Prevalence of Healthcare Conditions and Services Used by Patients with Myotonic Dystrophy (DM) Pre– and Post–Diagnosis: a Real–World Data Analysis

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Objectives

Describe the changes in outcomes (healthcare conditions, services, costs, and care days) for patients with DM compared with matched controls (MCs) 2 years post-diagnosis versus 2 years pre-diagnosis

Background

- DM is a rare, dominantly inherited, monogenic, multisystem disease that causes myotonia, progressive muscle weakness, and atrophy, along with respiratory, gastrointestinal, cardiac, and central nervous systems dysfunction, which significantly impacts quality of life[1-3]
- There are two major types of DM (type 1 and type 2)[1]
- Patients experience significant physical limitations, pain, fatigue, and a negative impact on wellbeing[4,5]
- Currently there is no cure or targeted treatment for DM[3]
- Real-world data characterizing the patients' pre- and post-diagnosis changes are limited

Methods

- Retrospective database analysis to compare outcomes for patients with DM versus MCs
  - Database: IQVIA US PharMetrics® Plus
  - Timeframe: January 2010 through March 2021
- The DM cohort is identified as having ≥2 DM claims ≥30 days apart
  - Claims identified by International Classification of Disease Ninth Revision (ICD-9) code 359.21 or Tenth Revision (ICD-10) code G71.11, which does not differentiate between DM subtypes
- The first diagnosis date was used for the index date
- DM patients were matched to a 5% random sample of eligible non-DM controls
  - Matching was done using R's Matchit procedure, with nearest neighbor matching (exact matching on month of index date)
- Cohorts were matched (5-MC:1-DM) on index month and baseline age, region, gender, plan, and payer types
- All subjects (patients and MCs) were required to have a minimum of 48 months of continuous data:
  - 24 months prior to their index date
  - 24 months following ("post") their index date (includes the index date)
    - The index date was the beginning of the post-index evaluation period
- Changes in outcomes were measured as 2 years post-diagnosis minus 2 years pre-diagnosis using:
  - Location of care data for overall care
  - 283 US Agency for Healthcare Research and Quality (AHRQ) condition categories
- Post-pre changes were compared within cohorts (using McNemar tests) and between cohorts (using *t*-tests)
- All presented comparisons were significant ($p<0.05$) unless noted
- Based on the 283 comparisons, those *p*-values <0.000177 (0.05/283) are considered highly significant

Results

We identified 519 DM patients and 2,595 MCs

- Descriptive characteristics were similar between cohorts (Table 1)
- The cohorts had significant ($p<0.0001$) differences for the Charlson Comorbidity Index (Table 2)
- The cohorts had changes (Post-Pre) in costs and days of service by location of care (Table 3)
- DM patients':
  - AHRQ prevalence changed significantly in 58 categories (↑57 ↓1, Figure 1)
  - Costs changed significantly in 7 AHRQ categories (↑6 ↓1, Figure 2)
  - Number of services per person per year changed significantly in 21 AHRQ categories (↑20 ↓1, Figure 3)

Table 1: Age, US Region, Insurance, and Payer Types Were Similar Between DM Patients and MCs

Descriptive Characteristics	DM Patients (N=519)
Gender, % Female	47.6%
Age, mean years (SD)	43.8 (18.0)
Age, years	
<18	11.0%
≥18 to <35	17.3%
≥35 to <45	18.9%
≥45 to <55	21.8%
≥55 to <65	22.2%
≥65	8.9%
US Region	
South	30.1%
Midwest	26.8%
Northeast	22.7%
West	18.1%
Unknown	2.3%
Insurance Type	
Preferred Provider Organization	69.9%
Health Maintenance Organization	20.8%
Point-of-Service Plan	4.0%
Consumer-Directed Health Care	2.1%
Indemnity/Traditional Plan	1.3%
Unknown Plan	1.7%
Payer Type	
Commercial	60.9%
Self-Insured	22.7%
Medicaid	6.2%
Medicare Advantage	4.2%
Medicare Supplemental	4.6%
Unknown Line of Business	1.3%

There were no significant differences between DM patients and MCs $p>0.05$

Table 2: Before and After Diagnosis, Charlson Comorbidity Index Scores Were Higher for DM Patients Versus MCs

Descriptive Characteristics	DM Patients (N=519)	Matched Non-DM Patients (N=2,595)
Pre-index (before diagnosis)		
Mean (SD) score	1.08 (1.83)	0.57 (1.30)
Percent with values >1, %*	24.3%	13.0%
Post-index (after diagnosis)		
Mean (SD) score	1.58 (2.27)	0.71 (1.63)
Percent with values >1, %*	33.5%	14.8%

*All comparisons highly significant $p<0.0001$

Abbreviations:
AHRQ, US Agency for Healthcare Research and Quality; DM, myotonic dystrophy; MC, matched control; PMPY, per member per year; SD, standard deviation.

