

# **Methodology for Cost-Effectiveness Analysis of a Pain-Focused Brief Intervention: Emphasis on Pain-Related Costs**

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Spotlight on Pain Management

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# Overview of presentation

- Introduction to the SBIRT-PM trial
- Methods to find cost of VA sponsored care for musculoskeletal conditions
- Methods for the economic hypotheses of the SBIRT-PM trial

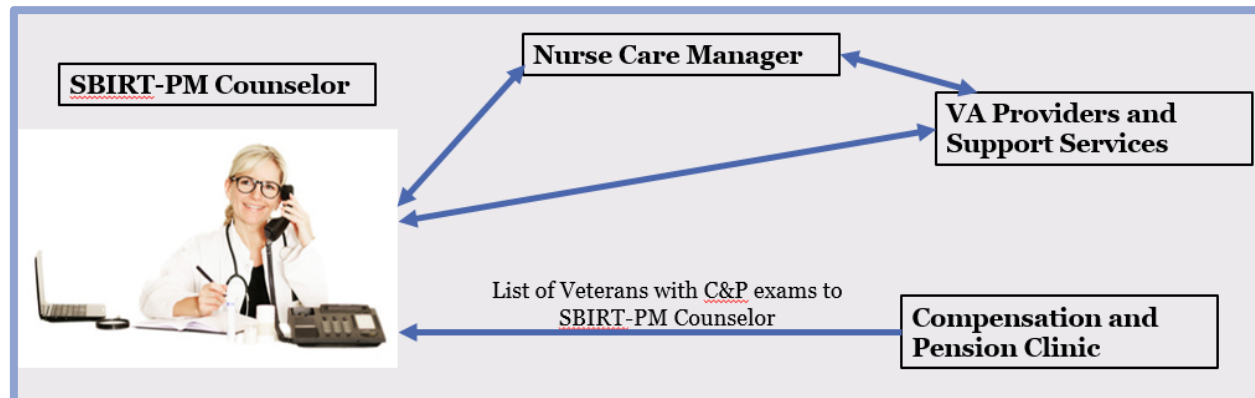
# Introduction to the SBIRT-PM trial

# SBIRT-PM

- Screening, Brief Intervention, and Referral to Treatment for Pain Management (SBIRT-PM)
- Aim: To test the effectiveness and cost-effectiveness of brief counseling compared to usual care

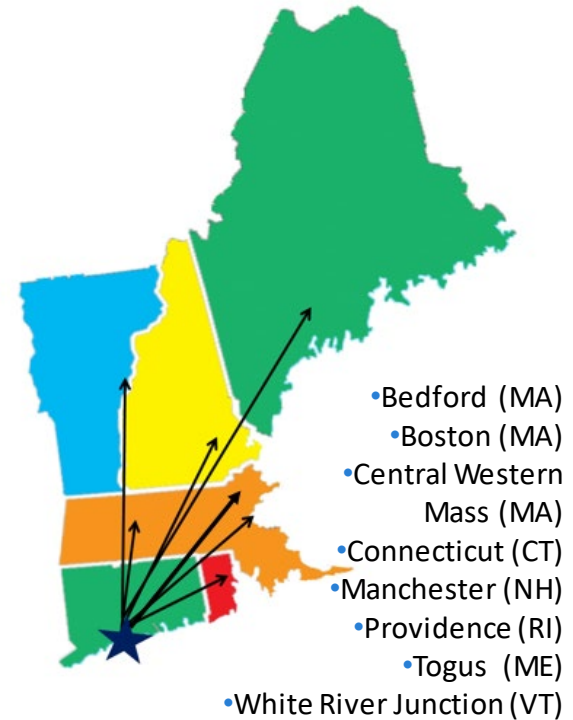
# SBIRT-PM Intervention

- Motivational interview-based counseling to:
  - engage in multimodal pain care
  - address risky substance use
- Delivered by phone
  - 4 sessions over 12 weeks
  - 1 booster session weeks 12-32



# Study procedures

- Randomized Clinical Trial
  - Brief counseling & referral
- vs.
- usual care
- 1100 Veterans
  - Applicants for service-connected disability for a musculoskeletal condition of back, neck, shoulder, or knee
- 8 VA medical centers in New England (VISN 1)
- 4 years



