.68
Messages/nurse visits[c]						
0–2	158 (49.5%)	138 (61.1%)	0.001	261 (54.8%)	35 (50.7%)	0.03
3–5	79 (24.8%)	58 (25.7%)		125 (26.3%)	12 (17.4%)	
6+	82 (25.7%)	30 (13.3%)		90 (18.9%)	22 (31.9%)	

Notes: [a]Subset of pain cohort with schedule information available. [b]Subset of pain cohort with available information on number of opioids prescribed. [c]Includes telephone calls, secure messages, and nurse visits.
Abbreviation: ED, emergency department.

Table 4 Model-adjusted odds of health care utilization for pain versus non-pain patients

	Adjusted OR[a]	95% CI	P-value
ED visits[b]	1.9	1.4–2.4	<0.001
Hospitalizations[c]	1.3	0.9–1.9	0.11
Clinic visits[d]	1.2	0.9–1.6	0.15
Telephone triage[c]	1.4	1.0–1.9	0.03
Messages[e]	1.6	1.2–2.0	<0.001

Notes: [a]Models were adjusted by applying a stepwise model selection process to the following patient characteristics: age; race; provider (advanced practitioner vs physician); psychiatric diagnosis; depression; diabetes; hypertension; cardiac, renal, and pulmonary disease; neuropathy; obesity; tobacco use or substance use disorder; arthritis; service connection; and nonsteroidal anti-inflammatory, antiepileptic, or benzodiazepine prescriptions. [b]Adjusted common odds ratio for the ordinal outcome of 0, 1, or 2+ visits. [c]Adjusted odds ratio given any vs none as binary outcome. [d]Adjusted common odds ratio for the ordinal outcome of 1, 2–3, 4+ visits. [e]Adjusted common odds ratio for the ordinal outcome of 0–2, 3–5, or 6+ telephone calls, secure message contacts, or nurse visits.
Abbreviation: ED, emergency department.

COT were not found to have more hospitalizations or clinic visits compared to patients not on opioids. The full models are provided in Tables S1–S5.

Discussion

As with prior studies, we found numerous differences in characteristics of patients on COT and those not on opioids. However, in our study, there were no significant differences in the proportion of patients with diabetes, CAD/CHF, or hypertension between the opioid and non-opioid groups. This contrasts with previous studies.[27,28] Beehler et al focused on veterans with musculoskeletal pain.[27] Their population was younger, with an average age of 56 years, compared to our study's average age of 62 years.[27] The study by Kay et al focused on a civilian population, which could be considered to have fewer comorbidities.[28]

The main focus of our study remains consistent with previous works that demonstrated higher utilization by patients on chronic opioids.[27,28] To our knowledge, this is the first study to examine the utilization of health care resources not easily measured by patients on COT at a VA and in a PACT.

The CDC-recommended morphine equivalent dose is lower than previous guidelines, based on studies that showed increased adverse risks with higher doses. While this study did not examine the adverse outcomes, it did not find any significant difference in health care utilization by MED.

Similar to the Kay et al study, patients on schedule II opioids were more likely to have a higher number of telephone calls, secure messages, or nurse visits compared to those on lower scheduled opioids.[28] However, unlike that study, patients on more than one opioid also had more telephone calls, secure messages, and nurse visits. It is possible that patients who were prescribed stronger or more opioids have pain severity greater than those on less potent opioids or those who were prescribed just one. This may translate to more contact with their provider and PACT team for advice and recommendations.

The VHA started implementation of the PACT in 2010, and it is now fully functional across all VHAs. Past studies have demonstrated PACT effectiveness in decreasing utilization of health care resources, such as EDVs and hospitalizations but did not take chronic pain or oft-overlooked primary care resources into account.[14,29]

In our study, despite being managed by a PACT, patients on COT had significantly more EDVs, telephone triage, nurse visits, telephone calls, and secure messages compared to patients not on opioids. However, unlike a previous study,[28] patients on COT did not have more hospitalizations or more clinic visits compared to patients without opioids, after adjusting for relevant demographic and clinical characteristics.

The PACT model allows patients to have greater access to their clinic nurse and provider. This might translate to more contact through telephone calls, secure messages, and nurse visits, as seen in our results. The increased utilization for certain services may simply be a fundamental consequence of the model itself. Correspondingly, these alternative methods for contact may also explain why there were not more clinic visits as noted in other studies.

As states and new laws target safe opioid practices to curb the opioid epidemic, a team-based approach seems most reasonably equipped to be successful. The PCMH or PACT model is considered the way to provide ideal primary care. While many aspects of chronic care management are implemented within the PCMH model, whether chronic pain can or should be managed the same way as other chronic diseases remains unclear. It may be naïve to assume that one model can be effectively used for the management of all chronic diseases.

