Economic Analysis of the Impact of Delandistrogene Moxeparvovec Gene Therapy on Work Opportunity in Caregivers of Individuals With Duchenne Muscular Dystrophy

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Introduction

- Duchenne muscular dystrophy (DMD) is a rare, pediatric, degenerative neuromuscular disease leading to progressive muscle loss and functional impairments that predominantly occurs in males[1,2]
- As DMD progresses, caregiver demands due to DMD have a considerable impact on workforce participation[3,4]
- Delandistrogene moxeparvovec is a single-dose recombinant adeno-associated virus rhesus isolate serotype 74 vector-based gene therapy (GT), approved in the US, United Arab Emirates, Qatar, Kuwait, Bahrain, and Oman (as of March 2024) for the treatment of ambulatory pediatric patients aged 4–5 years with DMD with a confirmed mutation (pathogenetic variant) in the *DMD* gene[5–8]

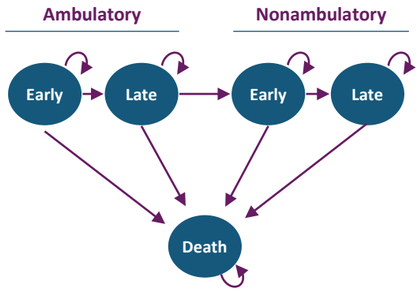
Objective

To estimate the potential impact delandistrogene moxeparvovec has on work opportunity for caregivers of individuals with DMD compared with the general US population and caregivers of patients treated with standard of care (SoC) alone

Methods

- A five-state partitioned survival model was developed to assess a homogenous cohort of 4-year-old early ambulatory patients with DMD (**Figure 1**)

Figure 1 *Partitioned Survival Model for DMD*



DMD=Duchenne muscular dystrophy.

- DMD progression on SoC (corticosteroids and medical management) was obtained from published literature,[9–11] and the predicted delandistrogene moxeparvovec plus SoC effect was determined via published hazard ratios[12]

Methods (cont)

- The base case analysis assumed a lifetime treatment durability, with sensitivity analyses for treatment durability of 10, 20, and 30 years
- Scenario analyses examined the impact of delaying disease progression without a survival benefit and of delaying mortality without a progression benefit
- Beginning at age 31 years, caregiver work opportunity was estimated from age-based median US salaries, mortality-adjusted employment by age, and worktime loss estimates (**Table 1**) for caregivers of patients with DMD relative to the general population; annual 2.8% salary growth and 3% discount rates were applied
- Total work hours and income lost from caregivers of patients with DMD were modeled for delandistrogene moxeparvovec plus SoC and SoC alone relative to that of the US general population (*scan QR code for methods details)*

Table 1 *Caregiver Work Hours Lost per DMD Health State*[13]

Patient Ambulatory State	Mean Loss in Annualized Loss in Work Hours
Early and late ambulatory	-1.5
Early nonambulatory	-459.0
Late nonambulatory	-809.4

DMD=Duchenne muscular dystrophy.

Results

Base Case Model

- Caregivers of patients with DMD treated with SoC were estimated to lose a total of 7194 working hours or 15.5% of their potential working hours over their lifetime compared with the general US population (39,251 vs 46,445 hours) (**Table 2**)
- Caregivers of patients with DMD treated with delandistrogene moxeparvovec were estimated to lose a total of 4564 working hours or 9.8% of their potential working hours over their lifetime compared with the general US population (41,881 vs 46,445 hours; **Table 2**)
- The estimated average lifetime earnings for caregivers of patients with DMD treated with delandistrogene moxeparvovec increased to $1,402,232 (undiscounted, $2,349,974): a gain of $96,301 over SoC alone (undiscounted, $113,537; **Table 2; Figures 2A, 2B**)

Sensitivity Analyses

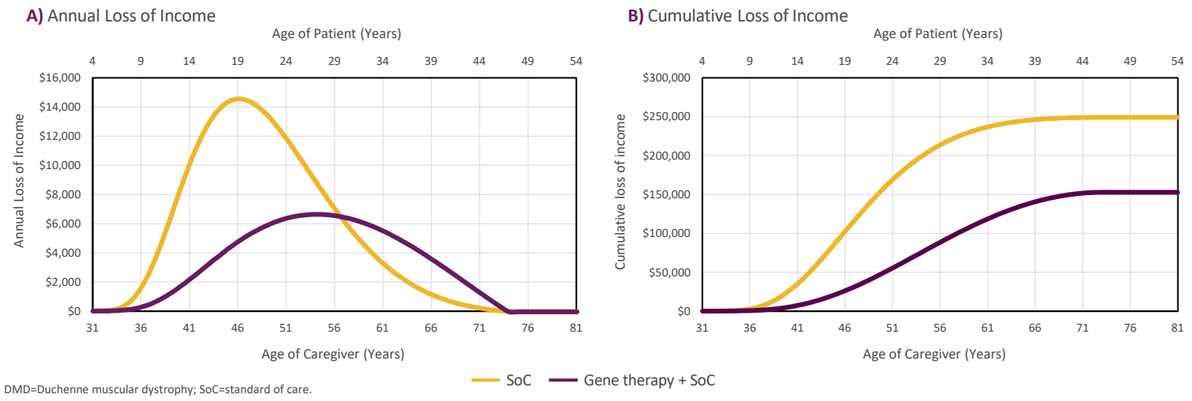
- Alternative scenarios tested for the impact of delaying either disease progression or mortality alone (**Table 3**)
- Additional scenarios evaluated the impact of delandistrogene moxeparvovec treatment durability on working hours and income (**Table 4**)
  - Changing treatment durability from 10 to 30 years resulted in lifetime work hours and income gained with delandistrogene moxeparvovec plus SoC vs SoC alone to range from 1547–2610 and $55,358–$95,908, respectively

Table 2 *Base Case Results*

	US Population	SoC		Delandistrogene Moxeparvovec + SoC		
		Value	Loss vs US Pop	Value	Loss vs US Pop	Gain vs SoC
Working hours	46,445	39,251	7194 (15.5%)	41,881	4564 (9.8%)	2630
Income (undiscounted)	$2,668,349	$2,236,438	$431,911 (16.2%)	$2,349,974	$318,375 (11.9%)	$113,537
Income (discounted)	$1,555,628	$1,305,931	$249,697 (16.1%)	$1,402,232	$153,396 (9.9%)	$96,301

Pop=population; SoC=standard of care; US=United States.

