The Prevalence of Musculoskeletal Conditions Among the Adult U.S. Population: Considerations for Physical Therapists.

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THE PREVALENCE OF MUSCULOSKELETAL CONDITIONS AMONG THE U.S. POPULATION: CONSIDERATIONS FOR PHYSICAL THERAPISTS

Abstract

Study Design: Retrospective, Cross-sectional. Objectives: Identify the prevalence of musculoskeletal conditions (MSC) among the non-institutionalized U.S. population using an expanded set of ICD-9-CM codes that correspond to the range of conditions seen in Physical Therapist (PT) Practice. Examine prevalence rates among adults and older adults (65 years and older). Background: MSCs are the most common health problem in the U.S. and prevalence increases with age. Previous studies examining MSC prevalence were based on a limited set of conditions seen by physicians, therefore may not be representative of those who receive PT services. Disease prevalence is used to determine resource allocation for health care services. Methods and Measures: Data from the Household Component of the Medical Expenditure Panel Survey (MEPS-HC) were used, including all respondents with a diagnosed MSC (ICD-9-CM codes). Descriptive analyses were used to examine MSC prevalence, by year, from 1997 through 2000. Results: Final weighted samples ranged from N=75.5 to 80.6 million. The prevalence of MSCs was higher among all adults (34-36%) and adults 65 years and older (52-54%) than has been previously reported. Conclusions: Higher prevalence of MSCs has implications when determining overall health care costs as well as workforce needs within the physical therapy profession. HPA Resource/HPA Journal 2009; 9(2): J1 – J8.

Michael P. Johnson, PT, PhD, OCS; Stephen Metraux, PhD
INTRODUCTION

This paper uses a large, nationally representative dataset to assess the prevalence of musculoskeletal conditions (MSC) using an expanded set of ICD-9-CM codes that correspond to the range of presenting problems seen in physical therapist practice. MSCs (injury, disorders and/or diseases of the musculoskeletal system) represent the most prevalent health problem in the United States. These findings suggest that MSCs, such as those commonly managed by physical therapists, are more prevalent than previously indicated.9 These diagnoses are limited primarily to osteoarthritis, rheumatoid arthritis, and non-traumatic tissue disorders, and as such are well-suited for the purposes of the physician, whose role related to MSCs primarily concerns disease management, which is accomplished through the use of pharmaceuticals, patient education, activity modification, and surgical intervention, as needed.

Physical therapists, in contrast, primarily address the patient-related impairments, functional limitations, and disabilities associated with a disease or medical condition (see Figure 1). This rubric includes common musculoskeletal diagnoses that are presented by patients who are seeking physical therapy care and which are not considered as MSCs by the National Arthritis Data Work Group Force criteria. Most recently, a national report from the American Academy of Orthopedic Surgeons (AAOS) titled, The Burden of Musculoskeletal Diseases in the United States found the prevalence of musculoskeletal disease among the U.S. population ranged from 25-30%. These findings, which were determined using data from the 1996-1998 and 2002-2004 Medical Expenditure Panel Surveys (MEPS), included a broader set of MSCs than the study by Yelin et al.9 These findings suggest that MSCs, such as those commonly managed by physical therapists, are more prevalent than previously indicated.

The majority of studies which examine the prevalence of MSCs, focus on specific body regions, such as the low back, neck, knee, or shoulder, and thus provide an incomplete assessment of overall MSC prevalence among the population. One of the most widely cited studies assessing the prevalence of MSCs, conducted by Yelin and colleagues in 2001, found a 20.1% annual prevalence of MSCs among the U.S. population. These authors utilized data from the Household Component of the 1996 Medical Expenditure Panel Survey (MEPS-HC) and included specific diagnoses recommended by the National Arthritis Data Work Group Force defining MSC by the ICD-9-CM codes: 274 (gout), 710-738 (arthropathies, osteopathies, degenerative joint diseases, mechanical low back pain, non-traumatic disorders of soft tissue – muscle, tendon, synovium, etc.).9

These diagnoses are limited primarily to osteoarthritis, rheumatoid arthritis, and non-traumatic tissue disorders, and as such are well-suited for the purposes of the physician, whose role related to MSCs primarily concerns disease management, which is accomplished through the use of pharmaceuticals, patient education, activity modification, and surgical intervention, as needed.

