Cost-effectiveness of onasemnogene abeparvovec in newborns with pre-symptomatic spinal muscular atrophy

Karris Jeon MSc, and Josh J. Carlson Ph.D., MPH

UNIVERSITY of WASHINGTON
THE CHOICE INSTITUTE
School of Pharmacy

BACKGROUND

SPINAL MUSCULAR ATROPHY (SMA) IS A RARE NEUROMUSCULAR DISEASE AND ONASEMNOGENE (ONA) IS A GENE THERAPY INTENDED TO BE CURATIVE

- SMA is caused by the survival motor neuron 1 (SMN1) gene mutation, resulting in the degeneration of motor neurons and progressive muscle weakness
- ONA is a one-time intravenous treatment with a list price of $2.1 million US dollars.
- Previous analyses reported incremental cost-effectiveness ratios (ICER) above $150,000 per quality-adjusted life years (QALY) for treating symptomatic SMA with ONA compared to best supportive care (BSC)
- Recent research suggests that treating pre-symptomatic SMA may prevent a substantial loss of motor neurons and improve motor function

MODEL SUMMARY

- Population: Newborns with pre-symptomatic SMA and two copies of survival motor neuron 2 (SMN2)
- Intervention: Onasemnogene (ONA)
- Comparator: Best supportive care (BSC)
- Outcome: Cost per quality-adjusted life years gained
- Perspective: US healthcare sector perspective
- Structure: Health state transition model
- Cycle: Month
- Time Horizon: Lifetime
- Cost: 2021 dollars
- Discount rate: 3% for both costs and outcomes

OBJECTIVE

- We estimated the cost-effectiveness of ONA compared to BSC in pre-symptomatic newborns diagnosed with SMA and two SMN2 copies, typically the most severe form of SMA

METHOD

HEALTH STATES

- The health state transition model included 'not sitting,' 'sitting,' 'standing,' 'walking,' 'permanent ventilation (PV),' and 'death'

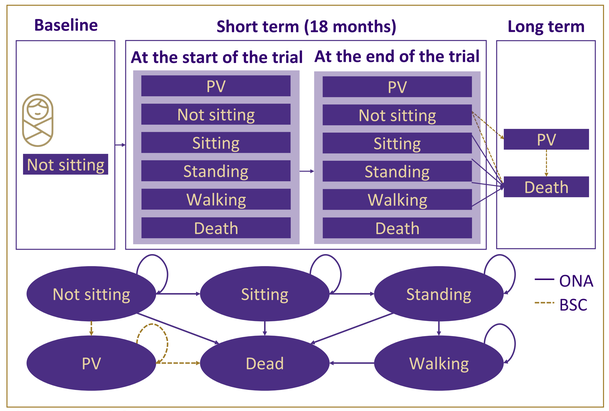

Figure 1: Model schematic

ONA

- We directly extracted the proportions of children in each state from the single-arm SPR1NT trial for the first 18 months. After that, patients remained in their states until death
- No patient needed 'PV' after infusing ONA following the results of the SPR1NT trial

BSC

- Motor functions did not improve from 'not sitting,' and patients transitioned only to 'PV' or 'death.'
- Inputs for 'PV' were obtained from the ENDEAR trial using a partitioned survival modeling approach

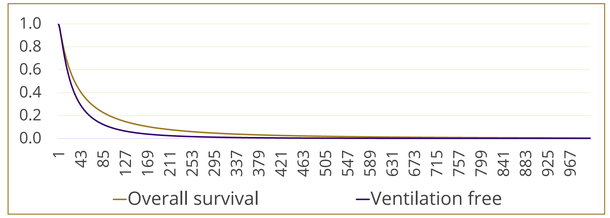

Figure 2: Overall survival and ventilation-free survival

MORTALITY

- Both groups' state-specific mortality estimates were extrapolated into a lifetime, except the 18 months for ONA, where we used background mortality from the age-specific general population

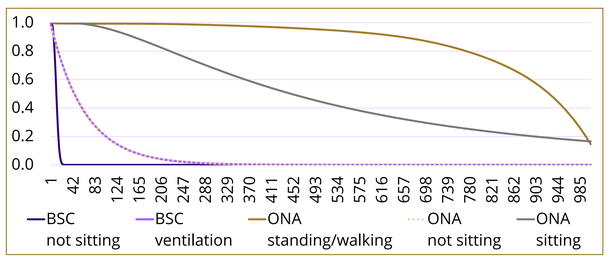

Figure 3: State-specific mortality

COST

- The model included a list price of $2.1 million for ONA and monthly health costs estimated from published commercial healthcare claims

UNCERTAINTY

- We conducted one-way and probabilistic sensitivity analyses and scenario analyses

RESULT

- ONA yielded incremental QALYs gained of 21.76 at an additional cost of $2,124,154, with an ICER of $95,868
- The ICER was most sensitive to ONA cost and time horizon
- At an ICER threshold of $100,000 per QALY gained, the probability that ONA is cost-effective compared to BSC is 72% which increased to 100% at a threshold of $150,000

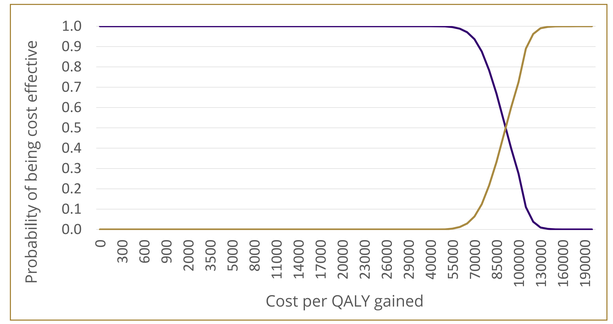

Figure 4: Cost-effectiveness acceptability curve of ONA

- In the scenario analysis where a 30% regression from the 'sitting' state to the 'not sitting' state was assumed, the ICER was $99,673
- When the time horizon was tested, substantially higher ICERs were returned with shorter time horizons due to high upfront costs and clinical benefits extrapolated over a lifetime for ONA

CONCLUSION

- Treating pre-symptomatic SMA with ONA was cost-effective at an ICER threshold of $100,000 from the US healthcare sector perspective