Also, it may be that cost effective and appropriate health care utilization for the management of chronic pain is beyond the realm of care teams. A top-down approach, starting with national or state policies might be necessary. Florida, for example, demonstrated a decline in both prescription drug death and prescribing rates with the establishment of laws that targeted pill mills and made reporting to the state's PDMP mandatory.[30,31]

Multidisciplinary and interdisciplinary pain management programs have been shown to be beneficial for chronic pain.[32,33] These programs offer a collaborative approach from providers of various disciplines who work together to address

a common issue. Unfortunately, there are major barriers to the creation of these pain programs. Multi- and interdisciplinary programs require a significant amount of time, collaboration across fields, and infrastructure that may be difficult to acquire for most practices. Furthermore, these programs are not often covered by third-party payers.

Limitations

There are several limitations to this study. First, this was a retrospective chart review of a single VA medical center. Whether the population at this center can be generalizable to other VA centers or community clinics is uncertain. Second, we did not attempt to determine the reasons for each health care utilization count or limit them to those related only to pain. Along the same lines, we did not differentiate regular clinic visits from urgent care appointments, so the total number of clinic visits may have been overestimated. Secure messages may have been underestimated as only encounters visible in CPRS were counted. Secure messages can be completed without being saved into the EMR. Also, some veterans receive additional health care outside the VA. We were unable to account for health care utilization that took place at community health care systems or even other VA centers. We did not collect information on insurance or sociodemographic information. Data extraction of health care utilization was performed manually and could be susceptible to human error. Finally, given the retrospective nature of the study, we are unable to comment on causal effects.

Conclusion

Veterans on COT utilized significantly more ED visits, telephone triage, nurse visits, telephone calls, and secure messages compared with patients not on opioids, after adjusting for relevant diagnoses and other patient characteristics. While the PACT model has been effective in reducing utilization for other comorbidities, it did not decrease all utilization measures for patients on COT. This may just be an inevitable byproduct of a model designed to allow greater patient access. Regardless, effective management of patients on COT likely requires more than just primary care involvement. Multidisciplinary and interdisciplinary pain management programs have been shown to be beneficial.[14,29] Their integration with primary care might be an area for future studies.

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Disclosure

The authors report no conflicts of interest in this work.

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Supplementary materials

Table S1 Multivariable ordinal logistic regression of variables associated with ED visits

Variable	OR	95% CI
Pain[a]	1.864	1.426–2.439
Age	0.989	0.977–1.000
Non-white race[a]	1.680	1.293–2.184
Advance practitioner	0.878	0.684–1.128
Psychiatric diagnosis[a]	1.932	1.404–2.663
Depression	0.906	0.674–1.216
Diabetes	1.291	0.974–1.711
Hypertension	0.857	0.647–1.138
CKD/ESRD	1.370	0.888–2.096
COPD/asthma[a]	1.500	1.093–2.052
CAD/CHF[a]	1.523	1.117–2.073
Neuropathy	1.266	0.860–1.851
Obesity	0.918	0.710–1.186
History of substance abuse	1.175	0.839–1.637
Tobacco use	0.800	0.604–1.055
Arthritis/spinal stenosis	0.973	0.748–1.265
NSAID use	0.989	0.713–1.365
Antiepileptic use[a]	1.614	1.181–2.202
Benzodiazepine use	0.993	0.648–1.507
Service connection	0.799	0.619–1.030

Notes: Full model with significant independent variables are shown. [a]Significant variable.
Abbreviations: ED, emergency department; CKD, chronic kidney disease; ESRD, end-stage renal disease; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease; CHF, congestive heart failure; NSAID, nonsteroidal anti-inflammatory drug.

Table S2 Multivariable logistic regression of variables associated with hospitalization

Variable	OR	95% CI
Pain	1.343	0.936–1.936
Age	1.008	0.992–1.025
Non-white race	1.254	0.877–1.784
Advance practitioner	0.986	0.700–1.384
Psychiatric diagnosis[a]	1.754	1.122–2.751
Depression	1.072	0.724–1.591
Diabetes	1.261	0.875–1.813
Hypertension	1.083	0.737–1.609
CKD/ESRD[a]	1.884	1.138–3.071
COPD/asthma	1.346	0.891–2.002
CAD/CHF[a]	1.944	1.326–2.843
Neuropathy[a]	1.652	1.034–2.595
Obesity	0.683	0.477–0.971
History of substance abuse	1.484	0.959–2.266
Tobacco use	1.103	0.759–1.590
Arthritis/spinal stenosis	0.925	0.650–1.308
NSAID use	0.793	0.487–1.256
Antiepileptic use[a]	1.587	1.060–2.357
Benzodiazepine use	1.402	0.819–2.337
Service connection[a]	0.701	0.499–0.981

Notes: Full model with significant independent variables are shown. [a]Significant variable.
Abbreviations: CKD, chronic kidney disease; ESRD, end-stage renal disease; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease; CHF, congestive heart failure; NSAID, nonsteroidal anti-inflammatory drug.

