

The Musculoskeletal Diagnoses Cohort: A Resource for Collaborative Pain-relevant Health Services Research

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Pain Management and Patient Aligned Care
Collaborative Research to Enhance and Advance Transformation and Excellence (CREATE)

Yale School of Medicine



The PRIME Center

Pain Research, Informatics, Medical comorbidities, and Education



Enhancing Pain Care for Veterans

- The CREATE is part of the PRIME COIN
 - *Lori Bastian, Director*

- The MSD is 1 of 3 projects in the CREATE
 - *JL Goulet, Director*

Disclosure

- No conflicts of interest.
- The views expressed are those of the presenters and do not necessarily reflect the position or policy of the Dept. of Veterans Affairs or US government.
- Project is supported by HSR&D CRE 12-012.
- This is a work in progress...

Session Outline

- Background
- Aims of the MSD Project
- Current and ongoing studies
- Additional information, given time

Poll Questions #1

- What is your primary role in VA?
 - Student, trainee, or fellow
 - Clinician
 - Researcher
 - Manager or policy-maker
 - Other

Pain Management is a VA priority

- Up to 50% of Veterans in VA care report pain
- The number of Veterans with LBP is growing
- R_x opioids are a driving factor in overdose deaths
 - Veterans on high dose opioids are at suicide risk
- VA costs for low back pain care ~ \$2.2 billion

Cifu et al., 2013; Haskell et al., 2006; Sinnott, 2009; CDC; Ilgen et al, 2016; Yu et al., 2003

Aims of the MSD Cohort Project

- Identify Veterans with MSD, and describe
 - Their socio-demographic and clinical characteristics;
 - Variation in pain screening, severity, and persistence of pain;
 - Duration and recurrence of MSD episodes.
- Assess variation in pain treatment and outcomes, including
 - Differences in time to and in types of treatment;
 - Effect of mental health treatment on pain;
 - Adverse events associated with chronic opioid therapy.
- Estimate the costs of MSD care
 - By patient and facility characteristics;
 - By clinical characteristics;
 - Resulting from adverse events associated with opioid therapy.

Pain research using VA EHR data sources

Sources of pain data.

Source	Percent [*]	Impression of Data Validity (median score) [†]
NRS Scores	78	5
ICD-9 Codes for Pain	66	4
CPRS Progress Notes	41	4
Pharmacy	39	5
CPT Codes	38	4
CPRS Problem List	38	3.5
Other (e.g., patient self-report, RAI/MDS)	24	5.5
Clinic Stop Codes	22	4
CPRS Discharge Summary	16	4

Abel, Brandt, Czapinski, Goulet. Pain research using Veterans Health Administration electronic and administrative data sources. *JRRD*. 2016;53(1):1–12.

Poll Questions #2

- How many years experience do you have working with VA EHR data?
 - 0 (none)
 - Less than 1
 - 1-2
 - 3-6
 - 7+

Identify and Describe Veterans with MSD

Research Paper

PAIN[®]



The musculoskeletal diagnosis cohort: examining pain and pain care among veterans

Joseph L. Goulet^{a,*}, Robert D. Kerns^a, Matthew Bair^b, William C. Becker^a, Penny Brennan^c, Diana J. Burgess^d, Constance M. Carroll^a, Steven Dobscha^e, Mary A. Driscoll^a, Brenda T. Fenton^a, Liana Fraenkel^a, Sally G. Haskell^a, Alicia A. Heapy^a, Diana M. Higgins^f, Rani A. Hoff^a, Ula Hwang^g, Amy C. Justice^a, John D. Piette^h, Patsi Sinnottⁱ, Laura Wandner^a, Julie A. Womack^a, Cynthia A. Brandt^a

[Pain. 2016;157:1696-1703](#)

Methods

- We searched the VA EHR to identify Veterans with ICD-9-CM diagnoses including; joint, back, and neck disorders
- Inclusion criteria; 2 or more outpatient visits within 18 months, *or* 1 or more inpatient visit with an MSD diagnosis between 2000 and 2011.
 - The first MSD diagnosis date is the index date.
- Demographic and clinical data extracted from CDW *prior to and following* the MSD index date, including:
 - Non-MSD comorbid conditions
 - Dispensed opioid prescriptions
 - Pain intensity numeric rating scores (NRS)
- There were no exclusion criteria.