Figure 2 *Modeled Results Showing Loss of Income (Discounted) in Caregivers of Patients With DMD Receiving SoC Treatment Alone vs Delandistrogene Moxeparvovec and SoC*



DMD=Duchenne muscular dystrophy; SoC=standard of care.

Table 3 *Scenario Analyses: Delayed Progression or Mortality Alone*

	Delayed Progression and Mortality (Base Case)	Delayed Progression Only	Delayed Mortality Only
Lifetime loss of income (SoC)	$249,697	$249,697	$249,697
Lifetime loss of income (delandistrogene moxeparvovec)	$153,396	$16,046	$476,156
Lifetime income gained	$96,301	$233,651	−$226,459

SoC=standard of care.

Table 4 *Scenario Analyses: Alternative Treatment Durability*

	Working Hours Gained With Delandistrogene Moxeparvovec vs SoC	Income Gained With Delandistrogene Moxeparvovec vs SoC
10 years	1547	$55,358
20 years	2361	$86,630
30 years	2610	$95,908
Lifetime (base case)	2630	$96,301

SoC=standard of care.

Key Findings

Delandistrogene moxeparvovec may substantially improve employment opportunity and income accumulation in caregivers of patients with DMD

Conclusions

DMD is associated with substantial financial loss for caregivers of individuals with DMD, in part due to loss of work hours and lifetime income

This model predicts that delandistrogene moxeparvovec may have a substantial impact on improving work opportunity and earning potential in caregivers of patients with DMD, by delaying disease progression and improving survival in patients with DMD

These results are important to consider when assessing the potential value of delandistrogene moxeparvovec for individuals with DMD in the US

Acknowledgments & Disclosures

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SCAN THE QR CODE

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https://www.sareptacongresshub.com/ISPOR2024/ispor2024/economic-analysis

International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Annual Meeting; May 5–8, 2024; Atlanta, GA

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Methods (cont)

Model Framework

- A lifetime disease model was developed from a US societal perspective to explore the impact of a one-time treatment of delandistrogene moxeparvovec plus SoC vs SoC alone
- This study used a previously published model framework for a cost-effectiveness analysis of delandistrogene moxeparvovec[12]
- Time spent in early and late ambulatory and early and late nonambulatory health states was estimated using log-normal distributions fitted to digitally reconstructed Kaplan-Meier (KM) estimates from a prospective cohort study[14]
  - Loss of ability to stand from supine in <5 seconds was used for transition from early to late ambulatory
  - Loss of ambulation (LOA; inability to ambulate 10 meters) was used for transition from late ambulatory to early nonambulatory
  - Loss of unweighted hand-to-mouth function (Brooke score ≥5) was used for transition from early to late nonambulatory
- Risk of mortality was based on pooled KM estimates from Broomfield et al,[9] Passamano et al,[10] and Paramsothy et al,[11] and extrapolated using a log-normal distribution
- The treatment effect of delandistrogene moxeparvovec was modeled using hazard ratios, obtained from publications, reflecting anticipated long-term treatment benefits of delandistrogene moxeparvovec compared with SoC[12]

Limitations

- The model assumed that caregivers would return to general population income levels when the patient passed away; this is due to a lack of evidence on average workforce participation patterns and illustrates the modeling paradox called the “caregiver trap”
- Long-term treatment benefits were extrapolated beyond clinical trial data, and the long-term effects of therapy have yet to be observed

Estimating Loss of Caregiver Work Opportunity Due to DMD

- Loss of work opportunity for caregivers was estimated based on a US study that examined labor outcomes for female caregivers of patients with DMD[13]
  - Mean annualized working hours lost was estimated based on regression models that accounted for reduced participation in the labor force and changes in working patterns compared with a comparison group of female caregivers with ≥1 children under age 18 years
  - Mean annualized working hours lost was estimated to be 1.5 hours for caregivers of ambulatory patients, 459.0 hours during the first 4 years following LOA and 809.4 hours for caregivers of patients with >4 years of LOA
  - To estimate work hours lost each year in the present study, the proportion of patients with DMD in each health state was multiplied by the values reported by Soelaeman et al,[13] assuming that the early and late ambulatory health states were representative of no ambulation loss and the early and late nonambulatory health states were representative of the first 4 years and >4 years since LOA, respectively
    - Working hours lost were adjusted for the expected mortality-adjusted employment rates by age
- Caregivers were assumed to be 31 years of age at the start of the model, based on the average age of having a first child in the US being 27 years[15] and the average age at DMD diagnosis being 4 years[16]
- To account for changing employment by age, retirement, and all-cause mortality in caregivers, the mortality-adjusted employment rate for each age was calculated by fitting polynomial models to national data on employment and mortality by age group[13]
  - For each age, the ratio of the mortality-adjusted employment rate for the US population and the employment rate from the comparison group was calculated and used to adjust work hours lost over time
  - In the base case, this approach was taken for both male and female caregivers

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