Study approved by University of the Sciences in Philadelphia’s Institutional Review Board

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Acknowledgment

This paper comes from the work done as part of my dissertation, as such I would like to thank and recognize the following people who helped me through that arduous process: Steven Metraux, PhD (Chair), Carol A. Maritz, PT, EdD, GCS, Vivian Valdmanis, PhD, Laurie Hack, DPT, PhD, MBA, and Maggie O’Neil, PT, PhD, MPH. Additionally, my thanks and appreciation to all of my former colleagues within the Mercy Health System of Southeast Pennsylvania, most especially Grace Lefever, PT, MS; Michele Zappile, PT, DPT, OCS; and Joanne Agnew, PT, who have been my support and, in large part, inspiration as I have endeavored to understand the issues related to musculoskeletal health and the role of physical therapy services.
Understanding the true prevalence of conditions which are likely to result in a patient referral for physical therapy services is important. Epidemiologic data from the U.S. population is used as a basis for projecting resource needs, such as research grants and workforce development. These projections directly impact the physical therapy profession by facilitating health policy decisions which can affect funding for research and professional education, which together influence the ability to expand our body of knowledge and our professional workforce.7,29

To better reflect physical therapist practice, Freburger and colleagues30 examined physician referrals to physical therapists, using data from the National Ambulatory Medical Care Survey (NAMCS) collected from 1995 through 1999, for the treatment of MSCs utilizing an expanded set of ICD-9-CM codes to define MSCs. These diagnoses and corresponding ICD-9-CM codes are listed in Table 1.

This study, which was part of a larger research project,37 examined the prevalence of MSCs, using the same nationally representative data as previous studies,3,34 which are more commonly associated with patients being referred for physical therapy services. Estimating MSCs, based on Freburger et al’s parameters, provides an opportunity to examine the prevalence of these conditions among different populations within the U.S. For this study, we looked to examine the prevalence of MSCs among 1) the entire U.S. population, 2) the adult U.S. population (18 years and older), and 3) Medicare beneficiaries aged 65 years and older.

**METHODS**

The analyses for this study were descriptive in nature, using data from the 1997, 1998, 1999 and 2000 Medical Expenditure Panel Survey (MEPS). The MEPS is a national survey, which was first conducted by the Agency for Healthcare Research and Quality (AHRQ) in 1996.32 It is a continuation of similar surveys that examined medical expenditures, beginning in 1977, repeated again in 1987 and most recently administered in 1996. AHRQ conducts the MEPS annually and collects data from a nationally representative sub-sample of households that participated annually in the National Health Interview Survey (NHIS).31 The NHIS is administered through the National Center for Health Statistics and is conducted via interviews performed throughout the year by trained personnel at the U.S. Bureau of the Census.34

MEPS data include, among other things, very detailed information regarding the use of and expenditures for health related services, as well as types of health insurance utilized by non-institutionalized United States civilians. Since 1996, a new group of households has been selected annually, instead of every 10 years. The survey data are therefore overlapping across a sample of individuals and families nationwide, keeping the data within this component relatively current. These data are collected longitudinally, through a series of five in-person interviews, occurring approximately every 4 months over a two-year period. A final, brief interview occurs by telephone. Overall, the MEPS is considered an excellent population-based data set.35,36

All subjects who had a musculoskeletal diagnosis, as determined by a three digit ICD-9-CM code (see Table 1) within the calendar years 1997, 1998, 1999 or 2000 were included in the study sample.30 MSCs reported by individuals during the interview portion of the MEPS were assigned three-digit diagnostic codes, according to the International Classification of Diseases, Ninth Revision (ICD-9-CM),37 by professional, trained coders. The ICD-9-CM codes were collapsed from their fully specified five-digit codes to a three-digit designation. This was performed for purposes of maintaining confidentiality of each respondent’s data.