Results

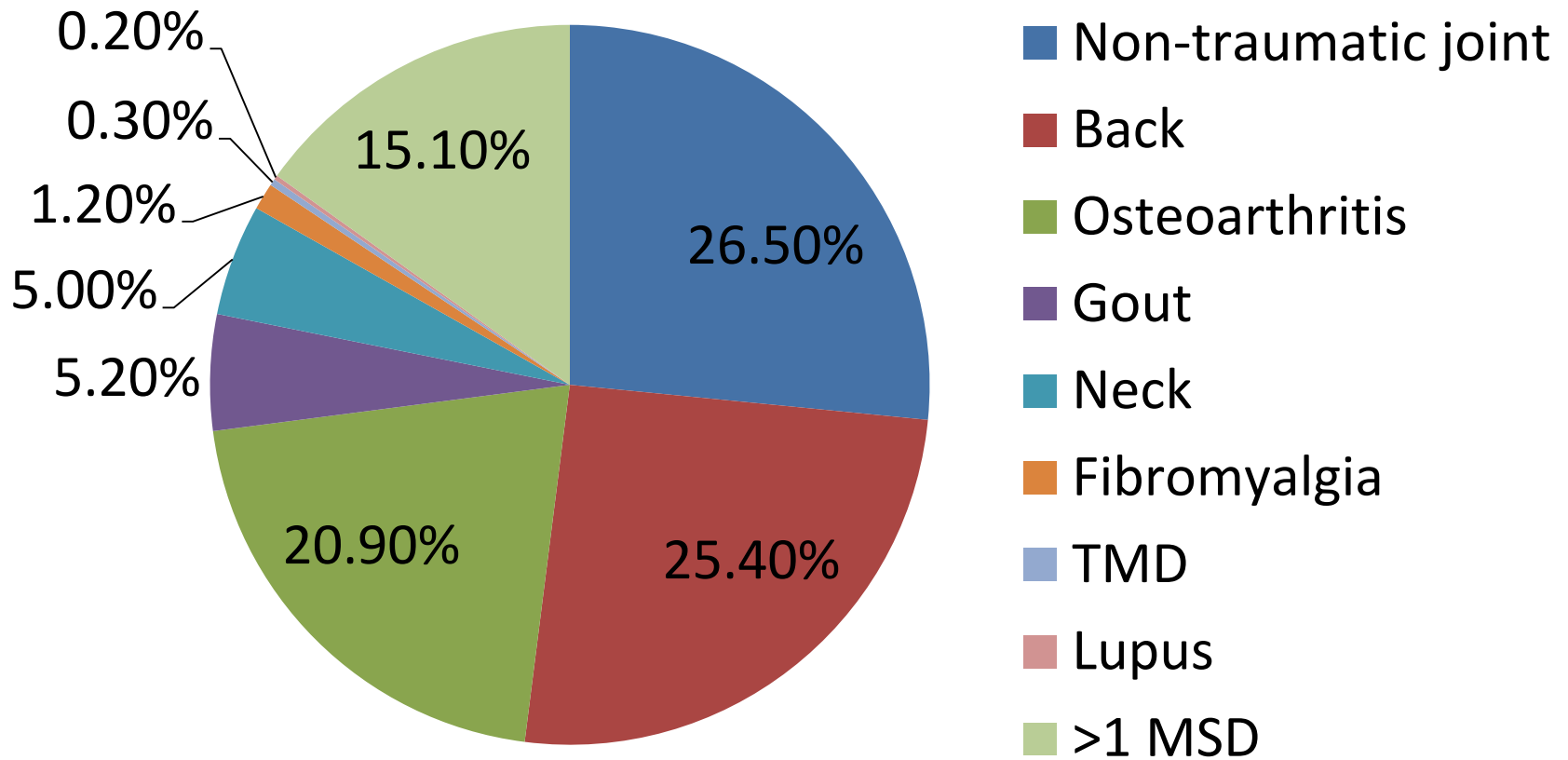
- The Cohort *currently* includes data on 5,237,763 Veterans with 1 or more MSD diagnosis
- Overall
 - 37.4% of the sample were aged 65 or older,
 - 6% (N=314,000) were women,
 - and 73.6% identified as white

Demographic Characteristics

	<i>Year of Entry in to the MSD Cohort</i>											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<i>N</i>	1,109,775	516,896	452,199	429,495	399,774	352,668	336,898	315,866	316,601	343,788	346,154	317,649
<i>Age</i>												
<i>under 40</i>	7.6%	7.6%	7.7%	8.4%	10.7%	12.9%	14.7%	17.3%	19.4%	19.8%	20.1%	20.5%
<i>40-49</i>	15.8%	13.7%	13.2%	12.8%	13.1%	12.9%	12.9%	13.2%	13.7%	13.9%	13.5%	13.2%
<i>50-64</i>	32.7%	32.4%	34.5%	36.6%	37.4%	38.0%	38.4%	39.3%	39.2%	40.1%	39.8%	38.8%
<i>65+</i>	43.9%	46.3%	44.6%	42.2%	38.7%	36.3%	34.1%	30.1%	27.7%	26.2%	26.5%	27.5%
<i>Sex</i>												
<i>Women</i>	5.5%	4.9%	5.0%	5.2%	5.7%	6.0%	6.3%	6.7%	7.1%	7.1%	7.4%	7.7%
<i>Race/Ethnicity</i>												
<i>White</i>	74.6%	76.1%	76.3%	76.0%	74.4%	73.8%	73.4%	71.8%	70.6%	70.5%	70.2%	69.6%
<i>Black</i>	16.6%	14.6%	14.0%	13.8%	14.6%	14.9%	15.1%	15.7%	16.2%	16.0%	15.8%	15.8%
<i>Hispanic</i>	4.0%	3.8%	3.7%	4.1%	4.7%	5.1%	5.1%	5.6%	5.8%	5.5%	5.6%	5.9%
<i>Other</i>	2.9%	2.7%	2.6%	2.3%	2.3%	2.4%	2.4%	2.5%	2.5%	2.6%	2.5%	2.5%
<i>Missing</i>	2.0%	2.8%	3.3%	3.8%	3.9%	3.8%	4.0%	4.4%	4.8%	5.4%	5.9%	6.1%

Not cumulative

Proportion of Veterans with Specific MSD



MSD Diagnoses

	<i>Year of Entry in to the MSD Cohort</i>											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<i>Non-traumatic joint</i>	15.8%	18.2%	18.5%	18.4%	19.6%	19.9%	20.6%	21.4%	21.9%	22.3%	22.3%	22.5%
<i>Back condition</i>	17.6%	17.0%	16.8%	17.1%	17.6%	17.8%	18.1%	18.2%	18.8%	18.9%	19.0%	18.8%
<i>Osteoarthritis</i>	21.5%	20.4%	19.7%	18.5%	16.0%	13.9%	12.7%	11.2%	10.3%	10.1%	9.5%	9.0%
<i>Fracture</i>	2.0%	2.3%	2.4%	2.3%	2.5%	2.6%	2.6%	2.7%	2.5%	2.3%	2.3%	2.4%
<i>Gout</i>	4.3%	4.8%	4.7%	4.5%	3.9%	3.9%	3.7%	3.4%	3.2%	3.2%	3.3%	3.4%
<i>Neck condition</i>	2.5%	2.4%	2.5%	2.6%	2.9%	2.9%	2.9%	3.1%	3.1%	3.1%	3.1%	3.1%
<i>Fibromyalgia</i>	1.1%	0.9%	0.8%	0.8%	0.7%	0.8%	0.8%	0.7%	0.7%	0.7%	0.7%	0.7%
<i>TMD</i>	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%
<i>>1 MSD</i>	12.2%	11.9%	12.7%	13.5%	14.2%	15.3%	16.4%	17.5%	18.5%	19.2%	19.8%	20.3%