# Study participation

- Inclusion criteria
  - Military service post 9/11/2001
  - Pain severity  $\geq 4$  Brief Pain Inventory (BPI) subscale
  - Access to phone for counseling and assessment
- Exclusion criteria
  - Inability to participate
  - $\geq 3$  modalities of non-pharmacologic pain treatment in past 12 weeks from VA
  - Participation in another PMC3 study

# Outcomes

- Assessment by telephone
  - baseline, 12 weeks, 36 weeks
- Primary Outcomes
  - Pain severity subscale of BPI
  - Number substances requiring any intervention on ASSIST
- Secondary Outcomes
  - Number of modalities of non-pharmacologic pain services
  - Pain interference subscale of BPI
  - Overall health
  - Cost of care for musculoskeletal conditions



# Methods to find cost of VA sponsored care for musculoskeletal conditions

# Goals of cost analysis

- What is value of other health care resources used by trial participants?
- What is cost of treatment for musculoskeletal conditions?
  - Costs of care that is the most likely to be affected by SBIRT-PM intervention
  - Methods may be useful to other interventions addressing musculoskeletal pain

# Sources of cost data

- Cost of intervention: Evaluation of study staff, their activities, and study labor costs
- VA Managerial Cost Accounting system (MCA)
  - Activity based cost allocation system
  - Cost of labor, supplies, overhead
  - Based on detailed measures of resources used
- MCA National Data Extracts
  - outpatient, pharmacy, inpatient
- VA Community Care Data
  - Program Integrity Tool (PIT) system of tables

# Test cohort

- Test methods of finding cost of VA sponsored care
- Define cohort that is similar to trial population
  - Veterans who applied for a disability pension based on musculoskeletal condition
  - Request for a VA provided evaluation exam
    - Compensation and Pension Exam database in VA Corporate Data Warehouse
    - Exam requests for back, neck, knee, or shoulder injury
    - Exams requested: 7/26/1990-3/4/2021
- Plan: determine costs & utilization in Federal fiscal year 2019 (year ending 9/30/2019)
- Searched for utilization by 1,416,130 cohort members
  - 799,836 used VA sponsored care in FY19



## Proportion of cohort members with utilization of each type of care

Type of care	Percent of cohort
Outpatient	98.0%
Outpatient Pharmacy	86.7%
Inpatient	5.5%
Community Care	40.2%
Total with any utilization	100.0%

Among 799,836 cohort members with any FY19 utilization

# Classification of outpatient care

- Identify all care and distinguish care for musculoskeletal conditions
- Care assigned to 5 categories:
  - Emergency care with musculoskeletal diagnosis
  - Surgical care with musculoskeletal diagnosis
  - Imaging of the musculoskeletal system
  - Other care with musculoskeletal diagnosis
  - Care without a diagnosis of musculoskeletal condition

# MCA fields

- Primary diagnosis
  - Single ICD-10 code per visit (OUT record)
- Clinic identifier
  - Stop code
  - Used to classify as emergency, surgery, or other
- Diagnosis rarely assigned in laboratory, radiology, or prosthetic utilization
- For this care musculoskeletal condition defined by:
  - Current Procedural Terminology (CPT) for radiology
  - Date close to visit for musculoskeletal care for laboratory
  - Healthcare Common procedure Coding System (HCPCS) codes for prosthetics service (includes medical supplies)

# VHA provided outpatient care

- 783,886 of 799,836 (98.0%) cohort members used VA provided outpatient care in FY19
- \$5,252 million cost
- Mean cost of \$6,567 per capita
  - (denominator of 799,836 who used any type of VA sponsored care in FY19)
  - Common denominator of 799,836 was used to find all per capita estimates we present here: pharmacy, inpatient, community care
  - Per capita cost reflects those who had no utilization of this type



# Outpatient cost

Category of care (exclusive of pharmacy)	Mean cost per cohort member	Mean number of encounters	Mean cost per encounter
Care for musculoskeletal conditions			
Emergency care	76	0.10	752
Surgical care	407	0.63	646
Radiology	220	0.63	348
Other care	482	1.68	286
Subtotal, care for musculoskeletal conditions	1,186	3.05	389
Other outpatient services	5,381	14.4	374
Total	6,567	17.4	377
% of care for musculoskeletal conditions	18.1%	17.5%	

