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Identifying Episodes of Back Pain Using Medical Expenditures Panel Survey (MEPS) Data: Patient Experience, Use of Services, and Chronicity

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Abstract

Objective—To explore the correspondence between “episodes of pain” and “episodes of care” for individuals with back pain.

Data Source—Secondary analysis of Medical Expenditures Panel Survey (MEPS) 2-year longitudinal data.

Study Design—Individual use and utilization of back pain services were examined across ambulatory settings and providers, and linked to MEPS medical condition data to identify individuals with back pain who do not use, or who delay or discontinue utilization of health services for back pain.

Data Collection/Extraction Methods—Episodes-of-care and episodes-of-pain were approximated through round-by-round temporal mapping of MEPS back pain utilization events data and medical conditions data.

Principal Findings—Of 10,193 individuals with back pain, approximately one fifth did not actively seek care for their back pain. Utilization of services for back pain (episodes-of-care) does not always correspond with an individual’s full experience of back pain (episodes-of-pain). Upwards of 20% of MEPS respondents who use services for some back pain episodes, reported additional episodes for which they do not use services.

Conclusions—These findings suggest that other longitudinal studies based only on data that reflect service use, e.g., claims data, may incorrectly infer the nature of back pain and back pain episodes. Many individuals report ongoing back pain that continues beyond their episodes-of-care, and many individuals with persistent back pain may use prescription drugs, medical services, and other health services only intermittently.

Keywords

Medical Expenditures Panel Survey; MEPS; longitudinal analysis; back pain; episodes of care; episodes of pain

INTRODUCTION

The economic burden of back pain is tremendous, and much interest is directed toward assessing the use of health services for back pain¹ and to better understanding the individual experiences over time of those with chronic back pain. Back pain chronicity has been

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operationalized in various ways in clinical research. Back pain may be defined as chronic/subacute based on the length of a single continuous episode, e.g. as pain duration greater than 4 weeks² or greater than 6 weeks,^{3,4} or as pain that persists for more than 3 months,⁵ or defined as chronic for pain lasting at least 6 months in duration.⁶ Chronic back pain has also been defined as the number of years since the back problem first occurred, e.g. with chronic defined as 5 or more years,⁷ which implicitly recognizes that a chronic back condition may also manifest as repeated “flare-up” acute recurrent back pain episodes over some time frame.^{8,9} As noted in recent reviews, episodes-of-pain or episodes-of-care are also somewhat arbitrarily defined in much of the clinical or health services research on back pain, and there is a growing awareness of the need to conceptualize and analyze care-seeking and care provision across episodes and to consider the long-term consequences of pain, functional status, and other outcomes of care.^{10,11,12}

The Medical Expenditures Panel Survey (MEPS) is a readily accessible source of data on health service use and utilization, and costs of care for self-reported conditions such as back pain.¹³ The MEPS public use data files have been analyzed to estimate the health care costs and treated prevalence of back pain,^{14,15,16} however such studies largely have reported only cross-sectional point-in-time annualized estimates, or trends over time, based on analyses of data from a series of MEPS one-year data files. Such time series cross-sectional reports can offer but a limited insight into this problem area, e.g. by comparing the overall volume and costs of ambulatory (outpatient and office-based) service use to inpatient service use for back pain care. The MEPS longitudinal data files have added potential for rendering a focused insight and a more comprehensive understanding of the range and variation of individual experiences with chronic back pain over time. For instance, individuals who utilize health services for a single limited back pain “episode of care” may be distinguished from those with longer ongoing episodes or from those who experience episodic recurrence of back pain. Given also that non-use of services does not necessarily equate to an individual’s being “free of pain”, MEPS data further affords the opportunity to better understand long term utilization behaviors for individuals with chronic back pain, e.g. by exploring the correspondence between “episodes of pain” and “episodes of care” for those individuals.

The purpose of this paper is to describe the as-yet underexplored potential of MEPS data for more detailed and useful examination and understanding of health service use and utilization over time by adult individuals with chronic back pain. Three dimensions of the added utility of MEPS data will be described: Use of the MEPS longitudinal panel structure to examine individual use and patterns of utilization over 2-years; linking across MEPS event file types to examine individual use and utilization across settings and providers; and linking event utilization data with medical condition data in longitudinal MEPS analyses to identify individuals with back pain who do not use, or who delay or discontinue utilization of health services for back pain.

METHODS

As shown in Figure 1, the Medical Expenditures Panel Survey (MEPS) consists of two distinct but related study designs for data collection: a year-to-year cross-sectional survey design, and a 2-year longitudinal panel design. Estimates of health service use for back pain based on the MEPS cross-sectional annual survey, using full-year consolidated data files, may differ somewhat from those generated by analyses of the slightly more complex data file structures of the MEPS 2-year longitudinal panel survey. I report here specifically my examination based on data from the MEPS longitudinal panels. The MEPS panel survey methodology uses an overlapping panel design, and each MEPS panel survey respondent is interviewed five times over 30 months and asked to recall their experiences during periods

ranging from 4 to 6 months. This recall time period was established for the MEPS on the basis of research¹⁷ which indicated there is limited recall bias for periods of up to 6 months.

All 5 Rounds

Each MEPS panel uses a 2-year longitudinal study design with participants re-surveyed during each of 5 separate rounds throughout the 2-years. Approximately 94% of MEPS respondents were in-scope and had data for all 5 rounds of the panel (see Appendix Note #1). Table 1 reports the total sample sizes of all MEPS respondents for each of the MEPS Panels 5-through-10, before and after applying the “All 5 Rounds” selection criteria used in this study. Of the 87,302 MEPS participants who were in-scope with data for all 5 rounds, approximately 70% were adults aged 18 or older at the start of the 2-year MEPS longitudinal panel timeframe.

Back Pain

MEPS interviewers recorded verbatim the respondents’ description of their health care conditions. Trained MEPS coders then re-assigned the verbatim condition narratives to fully specified ICD diagnostic codes which were then truncated to 3-digits to protect confidentiality. In addition to 3-digit ICD condition codes, each condition reported by MEPS respondents is also assigned by MEPS coders to a Clinical Classification Category (CCC), which aggregates health conditions into 259 mutually exclusive and broadly homogenous categories.^{18,19} Chronic conditions coded by CCC categories have been tested and shown to be a useful construct for generating preference-based chronic condition scores for calculating quality-adjusted life years for cost-effectiveness analyses and burden of illness studies.²⁰ For this study, MEPS respondents with back pain were identified using both the CCC code “205” and the ICD codes “846” and “847”. The CCC code “205” encompasses 66 ICD-9 codes presumed to represent a set of largely chronic back pain conditions (spondylosis, intervertebral disc disorders, other back problems). The ICD-9 back pain codes “846” (sacroiliac sprain/strain) and “847” (other backsprain/strain) are not included in the CCC “205” subset, but instead are categorized within the CCC “232” subset (all sprains and strains, presumably representing acute conditions) Therefore the data capture strategy for this study, was to identify acute, chronic, and recurrent cases in the longitudinal back pain cohort by including all MEPS respondents with any self-reported back pain assigned by MEPS coders to CCC code “205” or coded as ICD code “846” or “847”.