Not cumulative

Non-MSD Comorbidity

	<i>Year of Entry in to the MSD Cohort</i>											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<i>Depressive disorders</i>	13.6%	13.3%	13.5%	14.4%	15.1%	15.3%	15.6%	17.2%	18.6%	19.3%	19.9%	19.9%
<i>PTSD</i>	6.7%	5.2%	5.2%	5.4%	6.4%	7.6%	8.2%	10.2%	11.7%	11.8%	12.1%	12.2%
<i>Alcohol Disorders</i>	6.0%	6.8%	6.4%	6.5%	6.9%	7.1%	7.2%	7.9%	8.4%	8.5%	8.6%	8.6%
<i>Drug Use Disorders</i>	3.0%	3.5%	3.3%	3.3%	3.4%	3.5%	3.5%	3.8%	4.0%	3.9%	3.9%	3.8%
<i>Hypertension</i>	45.3%	48.7%	49.4%	50.7%	50.7%	50.4%	49.8%	48.8%	47.5%	47.0%	46.3%	45.9%
<i>Diabetes</i>	18.6%	19.6%	19.8%	20.2%	20.3%	20.4%	20.0%	19.7%	18.8%	18.6%	18.5%	18.8%
<i>Coronary Artery Dis.</i>	17.3%	19.1%	18.3%	17.9%	17.2%	16.7%	15.9%	14.7%	13.3%	12.7%	12.4%	12.4%
<i>BMI</i>												
<i>Normal</i>	22.4%	22.8%	22.3%	21.9%	22.3%	22.3%	22.2%	21.9%	21.6%	20.7%	20.4%	20.4%
<i>Overweight</i>	39.1%	40.0%	39.8%	39.9%	39.5%	39.1%	38.7%	38.4%	38.2%	37.8%	37.5%	37.2%
<i>Obese</i>	37.2%	36.0%	36.7%	37.1%	37.0%	37.5%	38.1%	38.6%	39.1%	40.5%	41.1%	41.4%