Data files from the MEPS Full Year Population Characteristics files and the Medical Conditions files from each year (1997, 1998, 1999 and 2000) were merged to create a comprehensive individual dataset. Data reduction occurred in a manner such that each data set included patient demographic variables (i.e. age, gender, insurance type), while avoiding problems with missing, incomplete or incorrect data. In order to assure internal validity of the study, the process of data reduction addressed three issues. First, individuals were removed from the dataset if they were not included for data collection within an entire calendar year (1997, 1998, 1999 or 2000) because of a change in eligibility (i.e. died, moved out of the U.S., became institutionalized). Second, individuals who were identified with a MSC in separate years were counted as separate individuals for the purposes of this analysis, Therefore, an individual can be represented in more than one year. Finally, incomplete data, i.e. variables or information missing within an individual observation, were assessed to determine whether a specific observation, in which there was missing data, could be appropriately “cleaned” to allow inclusion in the analyses or if it needed to be removed. Data reduction and cleaning were performed using the SAS software system for Windows, version 9.1.3.37 Data management and statistical analyses were performed using the SAS.
<table>
<thead>
<tr>
<th>Diagnostic cluster</th>
<th>Diagnosis</th>
<th>ICD-9-CM Codes (3 digit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degenerative joint disease (excluding spine)</td>
<td>Osteoarthroses and other allied disorders</td>
<td>715</td>
</tr>
<tr>
<td>Other joint disorders</td>
<td>Disorders of the knee</td>
<td>717</td>
</tr>
<tr>
<td></td>
<td>Arthropathies</td>
<td>716</td>
</tr>
<tr>
<td>Sprains/strains (excluding spine)</td>
<td>Sprain/strains of limbs, other areas, excluding spine</td>
<td>840-845; 848</td>
</tr>
<tr>
<td>Fractures, dislocations</td>
<td>Fracture of neck, trunk, limbs; dislocations</td>
<td>805-839</td>
</tr>
<tr>
<td>Mechanical LBP</td>
<td>Lumbosacral spondylosis</td>
<td>721</td>
</tr>
<tr>
<td></td>
<td>Disk displacement without myelopathy</td>
<td>722</td>
</tr>
<tr>
<td></td>
<td>Schmorl’s nodes – lumbar or unspecified</td>
<td>722</td>
</tr>
<tr>
<td></td>
<td>Degeneration of disk – lumbar or unspecified</td>
<td>722</td>
</tr>
<tr>
<td></td>
<td>Disk disorders with myelopathy – lumbar or unspecified</td>
<td>722</td>
</tr>
<tr>
<td></td>
<td>Postlaminectomy syndrome or other disk disorder - lumbar or unspecified</td>
<td>722</td>
</tr>
<tr>
<td></td>
<td>Other unspecified disorders of the lumbar region</td>
<td>724</td>
</tr>
<tr>
<td></td>
<td>Lumbago; sciatica, thoracic or lumbar neuritis; backache; sacral or other back disorder</td>
<td>724</td>
</tr>
<tr>
<td></td>
<td>Curvature of the spine (lumbar region)</td>
<td>737</td>
</tr>
<tr>
<td>Other spine disorders</td>
<td>Acquired spondylolisthesis; other deformities</td>
<td>738</td>
</tr>
<tr>
<td></td>
<td>Nonallopathic lesions of the lumbar regions</td>
<td>739</td>
</tr>
<tr>
<td></td>
<td>Sprains/strains of the lumbar region</td>
<td>846-847</td>
</tr>
<tr>
<td>Non-traumatic disorders of synovium, tendon, bursa</td>
<td>Polymylagia rheumatic; peripheral enthesopathies and allied syndromes; other disorders of synovium, tendon, bursa</td>
<td>725-727</td>
</tr>
<tr>
<td>Non-traumatic disorders of muscle, ligament, fascia, nerves</td>
<td>Muscle, ligament, fascia, other soft tissue disorder</td>
<td>728-729</td>
</tr>
<tr>
<td>Other musculoskeletal disorders/injuries</td>
<td>Mononeuritis of upper, lower limbs</td>
<td>354-355</td>
</tr>
<tr>
<td></td>
<td>Diffuse disease of connective tissue</td>
<td>710</td>
</tr>
<tr>
<td></td>
<td>Osteopathies, chondropathies, and acquired musculoskeletal deformities</td>
<td>730-739</td>
</tr>
<tr>
<td></td>
<td>Traumatic amputation of upper, lower limbs</td>
<td>885-887; 895-897</td>
</tr>
<tr>
<td></td>
<td>Late effects of musculoskeletal injuries</td>
<td>905</td>
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<tr>
<td></td>
<td>Contusion/crushing injuries of upper, lower limbs</td>
<td>923-924; 927-928</td>
</tr>
<tr>
<td></td>
<td>Unspecified injury upper, lower limbs</td>
<td>959</td>
</tr>
</tbody>
</table>
from the study results to the entire U.S. population. The weights account for the proportion of persons in any given sub-group and the probability that persons in a sub-group are likely to be included in the stratified sample. To ignore the weights is to risk over or under-representation of any given population sub-group.