Ambulatory Back Pain Utilization Events

For each of the MEPS longitudinal panels 5-through-10, adult MEPS respondents who were in-scope and had data for all 5 rounds of data collection were identified. Merged data from four separate MEPS event files²¹ (MEPS 2009): Office-Based visit events (OB), OutPatient visit events (OP), hospital Emergency Room visit events (ER), and Prescription medications (Rx), were used to identify MEPS respondents who reported a back pain utilization event (visit or prescription) in any of those ambulatory settings. The MEPS Rx events file also included a small number of Rx events for back pain that were only associated with inpatient hospitalizations. The MEPS Appendix Event-Link data files were used to identify and remove those Rx events for back pain identified as being associated with an inpatient hospitalization, which was less than 5% of all Rx back pain events. Reported in Table 2 are numbers of adult respondents with ambulatory-only back pain utilization events, for MEPS panels 5-through-10, i.e. the cohort of “Users” of health services for back pain (N=8,244). Each reported utilization event may have multiple ICD and CCC codes associated with that event, since patients may use a given service on a given date for more than one medical condition (e.g. for related or unrelated comorbid conditions). Reported in Table 2, the back pain utilization events tend to fall into mutually exclusive coding categories, with 90% of

events identified solely with code CCC “205”, and 9% identified solely as ICD “846” or “847” code. Less than 1% of the back pain utilization events were coded by MEPS coders as *both* CCC “205” and ICD “846”, “847”.

Approximating Episodes-of-Care by Mapping Back Pain Utilization Events across MEPS Rounds

Each MEPS back pain utilization event (OB, OP, ER, and Rx) is identified as having occurred during one of the 5 MEPS data collection rounds. Since prescription medicine refills are not well coded in MEPS, patterns of service utilization for back pain cannot be reliably examined using specific “event dates” (see Appendix Note #2). However, all MEPS utilization events (Rx, OP, OB, ER) can be temporally ordered as occurring in a specific MEPS data collection round, and each round for each MEPS respondent can therefore be classified as either “Back Pain active” (i.e. the round has a back pain utilization event occurring during that round) or “Back Pain inactive (i.e. the round does not have any reported back pain utilization events associated with it). For the cohort of “Users” of back pain services (N=8,244), Table 3a reports an example of this Round-by-Round mapping of “back pain active” and “back pain inactive” periods across all 5 rounds of MEPS Panels 5-through-10 that may generally approximate back pain episodes-of-care patterns. In Table 3b these same Panels 5-through-10 round-by-round patterns of back pain utilization are collapsed into six general categories of similar pattern types that may represent: those individuals with a single limited back pain episode-of-care (Categories A1 and A2, single back pain round), individuals with a single, possibly prolonged, back pain episode-of-care (Categories B1 and B2, two contiguous back pain rounds), individuals with long-term continuous back pain utilization (Category C, three or more consecutive back pain rounds), and individuals with recurrent episodic utilization (Category D, multiple back pain utilization rounds interspersed with rounds of no utilization for back pain). Also reported in Table 3b is whether the individuals in each of the categories above had only CCC “205” utilization events, or only ICD “846” or “847” events, or both types of events. Individuals with long-term continuous, or episodic recurrent utilization (Categories C and D) predominantly (90%) had been coded by MEPS as having only CCC “205” back pain events. Up to 20% of individuals categorized as a single limited back pain episode (Categories A1 and A2) had only events coded as ICD “846”, “847”. Reported in Table 3c, most individuals with back pain utilized some combination of ambulatory services (OB,OP,ER,Rx), or office-based services (OB) solely.

Approximating Episodes-of-Pain by Mapping All Back Pain Experienced across MEPS Rounds

The MEPS Medical Conditions file is another source for identifying MEPS respondents with back pain. Medical conditions are assigned corresponding ICD-9 and CCC codes and may be added to the MEPS condition roster in three ways: if the condition is identified as a reason for a utilization event; or if the condition is reported as the reason for any disability days (days missed from work or school); or if the condition is reported as having “bothered” the person during the reference period, i.e. at sometime during the entire round preceding the interview. As an additional measure of disability, each medical condition is flagged if the condition is associated with a day spent in bed.

Reported in Table 4a are the two separate back pain cohorts identified in the Panels 5-through-10 Medical Conditions file. The first cohort of “Users” (n = 8,244) is composed of adults with back pain identified in *both* the Medical Conditions file and the Utilization Events files, i.e. those individuals with back pain who report using health services for their back pain sometime during the 2-year longitudinal panel timeframe. The second cohort, “Non-Users” (n = 1,949), are adults with back pain identified in *only* the Medical Conditions

file but who are *not* in the Utilization Events files, i.e. those individuals with back pain who report that they did not use *any* health services for their back pain during the timeframe of that 2-year longitudinal MEPS panel. Among “Users”, 40% of the cases reported having a disability day due to back pain (missed work/school or in bed), and 34% of “Non-Users” reported having a back pain disability day.

Certain medical conditions, such as back pain, were designated by MEPS as “priority conditions” due to their prevalence, expense, or relevance to policy. Since back pain is a “priority condition”, the data was collected by MEPS and made available in the Medical Conditions file to allow for each MEPS respondent with a back pain ICD-9 or CCC code to be classified into a Round-by-Round pattern that identifies whether any given round is “active” in terms of whether the back pain bothered the person or was associated with a utilization event or disability day during that round. This Round-by-Round mapping is presented in Table 4a for each of the two back pain cohorts (“Users” and “Non-Users”) that were identified in the MEPS Medical Conditions files. In Table 4b is presented the collapsing of the patterns for the “Users” cohort (n = 8,244) into the six general categories approximating experienced *episodes-of-pain* pattern types, to compare and contrast to Table 3b which presents approximations of back pain *episodes-of-care* pattern types for this very same cohort of “Users”.

RESULTS

Referencing Table 5, approximately 54% of MEPS Respondents (pooled across Panels 5-through-10) are classified as having a single limited back pain episode-of-care, i.e. all of their ambulatory utilization events (Office-Based, Outpatient, ER, and Rx) occur during a single MEPS round. Also reported in Table 5 is the correspondence between the constructed Episodes-of-Care pattern groups (based on MEPS Utilization Event files) and Episodes-of-Pain pattern groups (based on MEPS Medical Conditions file). For individuals initially categorized as a single limited episode-of-care (A) or as single prolonged episode-of-care (B) based only on information about their utilization, approximately 20–25% of these individuals are reclassified into a longer or recurrent episode-of-pain categorization when additional information is factored in (i.e. the individual’s self-report of “being bothered” by back pain or having disability day due to back pain).