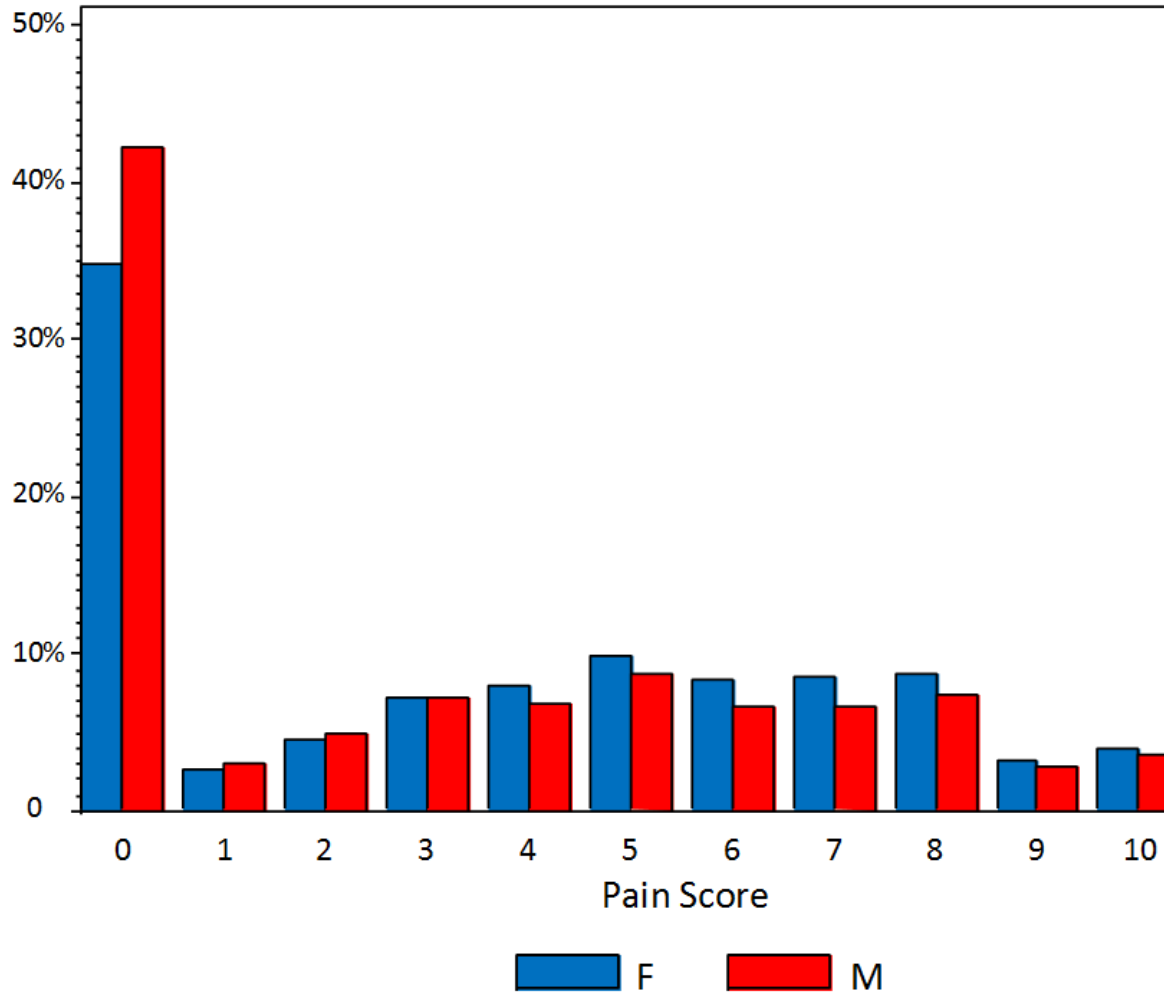
Conclusions

- Over 50% of Veterans receiving VA care 2000-2011 had 1 or more diagnosed MSD.
- That multiple MSD are increasing among younger Veterans deserves particular attention.
- These data demonstrate the potential of the MSD cohort to study complex interactions among demographic and clinical characteristics, including changes over time.

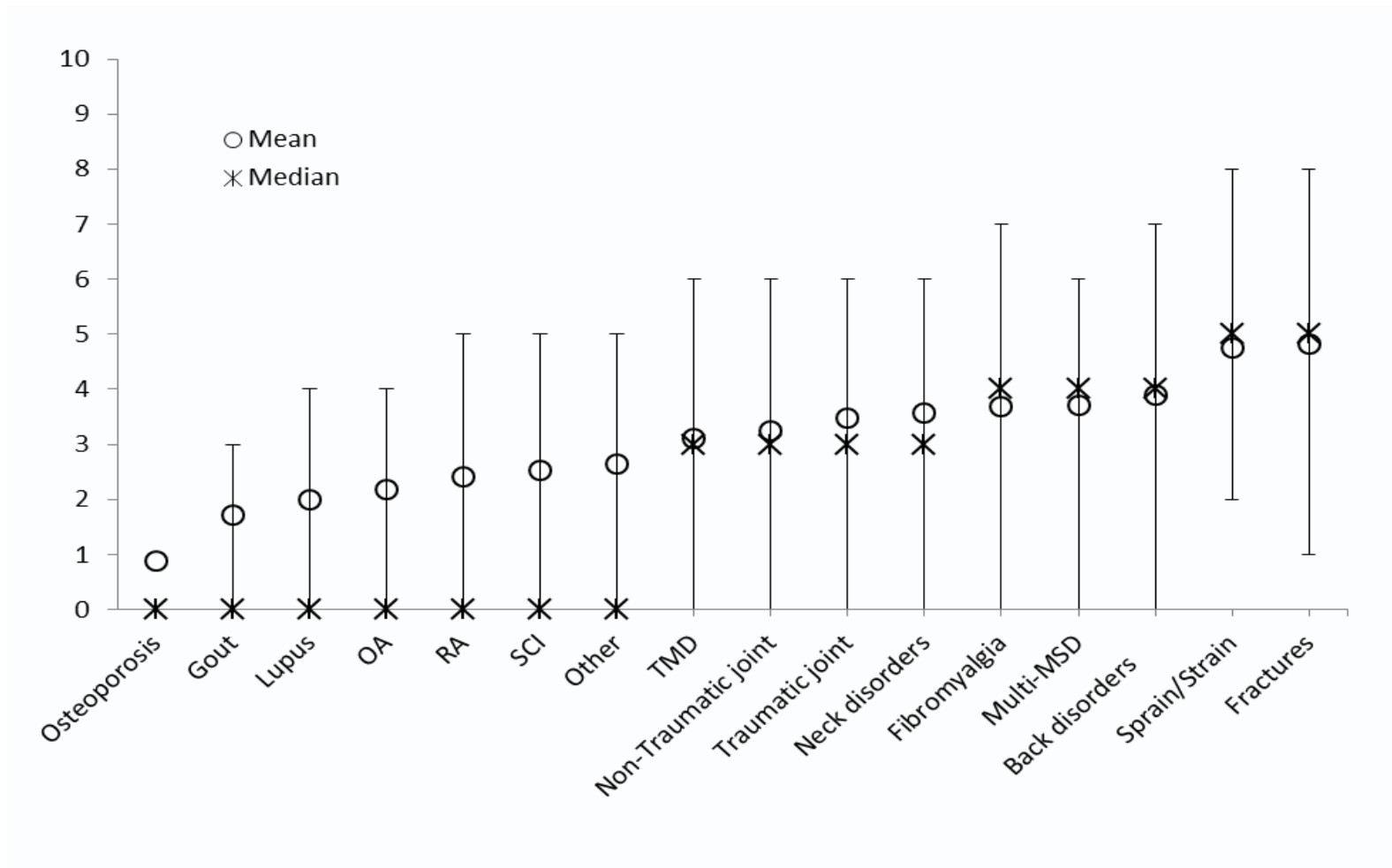
Poll #3

- What do you think was the most common NRS score reported on the MSD index date?
- 0 / 1 / 4 / 7 / 10

NRS Distribution on the MSD Index Date



Average NRS by MSD diagnosis*



*The circles represent the mean NRS score on the MSD index date for veterans with each diagnosis, the asterisk the median, and the ends of the whiskers represent the 25th percentile (bottom horizontal bar) and the 75th percentile

Assess Variation in Pain Treatment

Arthritis Care & Research

Original Article

Racial and Ethnic Differences in Total Knee Arthroplasty in the Veterans Affairs Healthcare System (2001 – 2013)

Leslie R.M. Hausmann PhD, MS^{1,*}, Cynthia A. Brandt MD, MPH^{2,3}, Constance M. Carroll MBA, MPH³, Brenda T. Fenton PhD, MSc^{2,4}, Said A. Ibrahim MD, MPH⁵, William C. Becker MD^{2,3}, Diana J. Burgess PhD⁶, Laura D. Wandner PhD⁷, Matthew J. Bair MD, MS⁸ and Joseph L. Goulet PhD, MS^{2,3}

DOI: 10.1002/acr.23137

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Issue



Arthritis Care & Research
Accepted Article (Accepted, unedited articles published online and citable. The final edited and typeset version of record will appear in future.)