Mean of 799,836 cohort members with any FY19 utilization

# Outpatient pharmacy

- Pain medications classified using categories identified in a review of literature
- Each generic name in MCA prescription file assigned to a category
  - 13 pain medication categories
  - or residual category of other medications not related to pain

# VHA provided outpatient pharmacy cost

- 693,451 of 799,836 (86.7%) in cohort received VA provided medications in FY19
- Total medication cost in FY19 was \$741 million
- Mean cost of medications was \$1,264 per capita (denominator of 799,836)
- Medications for pain accounted for
  - 32.0% outpatient pharmacy cost
    - (including anti-depressants, often included in pain studies)
  - 27.8% outpatient pharmacy cost
    - (excluding anti-depressants)

# Outpatient pharmacy cost

Category of medication	Mean cost per cohort member	Mean days supply per cohort member	Mean number of prescriptions per cohort member
Pain medications			
Opioid analgesics	58	25	1.0
Non-opioid analgesics	23	78	1.5
Topical analgesics	49	28	0.8
Benzodiazepines	5	8	0.3
Other sedative hypnotics	10	14	0.4
Muscle relaxants	10	24	0.6
Gabapentinoids	54	38	0.8
Other anticonvulsants	21	18	0.3
Non-topical corticosteroids	3	2	0.2
Antidepressants	57	126	2.3
Antirheumatics/immunologics	61	4	0.1
Misc pain medications	85	45	0.7
Subtotal, pain medications	436	409	9.1
Other medications (not for pain)	927	971	17.1
Total	1,364	1,380	26.2
Percent pain medications	32.0%	29.6%	34.9%

Mean of 799,836 cohort members with any FY19 utilization



## Distribution of cost, days supply, prescription count among medications for pain

Category of medication	Cost	Days supply	Prescriptions
Opioid analgesics	13.4%	6.1%	10.9%
Non-opioid analgesics	5.3%	19.1%	16.7%
Topical analgesics	11.3%	6.7%	8.8%
Benzodiazepines	1.2%	1.9%	3.2%
Other sedative hypnotics	2.2%	3.4%	4.3%
Muscle relaxants	2.3%	5.8%	7.1%
Gabapentinoids	12.4%	9.2%	8.8%
Other anticonvulsants	4.9%	4.4%	3.8%
Non-topical corticosteroids	0.7%	0.6%	1.8%
Antidepressants	13.0%	30.8%	25.5%
Antirheumatics/immunologics	13.9%	1.0%	1.1%
Miscellaneous pain medications	19.4%	11.0%	8.1%
Total	100.0%	100.0%	100.0%

# Inpatient services

- Used MCA discharge and treating specialty files
- Characterized count of stays, days of stay, and cost
- Categorized by type of setting
  - Two-digit code: VA treating specialty
  - Created 6 categories
- Stays related to musculoskeletal condition
  - Identified by principal diagnosis (diagnosis that was the reason for admission)

# VHA provided hospital care

- 43,990 of 799,836 (5.5%) in cohort received VHA provided inpatient care in FY19
- \$1,843 million inpatient services used in FY19.
- Mean cost of inpatient care was \$2,299 per capita (denominator of 799,836)
- Among patients with a hospitalization (N=43,990) there was an average of 1.6 stays and \$41,800 cost
- Hospitalizations with primary diagnosis of musculoskeletal condition accounted for 9.0% of cost



# VHA provided hospitalizations by diagnosis

Category of care	Hospitalizations per 1000 cohort members	Mean cost per cohort member	Cost per hospital stay
Principal diagnosis musculoskeletal condition	7.0	206	29,475
Other principal diagnosis	80.5	2,093	25,985
Total	87.5	2,299	26,264
Percent with principal diagnosis of musculoskeletal condition	8.0%	9.0%	