**RESULTS**

Table 2 includes U.S. population data for numbers of all individuals, as well as adults only (18 years and older) for each year using data from the MEPS (1997 - 2000). The number of individuals who participated each year in the survey ranges from 22,547 to 32,098. When sample weights are considered, national estimates for these populations range from 266 to 274 million individuals. These estimates are equivalent to U.S. population estimates made by the U.S. Census Bureau from 1997 to 2000. The data show that the prevalence of MSCs ranged from 27.8 – 30.2% within the U.S. population between 1997 and 2000. The data in Table 2 also show that the prevalence of MSC in adults 18 years and older (ranging from 33.6 – 36.4%) within the U.S. population is higher than that of the overall population. This is expected since MSCs have previously been identified as very common among working age adults and the elderly. The burden of musculoskeletal disease can therefore be correlated with age.

MSCs and their associated functional limitations are the leading cause of disability among the elderly in the U.S. Functional limitations are the leading cause for their limitations.

**DISCUSSION**

The data show that the prevalence of MSCs ranged from 27.8 – 30.2% within the U.S. population between the years 1997 and 2000. These prevalence estimates are higher than those reported by Yelin et al. using data from the 1996 MEPS-HC. These authors estimated an annual prevalence of 20.1% in 1996. However, they included fewer ICD-9-CM codes (274, 710-738) to identify self-reported MSCs. This appears to account for the lower prevalence estimate given that a separate analysis, performed with 1997 MEPS-HC data from this study and using the same ICD-9-CM codes as the previous authors, revealed an annual prevalence of 20.5%. The data in Table 2 also show that the prevalence of MSCs in adults 18 years and older (ranging from 33.6 – 36.4%) within the U.S. population is higher than that of the overall population. This is expected since MSCs have previously been identified as very common among working age adults and the elderly. The burden of musculoskeletal disease can therefore be correlated with age.

MSCs and their associated functional limitations are the leading cause of disability among the elderly in the U.S. Functional limitations are the leading cause for their limitations.

The overall costs associated with MSCs are high and evidence demonstrates that increased hospitals costs, the major health care expenditure among the elderly, are seen with even modest levels of functional decline. MSCs, however, have the lowest health expenditures relative to their burden of disability compared to nearly all other commonly occurring medical conditions in the U.S., suggesting that they are low on the list of federal health care funding priorities aimed at improving the overall health of Americans.

The findings from this study demonstrate a prevalence of MSCs in over 50% of Medicare beneficiaries 65 years and older. Evidence supports the importance of regular physical activity and the benefits of rehabilitation services in helping reduce functional limitations and disability among older persons with musculoskeletal conditions. Since it is clear that elderly individuals with MSCs have greater amounts of functional limitation and disability, policies affecting access to rehabilitation services among the elderly may have an impact on morbidity and quality of life, as well as future health expenditures, within this segment of the U.S. population.