Background

- Knee osteoarthritis (OA) is a significant source of disability
- Total knee arthroplasty (TKA) is a well-established surgical treatment for advanced cases
- Studies have documented lower rates of TKA among black or Hispanic patients than whites
- Main Objective: To examine changes in receipt of TKA over time by race and ethnicity.

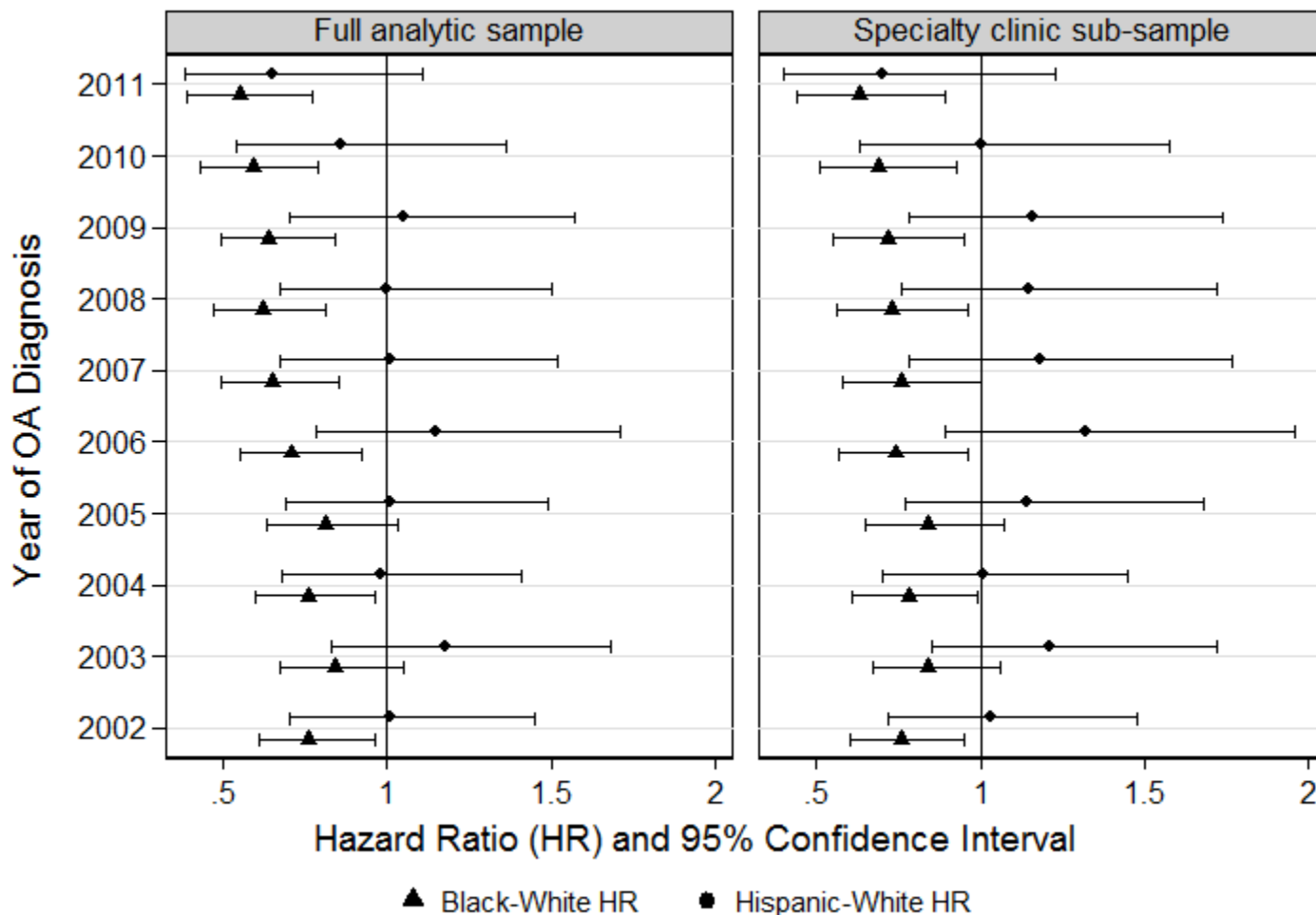
Methods

- We limited the sample to Veterans aged 50 and older with an OA diagnosis.
- Veterans were followed from their OA diagnosis index date until 9/30/2013.
- We used Cox regression to examine racial/ethnic differences in time to TKA by year of OA diagnosis, adjusting for age, sex, BMI, other medical and mental health diagnoses, and NRS scores.
- As a proxy for OA clinical severity, analyses were conducted for a sub-sample who had an orthopedic or rheumatology visit.

Results

- We identified 539,791 Veterans with an OA diagnosis
 - 473,170 white, 50,172 black, and 16,499 Hispanic*
- 12,087 of these Veterans had evidence of TKA
- In adjusted models, TKA rates were significantly lower for black than for white veterans in all but two years.
 - There were no Hispanic-white differences.
- These patterns held in the specialty clinic sub-sample (N=148,844).

Racial/Ethnic Differences in TKA



Conclusions

- In the VA, black Veterans diagnosed with OA were on average less likely to undergo TKA than white Veterans.
- In contrast, Hispanics and whites received TKA at similar rates across all years.
- In order to ensure the health care needs of all Veterans are met, it is important to understand and develop interventions to reduce racial differences in OA care.