An individual’s utilization of services for back pain (episodes of care) does not always correspond with that person’s full reported experience of back pain (episodes of pain), in that upwards of 20% of MEPS respondents report additional MEPS rounds during which they experience back pain for which they do not report using health care services (Table 5). For the cohort of “Users” who reported experiencing additional back pain rounds for which they did not use services, the extent to which their additional “Non-Utilization” rounds of back pain tended to precede or to follow their “Utilization” rounds of back pain is examined by mapping the direction of the changes in Round-by-Round patterns as presented in Table 6. For the majority (over 50%), their additional non-utilization rounds occurred subsequent to their utilization rounds (Pattern 1 in Table 6). For individuals with recurrent, episodic utilization (category D), most of their additional non-utilization back pain rounds tended to “fillin” between their existing utilization rounds.

DISCUSSION

Of the 10,193 individuals who reported experiencing back pain in this study, approximately one fifth were not actively seeking care for their back pain during the 2-year MEPS panel timeframe. Other longitudinal studies may be based on data that reflect health service use, e.g., claims data, rather than ongoing reports of pain. My findings suggest that such studies

based solely on use of health services may incorrectly infer the nature of back pain episodes. Of those who do use services (“Users”), approximately 80% of individuals exhibit the same round-by round patterning of back pain experience and use. For the other 20% of “Users”, however, their additional periods of pain are more likely to occur after their periods of health service use, rather than before. This is consistent with the notion that seeking treatment of some form may begin shortly after the onset of pain, but pain lingers after the receipt of services has ended. As well, this may be an artifact of how the prescription drug data are captured in MEPS, since periods are identified when the drugs are purchased, not when the drugs are taken. Importantly, these data also suggest that many people who might otherwise be classified as having intermittent recurrent bouts of back problems are actually experiencing persistent pain in a continuous series of time periods, but just are not receiving additional services in each period.

I have reported here examples and important considerations for a proposed methodology to examine health service use and utilization for back pain based on analyses of MEPS 2-year longitudinal survey data. Limitations to such a methodologic approach should also be noted. I described in this report an approach to defining back pain based on specific selection criteria of ICD-9 and CCC condition codes, therefore comparability of my findings to other MEPS studies are limited as such. Similarly, I reported limiting my focus to ambulatory utilization events, which guided my selection of relevant MEPS data files, events, and cases, which may also limit the comparability of my study findings to other MEPS studies with different foci, e.g. studies that have described both ambulatory and inpatient health service use for back pain. However, I note that of the 8,244 adult MEPS Respondents (pooled across Panels 10-through-5) that I identified as having any back pain ambulatory utilization events, only 296 (3.6%) of these also had reported any inpatient hospitalization for back pain during the 2-year panel timeframe.

Another limitation is that MEPS is self-report survey data and may therefore be subject to error or bias due to subject recall or other similar problems associated with self reporting of health conditions, health service use, or related impacts such as lost work time or disability. The rigorous MEPS data collection and interview methodology was explicitly designed to reduce the potential influence of non-recall or recall bias as a source of systematic error, though it is important to keep in mind the data collection and data encoding procedures employed in the MEPS. MEPS data are descriptions of health problems that are provided by the MEPS participants in response to prompts from MEPS field interviewers, and the narratives recorded by MEPS field interviewers are then interpreted and assigned by MEPS coders into specific ICD medical conditions and more general CCC coding categories. For those back pain cases that appear in only the MEPS Medical Conditions file but not the Utilization Events files, i.e. individuals with back pain who are not currently using *any* health services for their condition, it is unknown to what extent, for instance, a vague “self-diagnosed” report of a recurring “bad back” by a MEPS respondent, would be more likely coded in MEPS as CCC “205”, or coded as CCC “232”(sprain/strain), or perhaps some other code altogether. Similarly, MEPS respondents may, over time, receive varying diagnoses of their back problem from health care providers, which may also potentially impact the reporting, interpretation, and coding of specific medical conditions in MEPS. A robust data capture strategy such as I have demonstrated herein, using CCC “205” and the ICD codes for back and sacroiliac sprain/strain to identify back pain cases, yielded a broad inclusive representation of acute, chronic, and episodic recurrent back pain in MEPS.

The collection and encoding of prescription medication data in MEPS represents another potential source of systematic error, in that individuals may carryover unused pain medicine from an earlier back pain episode, or perhaps from a different medical condition entirely, in order to self-treat their current back pain episode (see Appendix Note#2 and Appendix

Note#3). It is unknown to what extent this might occur, or even to what extent it may occur in the other direction (i.e. individuals who may use or refill their back pain medications in order to self-treat other medical conditions for themselves or even for others). Such a behavior could also partly explain my finding that “episodes-of-pain” may not always correlate with “episodes-of-care”, in that individuals may self-medicate for a current episode-of-pain by using a prescription leftover from a prior back pain episode-of-care, by refilling a prescription from a different medical condition, or using an over-the-counter medication to self-treat their back pain.

I have proposed herein a categorical method for generically operationalizing the chronicity of back pain in large-scale population-based studies such as MEPS. Although not strictly calibrated as date-specific “episodes-of-care” or “episodes-of-pain”, the differentiated patterns of individual pain experiences and utilization that I described herein may serve useful for better quantifying and qualifying the costs and other impacts related to the experiences and utilization of individuals with back pain. Further research may advise whether this methodologic approach has additional potential utility for similar generic modeling of chronicity in medical conditions other than back pain, particularly for those chronic conditions that may similarly manifest in a recurrent episodic pattern.^{22,23} As well, further research on demographic subgroups may provide useful insights regarding the experience, utilization, and impacts of back pain or other chronic conditions on vulnerable populations and population subgroups of interest. In this study I focused my examination on the utilization and experiences of adults with back pain (see Appendix Note #5 for MEPS study data on children with back pain).

This population-based study contributes insight into better discerning the treated prevalence of back pain, and documents the existence of distinct patient-specific longitudinal patterning of pain experiences and utilization of health services within and across multiple ambulatory care settings. The episodes-of-care and episodes-of-pain proxies generated through a population-based methodologic approach such as demonstrated in this study, may also serve to inform further development and clarification of the presumptive clinical entities of acute, chronic, and recurrent episodic back pain, as these might be more comprehensively defined and applied within an evolving context of cross-disciplinary and integrative clinical practice, and coordinated health care delivery.