**Table 2: MSC Prevalence by Year among All Individuals and Adults (≥ 18 yrs).**

<table>
<thead>
<tr>
<th>Year</th>
<th>All individuals n - unweighted (weighted)</th>
<th>All individuals with 1 or more MSCs n - unweighted (weighted)</th>
<th>Prevalence</th>
<th>≥ 18 yrs n - unweighted (weighted)</th>
<th>≥ 18 yrs with 1 or more MSCs n - unweighted (weighted)</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>32,098 (266,748,146)</td>
<td>9,362 (80,636,950)</td>
<td>30.2</td>
<td>22,427 (195,857,291)</td>
<td>8,235 (71,258,448)</td>
<td>36.4</td>
</tr>
<tr>
<td>1998</td>
<td>22,547 (269,054,032)</td>
<td>6,362 (78,497,182)</td>
<td>29.2</td>
<td>15,742 (197,641,148)</td>
<td>5,602 (69,637,171)</td>
<td>35.2</td>
</tr>
<tr>
<td>1999</td>
<td>23,224 (271,977,303)</td>
<td>6,160 (75,543,670)</td>
<td>27.8</td>
<td>16,439 (200,323,259)</td>
<td>5,450 (67,288,748)</td>
<td>33.6</td>
</tr>
<tr>
<td>2000</td>
<td>23,479 (273,800,837)</td>
<td>6,354 (77,490,416)</td>
<td>28.3</td>
<td>16,654 (202,489,401)</td>
<td>5,669 (69,855,539)</td>
<td>34.5</td>
</tr>
</tbody>
</table>
Several study limitations need to be considered. First, data from the MEPS are based on self-report, which can be affected by recall bias resulting in over or under-reporting of events. In a study of community dwelling older adults (≥ 65 years), Raina et al. 58 examined the agreement between self-reported and routinely collected data regarding health care utilization. The authors found that senior citizens over-reported contact with primary care physicians, chiropractors and physical therapists. The study limitations should be noted.

### Table 3: MSC Prevalence by Year among Older (≥ 65 yrs) Medicare Beneficiaries.

<table>
<thead>
<tr>
<th>Year</th>
<th>All Medicare n - unweighted (weighted)</th>
<th>Medicare ≥ 65 yrs n - unweighted (weighted)</th>
<th>Prevalence of Medicare beneficiaries ≥ 65 yrs</th>
<th>≥ 65 yrs with 1 or more MSCs n - unweighted (weighted)</th>
<th>Prevalence of MSCs among Medicare beneficiaries ≥ 65 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>4,311 (35,750,660)</td>
<td>3,389 (31,658,369)</td>
<td>88.6</td>
<td>1,979 (16,979,409)</td>
<td>53.6</td>
</tr>
<tr>
<td>1998</td>
<td>3,001 (36,123,914)</td>
<td>2,556 (31,831,234)</td>
<td>88.1</td>
<td>1,359 (16,919,341)</td>
<td>53.1</td>
</tr>
<tr>
<td>1999</td>
<td>2,992 (36,312,403)</td>
<td>2,629 (32,125,054)</td>
<td>88.4</td>
<td>1,346 (16,574,664)</td>
<td>51.6</td>
</tr>
<tr>
<td>2000</td>
<td>3,142 (37,342,671)</td>
<td>2,720 (32,454,492)</td>
<td>86.9</td>
<td>1,461 (17,299,755)</td>
<td>53.3</td>
</tr>
</tbody>
</table>

MEPS is designed to minimize such problems, through the use of structured multi-year follow-up surveys among study participants. A second limitation is that MEPS data are based upon a representative sample of the non-institutionalized U.S. population and therefore are not an actual sample of every individual citizen. The population estimates determined using the 1997 to 2000 MEPS data for the entire non-institutionalized U.S. population and the population of Medicare beneficiaries 65 years and older were equivalent to estimates from the U.S. Census Bureau and the Centers for Medicare and Medicaid Services for each of the four years examined. The findings, therefore, strengthen the overall validity of the data used for this study.