Costs of Chronic Pain

Kerns, Carey, Bair, Edmond, Fenton, Higgins, Sico, Wandner, &
Goulet

Background

- Pain is significant driver of medical costs in the United States.
- Health care costs due to chronic pain were estimated to be between \$261 and \$300 billion for the civilian population
- Among Veterans reporting chronic pain in the MSD cohort, we will describe the distribution of costs at the system level and the Veteran level.

Methods

- Working definition of chronic pain
 - Average of 3 or more NRS scores reported in the 365 days following the MSD index date, at least 30 days apart, of 3 or higher
- Working definition of current user
 - At least 2 visits in different years in the 3 years prior to the MSD index date
- Costs will be aggregated in to the following:
 - Total Costs, Inpatient, Outpatient, Emergency Department, Pharmacy, And Mental Health.

Other Manuscripts

Recently Published/in Submission

- Estimating Healthcare Mobility in the Veterans Affairs Healthcare System, Wang et al., *BMC Health Services Research*, 2016;16(1):609
- Gender Differences Among Veterans with Musculoskeletal Disorders, *D Higgins et al.*
- Association of Co-occurring Painful Medical And Mental Health Conditions In Veterans With Temporomandibular Disorders, *B Fenton et al.*
- Use of Spinal Cord Stimulators in a Sub-Sample of the Veterans Health Administration's Musculoskeletal Disorders Cohort from 2000-2012, *L Wandner et al.*
- Pain and the Risk for Stroke, *J Sico, et al.*

Ongoing MSD Studies

- Analysis of Veterans with opioid use disorder Receiving Opioid Agonist Treatment, *A Agnoli*
- Trajectories of Pain and Risk for Incident Depressive Disorder Diagnoses, *E Buta*
- Gender Differences in Pain Intensity and Pain Management among Elderly Veterans 70 and Older, *L Bastian*
- Psychological Treatments for Chronic Pain, *A Heapy*
- Mining Free Text for Opioid-related Adverse Drug Events: A Pilot Study, *W Becker*
- Facility Variation in Pain, *JL Goulet*

Grants Informed by MSD

- S Taylor
 - IIR 14-435: The Cost Effectiveness of Complementary and Alternative Treatments to Reduce Pain
- D Burgess
 - IIR 13-030: A proactive walking trial to reduce pain in Black Veterans
- C Brandt, RD Kerns, S Luther
 - NCIH R01: Pain Care Quality and Integrated and Complementary Health Approaches
- J Goulet, Q Zeng
 - IIR under review: Association of Complementary and Integrative Health (CIH) Interventions with Opioid Use and Related Risks among Veterans with Musculoskeletal Disorders (MSD) and PTSD

Summary

- The MSD cohort is a productive project
 - It's a work in progress, more to be done
- The project is a rich resource for collaborative pain-relevant research
- We have established a process for collaboration
 - Investigator provides us some information
 - Then works with PI's to develop proposal
 - Proposal is presented on conference call to Co-I's

Co-Investigators

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More information

CRE 12-012 – HSR&D Study - Microsoft Internet Explorer provided by VA New England Health Care

http://www.hsr.d.research.va.gov/research/abstracts.cfm?Project_ID=2141701784

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CRE 12-012 **Musculoskeletal Diagnoses Cohort: Examining Pain and Pain Care in the VA**
Joseph Lucien Goulet PhD MS
VA Connecticut Healthcare System West Haven Campus, West Haven, CT
West Haven, CT
Funding Period: June 2013 - May 2017

BACKGROUND/RATIONALE:

In the VHA, Veterans with musculoskeletal diagnoses (MSD), including back and neck problems, osteoarthritis, and other inflammatory and degenerative disorders, have long been managed in the primary care setting. This is consistent with the Stepped Care Model of Pain Management (SCM-PM), which asserts that most pain conditions should be managed by Patient Aligned Care Teams (PACTs). Yet, little is known about the characteristics of Veterans with MSD, the development and persistence of pain, pain management variability, associated medical and mental health conditions, and outcomes and costs of treatments. These data can help identify gaps in care which inform quality improvement efforts. This project will play a key role in the development of VHA pain management performance measures through our collaboration with the Office of Analytics and Business Intelligence.

OBJECTIVE(S):

1) Identify Veterans with MSD and describe their socio-demographic and clinical characteristics; variation in pain screening, severity and persistence; pain-related functional limitations; duration and recurrence of MSD episodes; 2) Assess treatment and outcomes variation, including disparities and time to treatment, by patient and facility characteristics; effect of mental health services on pain reports; aberrant medication behaviors (e.g., early refills) and adverse events associated with long term opioid therapy (OT); and 3) Estimate costs of MSD care and long term OT associated adverse events. Theoretically and empirically informed hypotheses will examine the role of moderators of pain care, costs, and outcomes, especially pain severity and functional limitations, gender, and comorbidities. The project will provide pain management data to directly support the strategic plan of the National Pain Management Program Office and our other partners.

Questions?



"Mr. Osborne, may I be excused? My brain is full."