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APPENDIX: General data management considerations for examining back pain using MEPS longitudinal panel data

#1) All 5 Rounds

Each MEPS panel uses a 2-year longitudinal study design, with participants re-surveyed during each of 5 separate rounds throughout the 2-years. MEPS Panel 9 and onward includes in the dataset a composite variable “ALL5RNDS” which is explained in the MEPS data documentation as a variable to flag participants who were in-scope and had data for all 5 rounds of the panel. After confirming with MEPS staff that “ALL5RNDS” was a new variable not previously available and that MEPS did not plan to retrofit earlier MEPS datasets (Panels 1–8) to include the composite “ALL5RNDS” variable, I obtained from MEPS analysts the SAS programming code they used to create “ALL5RNDS” for Panel 9, translated SAS to SPSS, and verified my SPSS programming code on MEPS Panel 9 data. Approximately 94% of MEPS respondents in Panels 5-through-10 were in-scope and had data for all 5 rounds of the panel.

#2) Using “Event Rounds” vs. “Event Dates” in longitudinal MEPS Medical Conditions and Utilization Events files to map patterns of individual experiences with back pain over time

Medical Conditions file

Certain medical conditions, such as back pain, were designated by MEPS as “priority conditions” due to their prevalence, expense, or relevance to policy. For such “priority conditions” MEPS interviewers collected additional information to identify the date the condition began. However, this query was only asked when the condition was first mentioned, therefore only the first occurrence of back pain conditions can be assigned to a specific date using the Medical Conditions file. Since back pain is a “priority condition”, the data available in the Medical Conditions file does allow for each MEPS respondent with a back pain ICD-9 or CCC code to be classified into a Round-by-Round pattern using the Condition Round (CRND) variables. The CRND1-CRND5 variables in the Medical Conditions file identify every round in which that priority condition is reported as having “bothered” the person, or was associated with a disability day (missed work/school or day spent in bed), or was associated with a utilization event for that condition.

Utilization Events files

The event dates for MEPS Office-based (OB), OutPatient (OP), and ER visit events are recorded as 3 separate data fields for the “year”, “month”, and “day” of each event, and most OB, OP, and ER back pain events (over 85%) contain valid data in all three of these date fields (year, month, and day). Approximately 15% of back pain event dates contain valid “year” and “month” data, missing only the “day” field. I recaptured these missing event data by imputing “day=15” for the small number of OB, OP, or ER visit events that were missing only the day field. The MEPS prescription medication events (Rx), however, do not have an actual event date, but rather only have a “first ever” Rx date that indicates the first time a prescription medicine was ever taken by a MEPS respondent, even if the first time ever for that prescription preceded the timeframe for that MEPS longitudinal panel. Although each prescription refill during the panel timeframe is included in the MEPS data as a discrete Rx event, refills do not have any “EventDate” associated with the event. Although varying by panel, approximately 15% of Rx events for back pain have a “first ever Rx event date” that occurs within the panel timeframe, and approximately 5% of Rx events for back pain have a “first ever Rx event date” that precedes the panel timeframe. The remaining 80% of Rx back

pain events have no data for “first ever date” and are presumably refill Rx events, or original prescription events missing all data for the “first ever” event date. Therefore, most Rx events do not have a useable “EventDate”, either because the “first ever” original prescription date for the Rx event occurred prior to the start of that panel, or because the Rx event is a refill and therefore does not have an “event date”, or because crucial month and year date fields for a first original prescription Rx event are “missing” and therefore cannot be recaptured by imputing “day=15”. However, each and every reported Rx event that occurs during the timeframe of the panel (original prescriptions for back pain, as well as each subsequent refill Rx event for that same prescription medicine), does have an “EventRound” associated with the Rx event, that identifies the MEPS data collection round during which a MEPS respondent reported purchasing a prescription medication for back pain. This feature of MEPS data collection then allows for every reported Rx event to be assigned to one of the 5 MEPS data-collection rounds.

When using MEPS longitudinal panel data to measure health service use and to map patterns of utilization for back pain, there are two important reasons to also include and consider Rx data. First, as demonstrated in Appendix Table 1 (below), there are a substantial number of MEPS respondents who report *only* Rx events for their back pain, i.e. they have *no* office-based, outpatient, or ER visits for back pain. If one does not explicitly identify and include those MEPS respondents who report *only* Rx events for back pain, then one would underestimate (by about 8%) the overall size of the cohort of MEPS respondents who report using ambulatory health services for back pain during the 2-year longitudinal panel timeframe. Second, the inclusion of Rx data is necessary in order to correctly map 2-year patterns of health services utilization for MEPS respondents with back pain. When Rx data is included, approximately 15% of MEPS respondents will “switch” and be reclassified as having a round-by-round pattern with a greater number of “active” rounds with back pain events, compared to their round pattern if only their non-Rx events were included. Appendix Table 2 (below) demonstrates how the inclusion of Rx events redistributes individuals with back pain across the 6-category approximated episodes-of-care schema, pooling across all of the MEPS panels 10-through-5. When Rx events are included, approximately 10% of “single limited episode” MEPS respondents (categories A1, A2) are reclassified as having longer or recurrent pattern of episodes. Similarly, 10–20% of those with a “single prolonged episode” (two contiguous rounds, categories B1, B2), would be reclassified as having a longer or recurrent episode pattern when their Rx events are included. Not including Rx events would therefore introduce systematic bias into estimates of ambulatory back pain utilization or corollary estimates (e.g. costs) based on analyses of MEPS longitudinal panel survey data.

The patterns of health service utilization events for back pain events may also be mapped out month-by-month based on specific event dates, as laid out in Appendix Table 3 (below). As noted, such patterns of back pain utilization should be interpreted more cautiously, since they are devoid of Rx events and therefore underestimate and misspecify back pain utilization to some extent. Nonetheless, the overall data distributions are somewhat consistent when comparing the round-by-round patterns to the month-by-month patterns, in that the percentage of individuals with a single “active” back pain utilization round is also generally consistent with the percentage of individuals with 3 months or less time lapsed between their first and last back pain visit event. Reported in Appendix Table 3, approximately 56% of MEPS respondents (pooled across Panels 5-through-10) incurred all of their non-Rx back pain visits within 3 months or less.