Table S3 Multivariable ordinal logistic regression of variables associated with clinic visits

Variable	OR	95% CI
Pain	1.204	0.935–1.552
Age	1.006	0.995–1.017
Non-white race	1.144	0.889–1.474
Advance practitioner[a]	0.689	0.543–0.874
Psychiatric diagnosis[a]	1.890	1.400–2.557
Depression	1.073	0.798–1.441
Diabetes[a]	1.468	1.125–1.917
Hypertension	1.270	0.968–1.667
CKD/ESRD[a]	1.764	1.171–2.663
COPD/asthma[a]	1.633	1.200–2.227
CAD/CHF	1.319	0.980–1.777
Neuropathy	1.302	0.900–1.885
Obesity	1.096	0.862–1.396
History of substance abuse	1.083	0.779–1.508
Tobacco use	0.894	0.687–1.164
Arthritis/spinal stenosis	1.092	0.850–1.403
NSAID use[a]	1.439	1.047–1.980
Antiepileptic use[a]	1.548	1.133–2.116
Benzodiazepine use[a]	1.629	1.075–2.471
Service connection	0.943	0.742–1.198

Notes: Full model with significant independent variables are shown. [a]Significant variable.
Abbreviations: CKD, chronic kidney disease; ESRD, end-stage renal disease; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease; CHF, congestive heart failure; NSAID, nonsteroidal anti-inflammatory drug.

Table S4 Multivariable logistic regression of variables associated with telephone triage

Variable	OR	95% CI
Pain[a]	1.402	1.043–1.888
Age[a]	0.984	0.972–0.997
Non-white race	1.174	0.876–1.571
Advance practitioner	0.889	0.673–1.173
Psychiatric diagnosis[a]	1.696	1.192–2.418
Depression	0.902	0.652–1.248
Diabetes	1.063	0.778–1.449
Hypertension	1.127	0.824–1.548
CKD/ESRD	1.063	0.652–1.697
COPD/asthma	1.220	0.857–1.722
CAD/CHF	1.371	0.972–1.928
Neuropathy	1.031	0.669–1.565
Obesity[a]	0.752	0.564–0.999
History of substance abuse	0.988	0.675–1.433
Tobacco use	0.841	0.616–1.141
Arthritis/spinal stenosis	0.935	0.698–1.249
NSAID use	1.352	0.950–1.914
Antiepileptic use[a]	1.526	1.082–2.144
Benzodiazepine use	1.439	0.916–2.240
Service connection	0.813	0.614–1.076

Notes: Full model with significant independent variables are shown. [a]Significant variable.
Abbreviations: CKD, chronic kidney disease; ESRD, end-stage renal disease; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease; CHF, congestive heart failure; NSAID, nonsteroidal anti-inflammatory drug.

Table S5 Multivariable ordinal logistic regression of variables associated with telephone calls/secure messages

Variable	OR	95% CI
Pain[a]	1.554	1.198–2.018
Age	1.002	0.991–1.014
Non-white race	1.259	0.972–1.629
Advance practitioner[a]	0.691	0.541–0.881
Psychiatric diagnosis[a]	1.566	1.150–2.132
Depression	0.833	0.621–1.117
Diabetes[a]	1.835	1.404–2.401
Hypertension	1.031	0.784–1.358
CKD/ESRD	1.193	0.797–1.776
COPD/asthma	1.087	0.794–1.480
CAD/CHF	1.259	0.935–1.691
Neuropathy	1.406	0.972–2.025
Obesity	0.799	0.621–1.026
History of substance abuse	0.875	0.617–1.232
Tobacco use	0.774	0.586–1.017
Arthritis/spinal stenosis	1.188	0.921–1.531
NSAID use	1.287	0.937–1.761
Antiepileptic use[a]	1.482	1.092–2.005
Benzodiazepine use	1.187	0.781–1.795
Service connection	1.173	0.918–1.498

Notes: Full model with significant independent variables are shown. [a]Significant variable.
Abbreviations: CKD, chronic kidney disease; ESRD, end-stage renal disease; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease; CHF, congestive heart failure; NSAID, nonsteroidal anti-inflammatory drug.