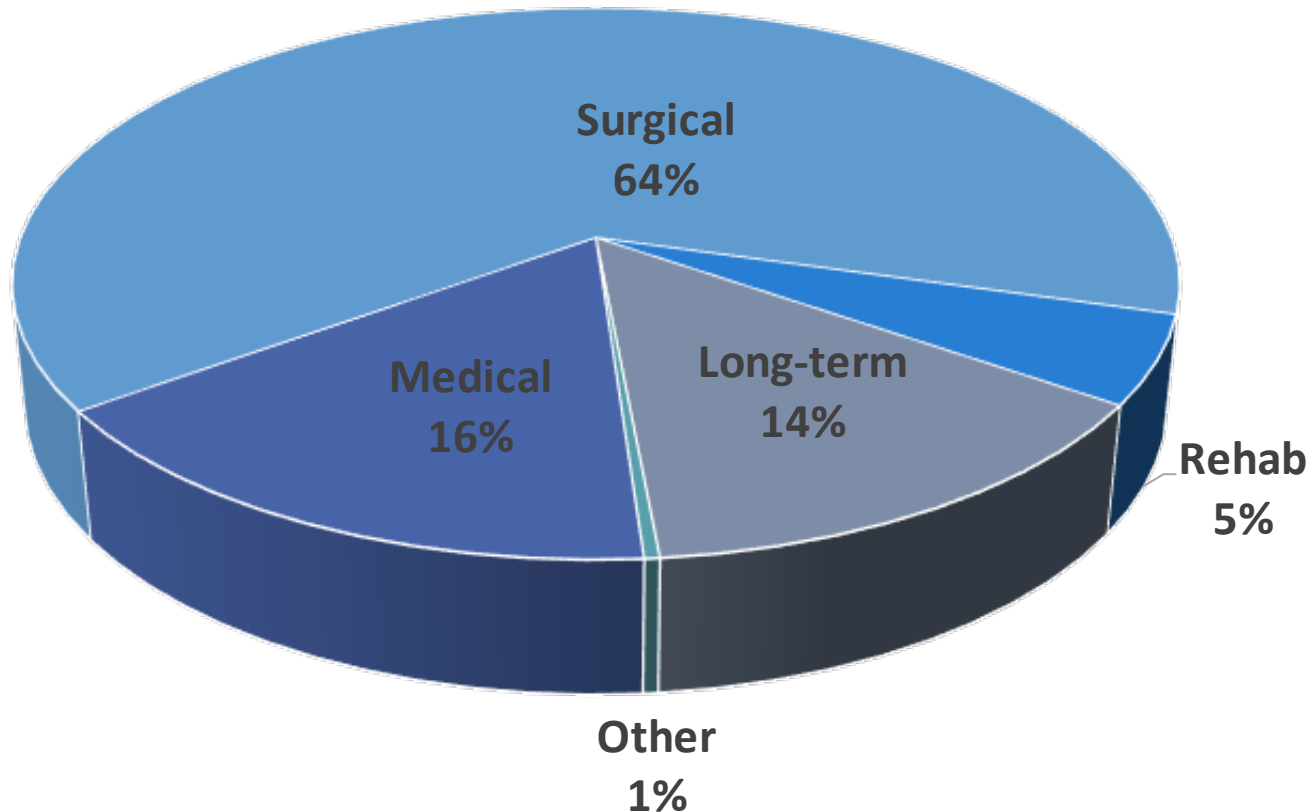
Mean of 799,836 cohort members with FY19 utilization.



## Share of cost for type of care from stays with primary diagnosis of musculoskeletal condition

Type of inpatient care	% of costs of this type of care from hospitalizations with primary diagnosis of musculoskeletal condition
Acute medical stay	4.4%
Acute surgical stay	32.6%
Rehabilitation	8.6%
Long-term care	8.6%
Domiciliary	0.2%
Mental health	0.1%
Total	9.0%

## Cost of VHA hospitalizations for musculoskeletal condition, by type of care



# Community care costs

- VA purchases substantial care from community providers
  - Institutional Claims
  - Professional Claims
- Data source Program Integrity Tool (PIT)

# Institutional Claims

- Bills from hospitals, ambulatory surgery centers, other institutional providers
  - Both inpatient and outpatient care
- Categories of care assigned by fields in claim:
  - Revenue Code
  - Place Of Service
  - Bill Type
  - Diagnosis Related Group
  - Procedure Code
  - Diagnosis Code