### CONCLUSION / HEALTH POLICY IMPLICATIONS

MSCs are very common among adults in this country and their numbers are only expected to increase as the U.S. population ages. They lead to increased rates of functional limitation and disability among working age adults and older adults, which result in significant health care and other industry costs. In fact, overall health care costs for people with MSCs are 50% greater compared to those without MSCs. In an effort to plan for the resources needed to address these problems, current epidemiologic data related to the prevalence of MSC is necessary.

This study, using a nationally representative data set from 1997 to 2000, shows that the prevalence of MSCs is higher that previously reported in the literature. This is due to the fact that previous research examined the epidemiology of musculoskeletal disease, which focused on specific diagnoses, rather than including additional MSCs associated with impairments, functional limitations, and disability. Patients with a wide range of MSCs seek the care of physical therapists every year, so it is essential to identify the prevalence of MSCs that are commonly associated with referral to and intervention by physical therapists. We, as a profession, need to consider extending more of our scholarly efforts into the area of health services research. Given our understanding of the negative impact that MSCs have on the functional independence of Americans, especially among the elderly, we must continue to push for changes in state and federal health policies that 1) provide further funding for rehabilitation research and entry-level education for rehabilitation professionals, as well as 2) enable patients to gain access to effective care, such as physical therapy. For the growing number of patients with MSCs, we as a profession are well-positioned to make a meaningful difference in identifying the problems related to these conditions, as well as solutions that have value to consumers and patients alike.

### REFERENCES

Technology in Physical Therapy SIG Update

by Daniel J. Vreeman, PT, DPT, MSc

It has been an exciting few months for those of us in the SIG interested in “all things technology” as we have continued building on the momentum generated from CSM 2009. It was clear from the SIG’s wildly successful sponsored CSM programming “The Use of the Wii and Related Technology in Physical Therapy” that there is a great deal of interest in gaming applications as interventions. Because of this widespread interest, we plan to develop additional educational opportunities on this topic and ways to highlight the science at the forefront of this field.

As a SIG representative and informatics researcher, I attended APTA’s recent Physical Therapy and Society Summit (PASS) event. PASS put the spotlight on opportunities for physical therapists to be leaders in integrating innovative technologies in practice. The SIG is committed to continuing this conversation and helping foster that innovation.

HPA’s new Strategic Outcomes help chart the course for HPA’s efforts in the next three to five years. Collaboration will be one of the SIG’s key strategies in our emerging action plan to achieve HPA’s Strategic Outcomes for Technology. For example, we have already launched new efforts to collaborate with members of the American Telemedicine Association and to participate in a resource group for

With a little help from the Tech SIG, HPA is now on Facebook. Be a “fan” without having to join Facebook, see what we’re up to, connect with colleagues, and add to the discussion. Just search for “APTA Health Policy Administration” on Facebook or visit: http://tinyurl.com/nk6js6

SIG members have also been involved in projects to initiate discussion about informatics competencies for physical therapy, the technological infrastructure necessary to support research, and effective use of Web 2.0 technologies.

The new funding for health information technology adoption and subsequent flurry of activities that resulted from the national stimulus package have dramatically accelerated national initiatives in health information technology. Adopting interoperable electronic health records is a clear priority for the nation and our profession, but there are still many challenges ahead. I continue to be involved with many national and international standards development activities, but rehabilitation professionals are really just getting started when it comes to defining a coherent method to exchange the content that makes up our unique body of knowledge in this emerging electronic environment. The SIG aims to continue promoting, educating, and fostering a sharing community that speeds adoption of systems that “make it easy to do it right”, but we can use all the help we can get. If you have interest, we would love to have you join us.

The Technology in Physical Therapy Special Interest Group is a forum for people interested in many areas of applying technology in physical therapy, from electronic health records to telehealth and other applications. Contact the HPA Section office for details on how to join.

Daniel J. Vreeman, PT, DPT, MSc is an Assistant Research Professor at Indiana University, a Research Scientist at the Regenstrief Institute, and President of the Technology SIG. He may be reached by e-mail at dvreeman@regenstrief.org. HPA