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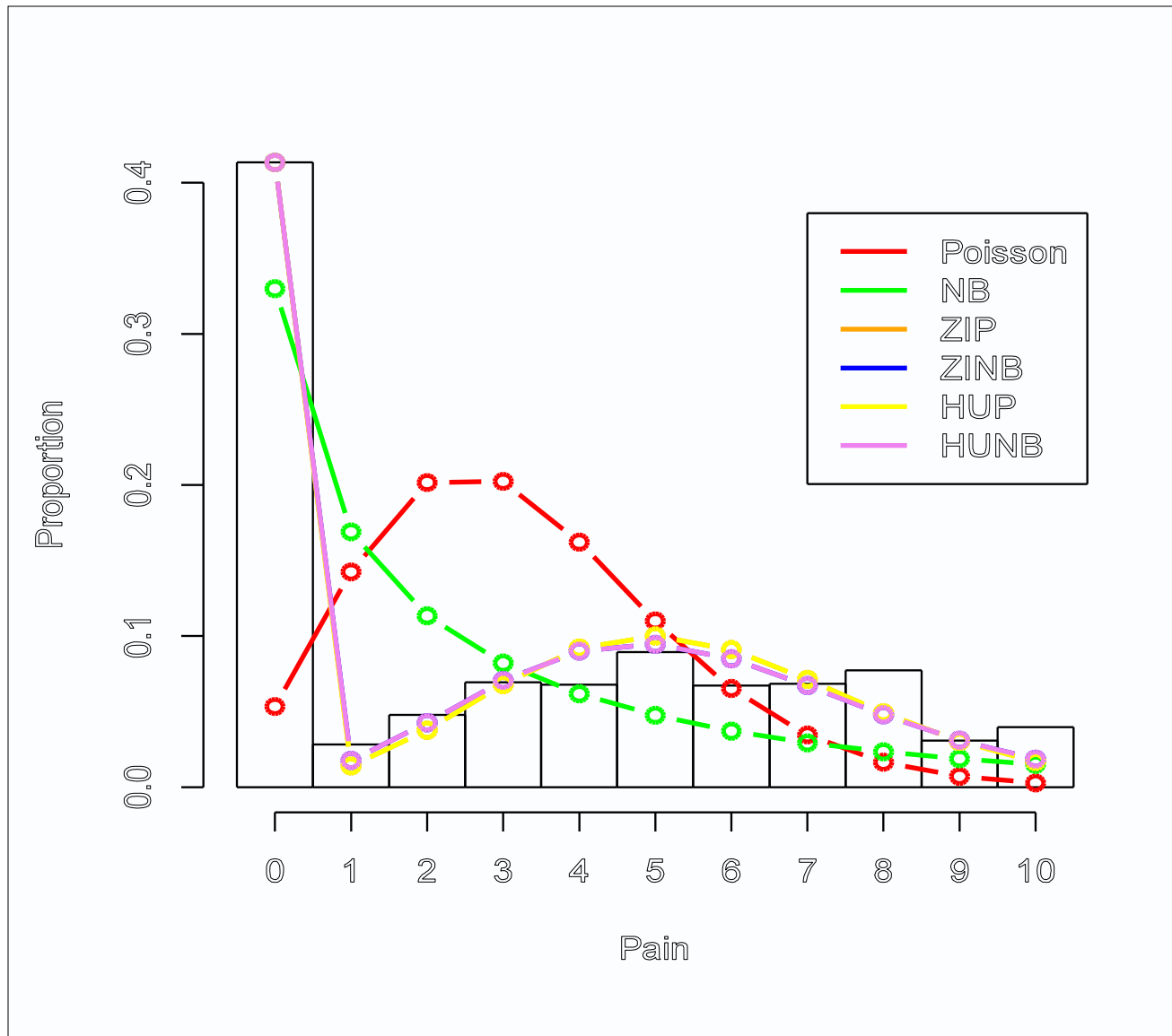
Angela.Consorte@va.gov

Additional Slides

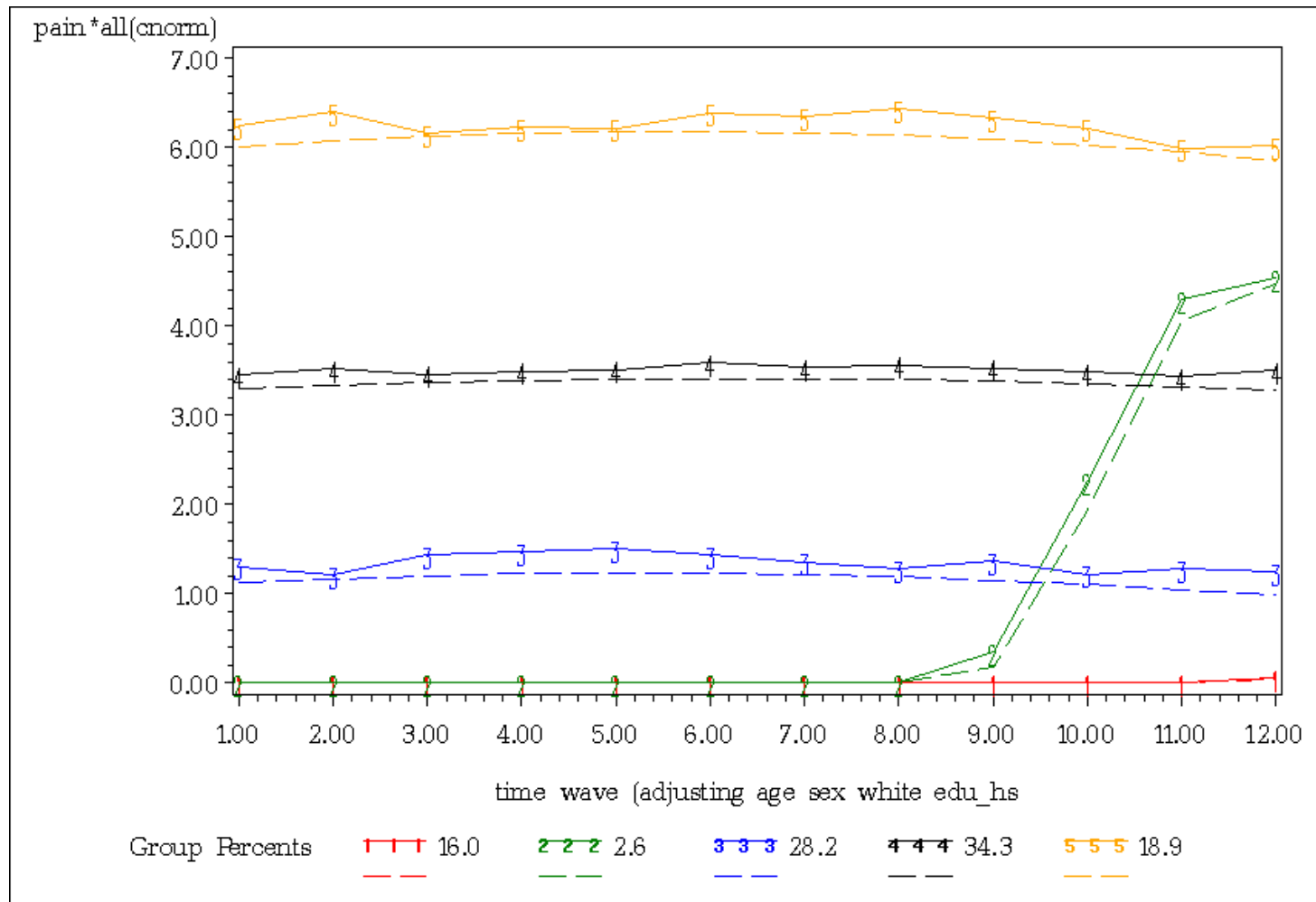
Statistical methods for the analysis of pain intensity numeric rating scale data