#3) Detailed sidenote on other minor data cleaning of back pain events and cases used in the final dataset for this study

As noted in the manuscript, for this study I used the MEPS Appendix Link file to identify and remove from my working datasets those prescription medicine (Rx) back pain events that were specifically associated with an inpatient back pain utilization event. As well, the MEPS Appendix Link file allowed me to identify and remove from my working dataset a very small number of Rx back pain events that were associated with a dental prescription medication purchase, which could represent either a “mis-code”, or perhaps more likely a MEPS respondent who reported purchasing a refill of a pain medicine that had been prescribed by their dentist for a dental problem, in order to self-treat their back pain. As well, I identified and removed from my final working dataset a very small number of cases (n=65) who had a discrepancy in their records, in that they were identified in the Medical Conditions file as having one or more back pain utilization events (Rx, OB, OP, ER, Inpatient, or Home Health) yet these cases did not have a corresponding back pain event recorded in the Utilization Events files.

#4) Use caution when pooling across MEPS Panels

Caution 1

I identified in my final back pain datasets pooled across MEPS Panels 5-through-10, a very small number of cases that inadvertently shared the same case record identifying number, i.e. the variable DUPERSID had the exact same value in different panels. I confirmed with MEPS that these cases were in fact separate individuals (and not the same individual sampled twice in separate panels). Excerpted here for the reader are the explanation and recommendation from MEPS: “The variable DUPERSID is the combination of the variables DUID and PID. The definitions of Dwelling Units (DUs) in the MEPS Household Survey are generally consistent with the definitions employed for the National Health Interview Survey (NHIS). The Dwelling Unit ID (DUID) is a five-digit random ID number assigned after the case was sampled for MEPS. A person number (PID) uniquely identifies each person within the DU. We (MEPS Staff) have found a few duplicate DUPERSID codes over the years, but it was from different panels and it does not represent the same individual. The DUPERSID uniquely identifies each person within a given panel/year. For example, the DUPERSID “50321018” you have identified represents the same person from HC61 (2001) and HC69 (2002) in panel 6 but a different person from HC97 (2005) in panel 9. It is recommended that you use a combination of panel/year and dupersid to uniquely identify a person when pooling multiple years/panels of data.”

Caution 2

A separate issue worth mentioning here as a caution to analysts pooling across MEPS Panels, is that certain variables may be inconsistently coded across panels. For instance, the MEPS race variable “RACEX” was recoded between years 2001 and 2002. For years 2001 and prior, the value of “1” for the RACEX variable was defined as “white”. For years 2002 and after, the RACEX variable was recoded and redefined so that the value “5” was defined as “white – no other race recorded”.

Caution 3

Analysts who use the STATA statistical software package should keep in mind that the DUPERSID variable in MEPS is 8-digits long, that STATA by default will store 8-digit or longer numeric variables as data type “float”, and that STATA data type float loses precision above 7 digits. That is, an 8-digit DUPERSID variable in MEPS may be “rounded” by

STATA to 7-digits, which will create non-unique identifiers for MEPS respondents. The two fixes for this potential problem, setting the DUPERSID data type as “double” or as data type “string”, are described at the website: (http://www.cpc.unc.edu/research/tools/data_analysis/statatutorial/misc/precision)

#5) Children with Back Pain

Pooled across MEPS Panels 5-through-10, of the sampled MEPS population who were in scope with data in all 5 rounds (N=87,302), 30% were children aged 17 or younger (n=26,076). Of my total pooled back pain cohort (N=10,753), 95% were adults and only 5% (n=560) were children younger than 18 at start of panel timeframe. Of the 560 children with back pain, 186 (33%) reported having a disability day due to back pain (missed work/school or in bed), 440 (79%) utilized ambulatory health services (Office-Based, OutPatient, ER, Rx) for their back pain during the 2-year MEPS panel timeframe, and only 5 reported any inpatient hospitalization for back pain.

Appendix Table 1

MEPS respondents with Back Pain events in any Office-based (OB), OutPatient (OP), ER, and Prescription medication (Rx) event files.

Panel	OB+OP+ER+Rx ^a		Only OB+OP+ER	
	Respondents	Events	Respondents	Events
10	1,470	19,379	1,357	12,733
9	1,538	19,707	1,429	12,915
8	1,485	19,064	1,372	12,993
7	1,406	17,136	1,274	11,726
6	1,897	21,537	1,746	14,997
5	888	10,430	814	7,273
Pooled across Panels 5–10:	8,684^b	107,253	7,992	72,637

Note: Back Pain events defined as ICD-9 code 846 (sacroiliac sprain/strain), ICD-9 code 847 (other back sprain/strain), or CCC code 205 (spondylosis, intervertebral disc disorders, other back problems).

^aExcludes Rx associated with Inpatient hospitalizations for back pain.

^bIncludes both adults (n=8,244) and children (n=440) who used ambulatory health services for back pain, with adult defined as age 18 or older at start of 2-year panel timeframe.

Appendix Table 2

Inclusion of Rx Utilization Events Redistributes Back Pain Episodes-of-Care groups.

<u>Only Office-Based, OutPatient, and ER visit events. Does NOT include their Rx events.</u>		<u>Office-based, Outpatient, and ER visit events and includes their Rx events</u>					
		<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>C</u>	<u>D</u>
<u>A1) Single BP Period - Uncensored</u> Patterns: OOOXO, OOXOO, OXOOO	(n = 3154)	89%		3%	2%	3%	3%
<u>A2) Single BP Period – Censored</u> Patterns: OOOOX, XOOOO	(n = 1596)		89%		3%	2%	6%
<u>B1) Two contiguous BP Periods - Uncensored</u> Patterns: OXXOO, OXXO	(n = 521)			82%		16%	3%
<u>B2) Two contiguous BP Periods - Censored</u>	(n = 611)				88%	7%	5%

<u>Only Office-Based, OutPatient, and ER visit events, Does NOT include their Rx events.</u>	<u>Office-based, Outpatient, and ER visit events and includes their Rx events</u>					
	<u>A1</u>	<u>A2</u>	<u>B1</u>	<u>B2</u>	<u>C</u>	<u>D</u>
Patterns: XXOOO, OOOXX						
C) Three or more contiguous BP Periods (n = 1066) Patterns: OOOXX, OXXXO, XXXOO, OXXXX, XXXXO, XXXXX					98%	2%
D) Multiple, recurrent BP Periods (n = 1049) Patterns: OOXOX, OXOOX, OXOXO, OXOXX, OXXOX, XOOOX, XOOXO, XOOXX, XOXOO, XOXOX, XOXOX, XOXXX, XXOOX, XXOXO, XXOXX, XXXOX.					16%	84%
TOTAL of BackPain cases pooled across MEPS Panels 10-through-5 Ambulatory Utilization Events files (N = 7,992^a)						

Note: Table 5 demonstrates how the inclusion of Rx events redistributes individuals with back pain across the 6-category episodes-of-care schema, pooling across all of the MEPS panels 10-through-5. Reading Row 1 as example, when considering only their office-based, outpatient, and ER events, 3,154 of MEPS respondents in Panels 10-through-5 are classified as A1 (single back pain round, uncensored). When their Rx events are also included, approximately 89% remain classified as A1, whereas 11% of A1 “single episode” MEPS respondents are reclassified as having longer (B,C) or recurrent (D) episodes-of-care pattern.