# Professional claims

- Bills from providers
- Includes outpatient care and services to inpatients

# VA sponsored community care

- 321,863 out of 799,836 (40.2%) cohort members received VA sponsored community care in FY19
- \$901 million total community care cost
  - Represents 9.9% of VHA sponsored care
- Mean per capita cost of \$1,126 (denominator of 799,836)
- Among those using community care, there was a mean of 11.2 claims and \$2,799 cost (denominator of 321,863)
- Portion attributable to musculoskeletal conditions not yet determined

# VA sponsored community care costs

Type of claim	Mean number of claims per cohort member	Mean amount paid per cohort member
Institutional, Inpatient	0.03	248
Institutional, Outpatient	1.76	435
Professional (Inpatient & Outpatient)	2.71	443
Total	4.50	1,126

Mean of 799,836 cohort members with FY19 utilization.



## Annual cost of VHA sponsored services (including community care)

Type of care	All care
Outpatient services	6,567
Outpatient pharmacy	1,364
Inpatient care	2,299
Community care	1,126
Total	11,356
Percent of total costs from community care	9.9%



# Community vs. VHA provided care

	Community Care Use	No Community Care Use	Total
VHA use	39.0%	59.0%	98.0%
No VHA use	1.2%	0.7%†	2.0%
Total	40.2%	59.8%	100.0%

Among 799,836 cohort members with any FY19 utilization

† Used VA pharmacy only

# Summary of test of methods of determining health care cost

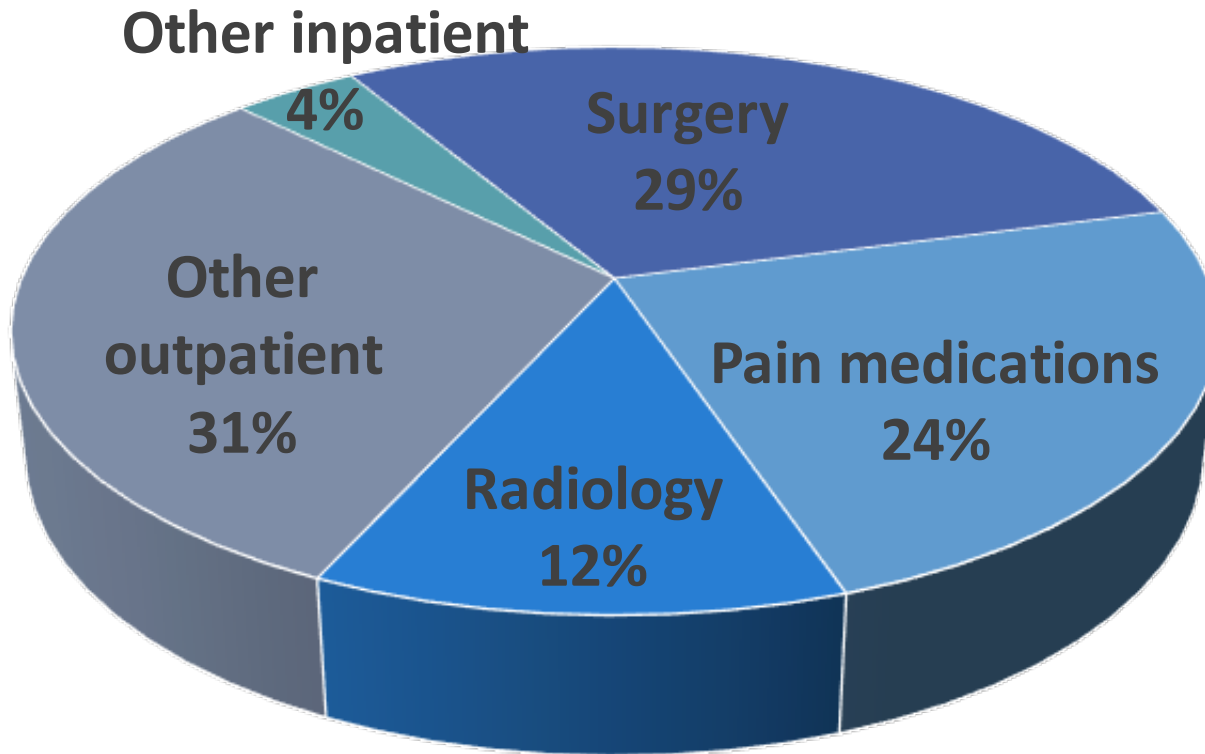
## Cost of musculoskeletal conditions and pain medications