References:
[1]Udd B and Krahe R. *Lancet Neurol.* 2012;11(10):891–905.
[2]Gourdon G and Meola G. *Front Cell Neurosci.* 2017;11:101.
[3]LoRusso S, et al. *Neurotherapeutics.* 2018;15(4):872–84.
[4]Hagerman KA, et al. *Muscle Nerve.* 2019;59(4):457–64.
[5]Landfeldt E, et al. *J Neurol.* 2019;266(4):998–1006.

Conclusions

- Healthcare utilization increased significantly in DM patients following diagnosis and was higher both overall and in different AHRQ categories than in MCs
  - This likely reflects the need to investigate and manage previously unsuspected manifestations of DM following formal diagnosis
- Future research should confirm if these findings hold true in longer-term follow-up
- These data highlight the many unmet needs for DM patients, including higher costs, more days of care, more prevalent and costly comorbidity management and the need for therapeutic interventions
- Based on the high unmet need, Avidity Biosciences is investigating AOC 1001 for the potential treatment of myotonic dystrophy type 1

Table 3: Costs and Number of Days of Service (Before, After, and Changes [Post minus Pre]) Were Higher for DM Patients for "Emergency Department", "Inpatient" and "All Locations of Care"

	Cost (PMPY)			Days of Service (PMPY)		
Location of Care	**DM Patients (SD)**	**MCs (SD)**	**Difference**	**DM Patients (SD)**	**MCs (SD)**	**Difference**
Post-diagnosis						
Emergency Department	$558 ($2,017)	$208 ($1,057)	$350*	0.59 (1.66)	0.22 (0.61)	0.37*
Inpatient	$8,242 ($36,117)	$1,482 ($8,460)	$6,760*	2.65 (10.56)	0.41 (2.64)	2.24*
All Medical Locations of Care^	$21,130 ($56,447)	$5,182 ($14,272)	$15,949*	26.03 (27.06)	9.80 (13.59)	16.24*
All Medical and Drug	$25,594 ($59,365)	$6,684 ($16,709)	$18,910*	39.80 (35.41)	17.48 (20.30)	22.32*
Pre-diagnosis						
Emergency Department	$449 ($1,623)	$211 ($1,242)	$238#	0.42 (1.25)	0.22 (0.76)	0.20#
Inpatient	$6,965 ($39,174)	$1,023 ($6,192)	$5,942*	1.60 (8.65)	0.37 (3.27)	1.23#
All Medical Locations of Care^	$15,534 ($47,773)	$4,276 ($11,264)	$11,257*	18.40 (23.73)	8.88 (12.21)	9.52*
All Medical and Drug	$18,705 ($51,537)	$5,640 ($13,277)	$13,065*	29.87 (30.87)	16.03 (18.85)	13.84*
Change (Post-Pre)	**Change (Post-Pre) in DM Costs (SD)**	**Change (Post-Pre) in MCs Cost (SD)**	**Difference of Cost Change**	**Change in Days of Service for DM Patients (SD)**	**Change in Days of Service for MCs (SD)**	**Difference of Days of Service Change**
Emergency Department	$108 ($1,856)	-$4 ($1,075)	$112	0.17 (1.39)‡	0.00 (0.67)	0.17#
Inpatient	$1,277 ($50,185)	$459 ($9,331)§	$818	1.05 (8.71)‡	0.04 (3.12)	1.01#
All Medical Locations of Care^	$5,597 ($67,294)	$905 ($13,991)‡	$4,691	7.63 (20.88)†	0.92 (11.15)†	6.71*
All Medical and Pharmacy	$6,889 ($69,332)§	$1,044 ($14,926)‡	$5,845	9.93 (22.31)†	1.45 (12.58)†	8.48*

Change=Post- minus Pre-Diagnosis. ^Emergency Department , Inpatient, Laboratory, Office, "Other", Outpatient, and Pharmacy
Between Cohorts: *$p<0.0001$; #$p<0.01$ Within Cohorts: †$p<0.0001$; ‡$p<0.01$; §$p<0.05$

Figure 1: DM Patients Had Higher Increases in Prevalence For AHRQ Categories of "Other Nervous System Disorders," "Cardiac Dysrhythmias," and "Other Lower Respiratory Disease" Versus MCs