^aFor purpose of constructing this demonstration table, N=7,992 are those MEPS respondents who have Rx back pain events *in addition to* Office-based, Outpatient, or ER events (Pooled across MEPS Panels 10-through-5, approximately 692 individuals have *only* Rx back pain events *but no other* utilization events and therefore they are not represented in this particular table).

Appendix Table 3

Time lapsed between an individual’s first Back Pain visit event and their last Back Pain visit event during the 2-year MEPS longitudinal panel timeframe, based on all Back Pain office-based visits, outpatient visits, or ER visits (but NOT including Rx events). Data are pooled across all MEPS Panels 10-through-5 (N = 7,985^a).

<u>N</u>		<u>1-day</u>	<u>1-mo</u>	<u>2-mo</u>	<u>3mo</u>	<u>4mo</u>	<u>5mo</u>	<u>6mo</u>	<u>7mo</u>	<u>8mo</u>	<u>9mo</u>	<u>10m</u>	<u>11m</u>	<u>12m</u>	<u>>12 months</u>
7,985	(n)	2399	1113	569	401	357	278	213	181	181	144	139	140	194	1678
	(%)	30%	14%	7%	5%	4.5%	3.5%	2.7%	2.3%	2.3%	1.8%	1.7%	1.8%	2.4%	21%

Note: As example to read the table above: For n=2,399 individuals (30%) in MEPS, all of their Back Pain visit events during the 2-years data collection window clustered onto a single date; For n=1,113 individuals (14%), all of their Back Pain events from their first event to their final event cluster into a period ranging from 2-days to 30-days (1-month); etc.

^an=7 MEPS respondents are missing crucial “Event Date” fields (month, year), therefore are not represented in this table.

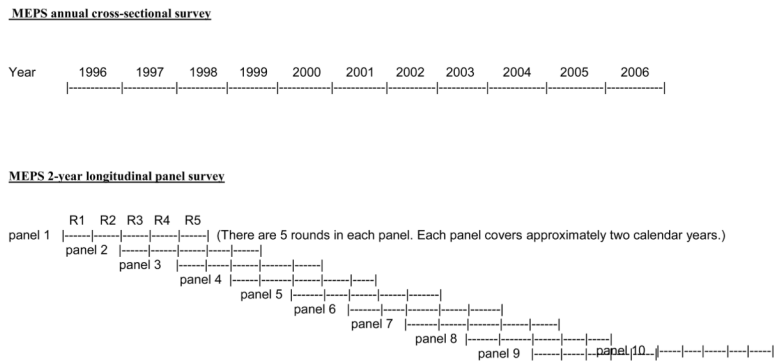


Figure 1. Medical Expenditures Panel Survey (MEPS) is 2 separate yet related study designs, an annual cross-sectional survey coupled with a 2-year longitudinal panel survey
 Note: MEPS Longitudinal Panel 10 covers the 2-years 2005 and 2006; Panel 9 is years 2004 and 2005; Panel 8 is years 2003 and 2004, etc.

MEPS respondents who were in-scope and had data for all 5 data collection rounds of the panel, for each 2-year longitudinal panel 10-through-5.

Table 1

Panel	ALL MEPS respondents	All 5 Rounds	Adults^a	Males^a	White^a
10	15,177	14,186	9,964	6,659	10,698
9	15,631	14,630	10,219	6,858	11,352
8	15,774	14,800	10,344	6,892	11,387
7	15,732	14,784	10,081	6,891	11,432
6	20,578	19,385	13,821	9,190	15,629
5	10,129	9,517	6,797	4,502	7,758
Pooled across Panels 5-10:	93,021	87,302	61,226 (70%)	40,992 (46%)	68,256 (78%)

^a Demographics (adults, sex, race) reported for MEPS respondents in All 5 Rounds. Adult defined as age 18 or older at start of 2-year panel timeframe. White defined in MEPS Years 2002 and after as "White - no other race reported"; White defined in MEPS Years 2001 and earlier as "White".

Table 2

Adult MEPS respondents with ambulatory back pain utilization events in Office-based (OB), OutPatient (OP), ER, and Prescription medication (Rx^a) event files, i.e. “Users” of back pain services (N=8,244).

Panel	Respondents	Events	Events only CCC “205”	Events only ICD 846,847	Events coded with both CCC “205” and ICD 846,847
10	1,404	19,003	17,596	1,363	44
9	1,469	19,445	17,602	1,655	188
8	1,406	18,659	16,908	1,675	76
7	1,336	16,858	15,282	1,434	142
6	1,799	21,093	18,665	2,183	245
5	830	10,135	8,806	1,213	116
Pooled across Panels 5–10:	N=8,244	105,193	94,859 (90.2%)	9,523 (9%)	811 (0.8%)

Note: Back Pain events defined as ICD-9 code 846 (sacroiliac sprain/strain), ICD-9 code 847 (other back sprain/strain), or CCC code 205 (spondylosis, intervertebral disc disorders, other back problems). Reading row one as example, of the 19,003 back pain utilization events identified in Panel 10, 17,596 of these events were coded as CCC “205”, 1,363 of these events were coded ICD 846 or 847, and 44 were coded CCC “205” and ICD 846,847.

^aExcludes Rx associated with Inpatient hospitalizations for back pain.

Table 3a

Approximating Episodes-of-Care for “Users” of back pain services (N=8,244).

	Frequency	Percent
OOOOX	809	9.8
OOOXO	1025	12.4
OOOXX	371	4.5
OOXOO	878	10.7
OOXOX	117	1.4
OOXXO	266	3.2
OOXXX	219	2.7
OXOOO	921	11.2
OXOOX	91	1.1
OXOXO	136	1.6
OXOXX	88	1.1
OXXOO	250	3.0
OXXXO	63	.8
OXXXX	170	2.1
XOOOX	248	3.0
XOOXO	717	8.7
XOOXX	60	.7
XOXOO	82	1.0
XOXOX	40	.5
XOXOX	87	1.1
XOXOX	27	.3
XOXOX	48	.6
XOXXX	92	1.1
XXOOO	302	3.7
XXOOX	60	.7
XXOXO	66	.8
XXOXX	73	.9
XXXOO	151	1.8

	Frequency	Percent
XXXXX	80	1.0
XXXXX	145	1.8
XXXXXX	562	6.8
Total	8244	100.0

Note: "X" indicates a MEPS Round "active" for Back Pain utilization, "O" indicates a Round "inactive" for Back Pain Utilization. Reading the first row as example, n=809 adult MEPS respondents utilized NO Back Pain services (i.e. "inactive") in Rounds 1-4 with only Round 5 being "active" for Back Pain utilization, hence their temporally-ordered Round-By-Round Pattern reads "OOOOX".