- Musculoskeletal conditions accounted for:
  - 18.1% of cost of outpatient care
  - 9.0% of cost of inpatient care
- Pain medications accounted for 32.0% of the cost of outpatient pharmacy
- Musculoskeletal conditions and pain medications accounted for \$1,828 cost per capita, or 17.9% of the cost of VA services provided to this cohort

# Annual cost of VHA provided services

	Care for musculoskeletal conditions	All care	Percent of care for musculoskeletal conditions
Outpatient services	1,186	6,567	18.1%
Outpatient pharmacy	436	1,364	32.0%
Inpatient care	206	2,299	9.0%
Total	1,828	10,230	17.9%

## Distribution of \$1,828 mean per person annual cost of VHA provided care for musculoskeletal conditions



# Limitations of the analysis

- Results are preliminary
  - Classification methods being refined
- Relied on simplified definition of musculoskeletal condition
  - ICD-10 codes beginning with “M”
- CDW database includes only information on VA provided Compensation & Pension Exams
  - In recent years, most exams conducted by contract examiners
  - Most recent veterans applying for C&P benefits are under-represented

# Limitations from assumptions

- Care is attributed by primary diagnosis
  - An encounter may address more than one condition
- Lab costs are assigned based on temporal proximity
- Radiology based on procedure code, but test may be more a diagnosis other than musculoskeletal conditions
- Medications
  - Some medications used for pain are also used for conditions other than a musculoskeletal diagnosis; e.g. depression, epilepsy, anxiety, etc.

# Limitations to analysis of community care

- Portion of community care attributable to musculoskeletal conditions not yet determined
- We did not extract community care costs from other data systems
  - These have been phased out
  - All were finally discontinued 1/1/20, 3 months after end of study period
- We have not yet studied cost of community care pharmacy



# Testing the economic hypotheses of the SBIRT-PM trial

# Poll

How do you use cost-effectiveness analysis in your work? (Check all that apply)

- Plan or implement a study with cost-effectiveness analysis
- Make clinical or administrative decisions that while considering cost-effectiveness.
- Read literature on cost-effectiveness.
- Do not use cost-effectiveness in my work.

# Economic hypotheses

- Cost-effectiveness analysis
  - Is the intervention a good use of health care resources?
- Budget Impact Analysis
  - What is the impact of intervention on the budget of the Veterans Health Administration?

# Cost-effectiveness guidelines

- Measure all costs
- Express outcomes as Quality-Adjusted Life Years
- Revised U.S. guidelines

Sanders GD, Neumann PJ, Basu A, et al. Recommendations for Conduct, Methodological Practices, and Reporting of Cost-effectiveness Analyses: Second Panel on Cost-Effectiveness in Health and Medicine. *JAMA*. 2016;316(10):1093-1103.  
doi:10.1001/jama.2016.12195

# Health Care Costs

- Direct cost of SBIRT-PM intervention
  - Measured by assessing value of staff time
- Cost of care for musculoskeletal conditions
- Cost of pain medications
- All other health care costs
  - VA provided
  - Outside VA system: focus on care for musculoskeletal conditions

# Costs outside of health care

- Lost wages from pain-related illness
  - Work Productivity and Activity Impairment Questionnaire (WPAIQ)

# Economic outcomes

- Quality Adjusted Life Years (QALYs)
- Preference based quality of life
  - Scored on a scale of zero to 1
  - Allows trade-off between quality of life and length of life
  - 1 QALY = 1 year in perfect health or
  - 1 QALY = 2 years with 0.5 preference-based quality of life score
- Incremental Cost Effectiveness Ratio (ICER)
  - Dollars cost per QALY gained
  - Can be compared to other interventions
  - Can be compared to “threshold” (e.g., \$100K/QALY)
- SBIRT-PM Trial
  - Quality of life instrument: EQ-5D

Questions?