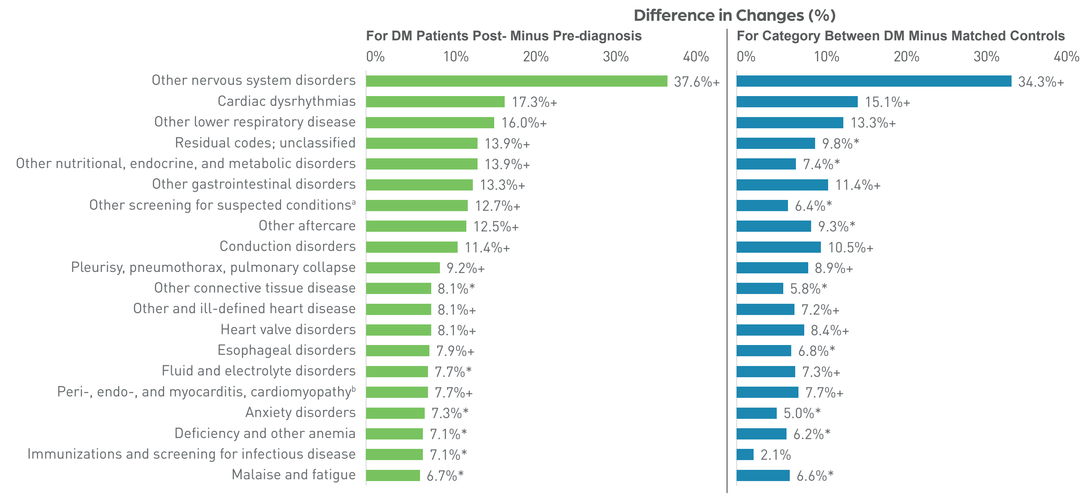


Figure 2: DM Patients Had Higher Increases in Costs in AHRQ Categories of "Other Nervous System Disorders," "Unclassified Codes," "Other Fractures," and "Developmental Disorders" Versus MCs

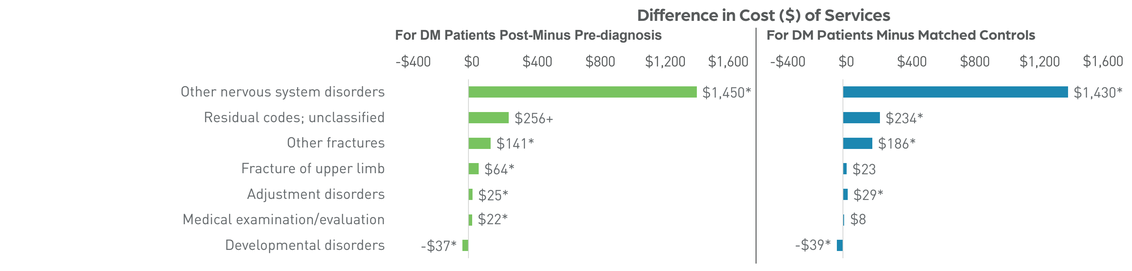
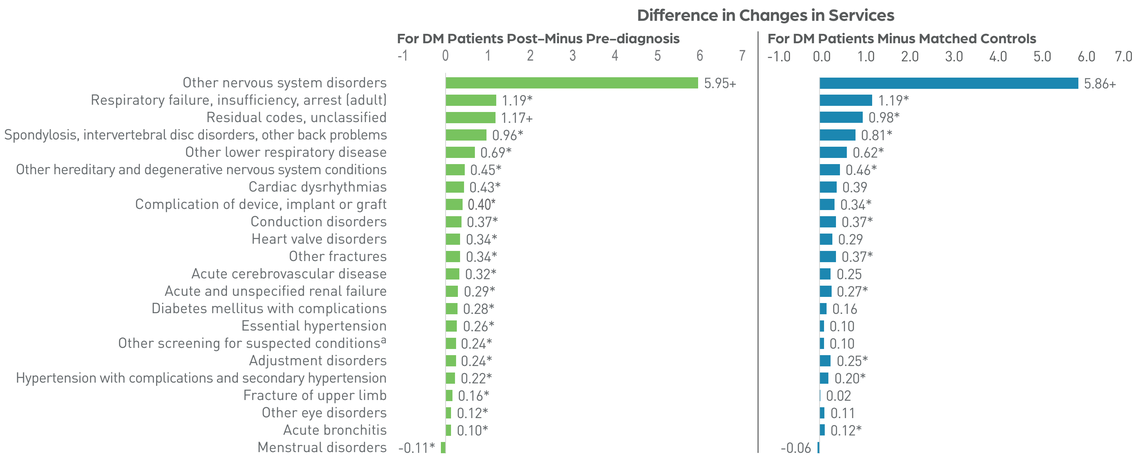


Figure 3: DM Patients Had Higher Increases in "Other Nervous System Disorders" and "Respiratory–Related" Services Versus MCs



*$p<0.05$; +$p<0.000177$ (threshold for multiple comparisons [0.05/283 comparisons])
[a]Not mental disorders or infectious disease; [b]Except that caused by tuberculosis or sexually transmitted disease