This table is based on data from the MEPS Utilization Events files to map temporal utilization of ambulatory health services for back pain across All-5-Rounds of MEPS 2-year longitudinal panel. Tabled Data are for adults, pooled across MEPS Panels 5-through-10 (N=8,244).

Table 3b

Six categories of similar patterns of approximated Back Pain Episodes-of-Care groups for “Users” of back pain services (N = 8,244)

	CCC “205”	ICD “846”, “847”	Both
A1) Single BP Period - Uncensored <i>One “active” round preceded and followed by “inactive” rounds</i> Round-by-Round Patterns: OOOXO, OOXOO, OXOOO	n = 2,824 80.4%	19.2%	.4%
A2) Single BP Period – Censored <i>One “active” round bounded on one side by sample frame and bounded on other side by “inactive” rounds</i> Round-by-Round Patterns: OOOOX, XOOOO	n = 1,526 83.9%	15.8%	.3%
B1) Two contiguous BP Periods - Uncensored <i>Two “active” rounds preceded and followed by “inactive” round</i> Round-by-Round Patterns: OXXOO, OOXOX	n = 516 86.0%	9.5%	4.5%
B2) Two contiguous BP Periods - Censored <i>Two “active” rounds bounded on one side by sample frame and bounded on other side by “inactive” rounds</i> Round-by-Round Patterns: XXOOO, OOOXX	n = 673 88.3%	8.3%	3.4%
C) Three or more contiguous BP Periods Round-by-Round Patterns: OOOXX, OXXXX, OXXXX, XXXOO, OXXXX, XXXXX, XXXXX	n = 1,495 92.8%	3.3%	3.9%
D) Multiple, recurrent BP Periods <i>Two or more “active” rounds interspersed with “inactive” rounds</i> Round Patterns: OOXOX, OXOOX, OXOXO, OXOXO, OXOXO, OXOXO, OXOXO, OXOXO, XOXOX, XOXOX, XOXOX, XOXOX, XOXOX, XOXOX, XXXOX, XXXOX, XXXOX, XXXOX, XXXOX, XXXOX	n = 1,210 88.4%	6.3%	5.3%

Note: Reading Row one as example, of the 2,824 individuals in category (A1), 80.4% were identified with only the chronic back pain CCC code “205” in all of their ambulatory events in the MEPS Utilization Events files, 19.2% were identified with only the acute back pain ICD “846” or “847” codes for all of their events, and less than 1% were identified as having *both* types of events (some of their events coded as CCC “205” and some of their events coded as ICD “846”, “847”).

This table constructs 6 categories of similar patterns of approximated Back Pain Episodes-of-Care groups, for adult Back Pain cases identified in MEPS Panels 5-through-10 Ambulatory Utilization Events files, Office-Based, Outpatient, ER, and Rx (N = 8,244).

Table 3c

Ambulatory Utilization for “Users” of back pain services (N = 8,244)

	<u>OB only</u>	<u>OP only</u>	<u>ER only</u>	<u>Rx only</u>	<u>COMB</u>
A1) Single BP Period - Uncensored <i>One “active” round preceded and followed by “inactive” rounds</i> Round-by-Round Patterns: OOOXO, OOXOO, OXOOO	n = 2,824 44.8 %	1.3 %	2.5 %	9%	42.3%
A2) Single BP Period – Censored <i>One “active” round bounded on one side by sample frame and bounded on other side by “inactive” rounds</i> Round-by-Round Patterns: OOOOX, XOOOO	n = 1,526 44.9 %	1.6 %	1.9 %	1.4%	37.6%
B1) Two contiguous BP Periods - Uncensored <i>Two “active” rounds preceded and followed by “inactive” round</i> Round-by-Round Patterns: OXXOO, OOXOX	n = 516 30.2 %	.6 %	.2 %	5.4%	63.6%
B2) Two contiguous BP Periods - Censored <i>Two “active” rounds bounded on one side by sample frame and bounded on other side by “inactive” rounds</i> Round-by-Round Patterns: XXOOO, OOOXX	n = 673 36.1 %	0 %	0 %	6.2%	57.7%
C) Three or more contiguous BP Periods <i>Two or more “active” rounds interspersed with “inactive” rounds</i> Round Patterns: OOOXX, OXOOX, OXOXO, OXOOX, OXXOX, XOOOX, XOOOX, XOXOX, XOXOX, XOXOX Round-by-Round Patterns: OOOXXX, OXXXX, XXXOO, OXXXX, XXXXX, XXXXX, XXXXX	n = 1,495 23.3 %	.1 %	0 %	4.2%	72.4%
D) Multiple, recurrent BP Periods <i>Two or more “active” rounds interspersed with “inactive” rounds</i> Round Patterns: OOXOX, OXOOX, OXOXO, OXOOX, OXXOX, OXXOX, XXOXO, XXOXO, XXXOX, XXXOX Round-by-Round Patterns: XXOOX, XXOXO, XXOXO, XXOXO	n = 1,210 29.2 %	0 %	.1 %	6.8%	64%

Note: Reading Row one as example, of the 2,824 individuals in category (A1), 44.8% were identified with back pain events in only the Office-Based (OB) setting, 1.3% were identified with back pain events in only Outpatient (OP), 2.5% were identified with back pain events in only ER, 9% were identified with only back pain Rx events, and 42.3% were identified with back pain events in more than one, i.e. some combination of OB, OP, ER, and/or Rx back pain events. This table represents adult back pain cases identified in MEPS Panels 5-through-10 Ambulatory Utilization Events files, Office-Based (OB), Outpatient (OP), ER, and Rx, by categories of approximated back pain episodes-of-care groups (N = 8,244).

Table 4a

Approximating Episodes-of-Pain for “Users” (N=8,244) and “Non-Users” (N=1,949) of back pain services.