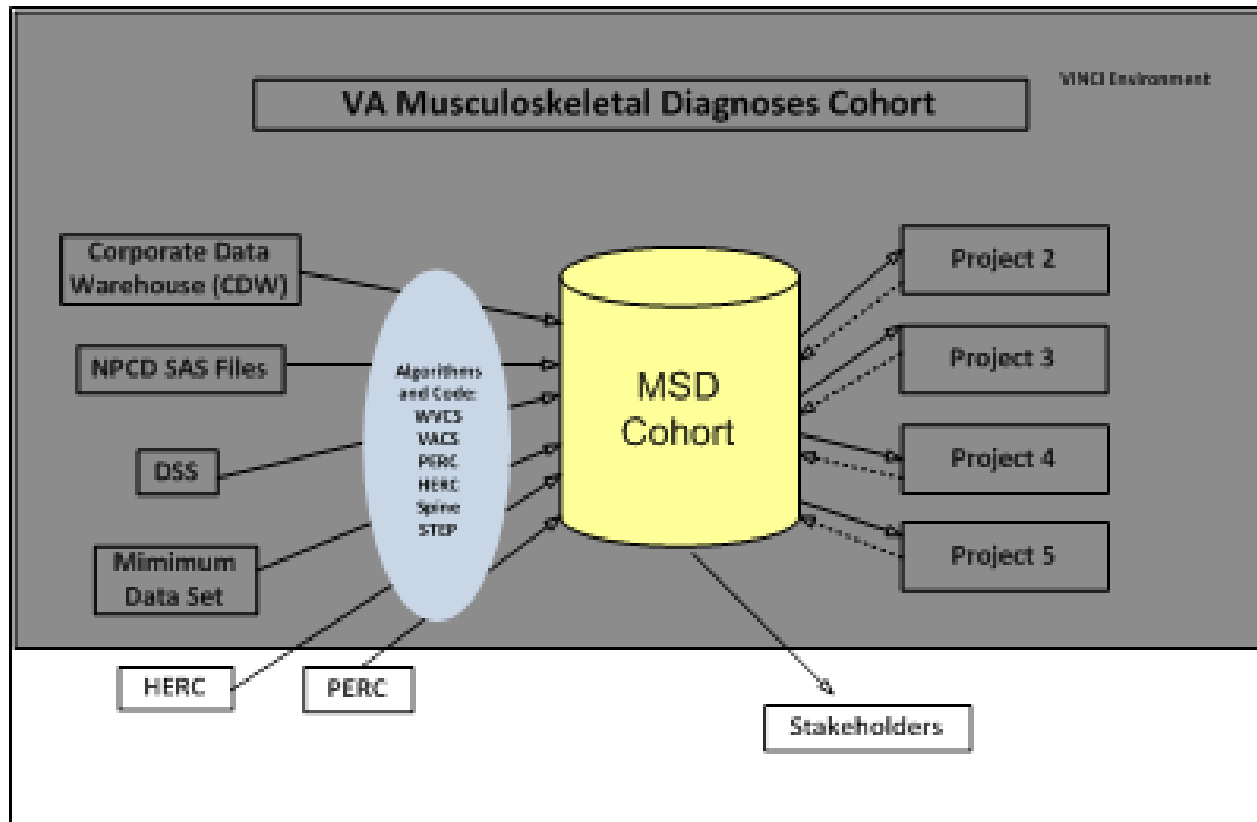
- NRS scores are recorded as discrete values, and they may display a high proportion of zeroes and a right-skewed.
- We present results from a cross-sectional cohort study examining the association of NRS scores with patient characteristics using data collected from 18,935 Veterans diagnosed with a MSD.
- We compared the following statistical models: linear regression, generalized linear models (Poisson and negative binomial), zero-inflated and hurdle models, and a cumulative logit model for ordinal data.
- Models that accommodate zero inflation provided a better fit than the other models. These models should be considered for the analysis of NRS data with a large proportion of zeroes.

NRS Distribution on MSD Index Date



Course of Pain





This figure demonstrates the existing VA data sources that are used to create the MSD cohort, and relationships between the MSD cohort and other CREATE projects.