“Users” ^a Round-by-Round Pattern	Frequency	Percent	“Non-Users” ^b Round-by-Round Pattern	Frequency	Percent
OOOOX	674	8.2	OOOOX	187	9.6
OOOXO	822	10.0	OOOXO	246	12.6
OOOXX	468	5.7	OOOXX	53	2.7
OOXOO	674	8.2	OOXOO	247	12.7
OOXOX	121	1.5	OOXOX	19	1.0
OOXXO	254	3.1	OOXXO	35	1.8
OOXXX	294	3.6	OOXXX	20	1.0
OXOOO	683	8.3	OXOOO	305	15.6
OXOOX	82	1.0	OXOOX	13	.7
OXOXO	120	1.5	OXOXO	20	1.0
OXOXX	97	1.2	OXOXX	12	.6
OXXOO	256	3.1	OXXOO	62	3.2
OXXOX	85	1.0	OXXOX	7	.4
OXXXX	155	1.9	OXXXX	12	.6
XO000	356	4.3	OXXXX	15	.8
XO00X	513	6.2	XO000	402	20.6
XO0XO	64	.8	XO00X	24	1.2
XO0XX	83	1.0	XO0XO	15	.8
XOXOO	57	.7	XO0XX	4	.2
XOXOX	108	1.3	XOXOO	43	2.2
XOXXO	28	.3	XOXOX	3	.2
XOXXX	65	.8	XOXXO	6	.3
XX000	110	1.3	XOXXX	8	.4
XX00X	340	4.1	XX000	74	3.8
XXOXO	60	.7	XX00X	9	.5
XXOXX	76	.9	XXOXO	8	.4
XXXOO	105	1.3	XXOXX	9	.5
	207	2.5	XXXOO	47	2.4

“Users” ^a Round-by-Round Pattern	Frequency	Percent	“Non-Users” ^b Round-by-Round Pattern	Frequency	Percent
XXXXX	101	1.2	XXXXOX	5	.3
XXXXXO	208	2.5	XXXXXO	13	.7
XXXXXX	978	11.9	XXXXXX	26	1.3
Total	8244	100.0	Total	1949	100.0

Note: “X” indicates a Round “active” for Back Pain occurrence, “O” indicates a Round “inactive” for Back Pain occurrence.

^aUsers” (n = 8,244) are adult MEPS respondents with back pain identified in *both* the Medical Conditions file *and* the Utilization Event files.

^bNon-Users” (n = 1,949) are adult MEPS respondents with back pain identified in *only* the Medical Conditions file but *not* the Utilization Events files, i.e. individuals who did not use any services for their back pain during the MEPS 2-year panel timeframe. This table approximates Episodes-of-Pain, using MEPS Medical Conditions file to map temporal occurrence of back pain across All-5-Rounds of 2-year longitudinal panel. Tabled Data are for adults, pooled across MEPS Panels 5-through-10 (N=10,193).

Table 5

Correspondence between Back Pain Episodes-of-Care and Episodes-of-Pain for “Users” of back pain services (N = 8,,244^a)

<u>Back Pain episodes based solely on Utilization(Back Pain Episodes-of-Care)</u>	<u>Back Pain episodes based on Utilization, or “being bothered” by back pain, or Disability Days due to back pain (Episodes-of-Pain).</u>			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
<u>A) Single Limited BP Episode</u>	(n = 4,350)	9%	4%	9%
<u>B) Single Prolonged BP Episode</u>	(n = 1,189)	75%	18%	7%
<u>C) Longterm Continuous Back Pain</u>	(n = 1,495)		99%	1%
<u>D) Multiple, recurrent BP Episodes</u>	(n = 1,210)		26%	74%

Note: Reading Row 1 as example, 4,350 of adult MEPS respondents are initially classified as having a single limited back pain episode based only on their MEPS Utilization “Episodes-of-Care” pattern (Category A1 or A2). When information about their Utilization is augmented with their self report of “being bothered” by back pain or having disability day due to back pain, 78% of individuals remain classified as a single limited Episode-of-Pain, whereas 22% are reclassified as having a longer back pain episode (Category B,C) or having recurrent back pain episodes (Category D).

^aFor purpose of constructing this table, N = 8,244 are those adults who are identified in the MEPS Ambulatory Utilization Events files *and* in the MEPS Medical Conditions file as having back pain utilization events, i.e. “Users” of back pain services. (Approximately 1,949 adults self-report “being bothered” by back pain or having disability day due to back pain, but use *NO* health services for their back pain and therefore they are “Non-Users” and are not represented in this particular table).

Table 6
Do Episodes-of-Pain Without Utilization Occur Before or After Episodes-of-Pain with Utilization?

Episode-of-Care Category (N=8,244)	% Change RndXXRnd	n = those who do change pattern	Pattern 1 (n), %	Pattern 2 (n), %	Pattern 3 (n), %	Pattern 4 (n), %	Pattern 5 (n), %
A) Single limited episode (n=4,350)	23% (984/2824)	984	(555), 56%	(316), 32%	(113), 12%		
B) Single prolonged episode (n=1,189)	25%	296	(177), 60%	(88), 30%	(31), 10%		
C) Longterm Continuous (n=1,495)	18%	266	(144), 54%	(111), 42%	(11), 4%		
D) Multiple Recurrent episodes (n=1,210)	43%	525	(88), 17%	(74), 14%	(4), 1%	(322), 61%	(37), 7%

Direction of Change of Round-by-Round Pattern (P1 is Pattern 1, P2 is Pattern 2, etc)

P1) Back Pain Utilization Round-by-Round Pattern plus Back Pain Experience Round-by-Round Pattern adds Non-Utilization Experience Rounds **subsequent** to Utilization Rounds (e.g. Utilization(U) Pattern XXXOO + Pain(P) Pattern XXXOO => Both(U+P) Pattern XXXOO)

P2) Utilization plus Experience adds Non-Utilization Rounds **prior** to Utilization Rounds (e.g. Utilization (U) Pattern OOOOX + Pain (P) Pattern OOOXX => Both (U+P) Pattern OOOXX)

P3) Utilization plus Experience adds Non-Utilization Rounds **BOTH subsequent and prior** to Utilization Rounds (e.g. OOXOO + XOXOX => XOXOX)

P4) Utilization plus Experience adds Non-Utilization Rounds that **“Fill-In”** between Utilization Rounds (e.g. XOXOX + XXXOX => XXXOX)

P5) Utilization plus Experience does **NOT** add Non-Utilization rounds, but just **OVERLAYS** existing rounds (e.g. XXXOO + XXXOO => XXXOO)

Note: Reading Row one as example, 4,350 adult MEPS respondents were initially categorized as having a single limited back pain episode based only on their Utilization Events Round-by-Round pattern, and 645 of these (23%) changed their Round-by-Round pattern when their Utilization back pain rounds were supplemented with their Non-Utilization back pain rounds. Of the 984 with a changed pattern, 56% experienced additional Non-Utilization rounds following their Utilization rounds (Change Pattern 1), 32% experienced additional Non-Utilization rounds preceding their Utilization rounds (Change Pattern 2), and 12% experienced additional Non-Utilization both before and after their Utilization rounds (Change Pattern 3). This table demonstrates how adding Back Pain Experience Rounds (from the Medical Condition file) to the Utilization Back Pain Rounds (from the Utilization Events files) changes the final overall Round-by-Round pattern for adult Back Pain (Utilization plus Non-Utilization).