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QUALITY OF LIFE MATHEMATICAL MODELING COMPARING SACRAL NEUROMODULATION VS. BOTOX A IN THE TREATMENT OF OVERACTIVE BLADDER SYNDROME IN COLOMBIA

Hypothesis / aims of study
Using Mathematical modeling to do a long term effectiveness and utility analysis of Sacral Neuromodulation (SNM) vs. botulin toxin type A (BoNTA) in patients with Overactive Bladder (OAB) treatment in Colombia.

Study design, materials and methods
Through the adaptation of an HTA Consulting model [1] and after data transferability analysis, an effectiveness and utility analysis of SNM vs. BoNTA 100UI in the treatment of OAB in Colombia was done. The model was constructed as a Discrete Event Simulation, which allows modeling events with data dependent time, been time to treatment failure as the main variable that reflects the effectiveness of treatment. The effectiveness data of SNM and BoNTA, defined as more than 50% improvement in urinary parameters, was based on studies identified in a systematic review by Jaros [2] in 2013 conducted in the Polish clinical settings.
The Quality Adjusted Life Years (QALYs) allow us to capture the length of life adjusted by its quality. One QALY is a one year of life in perfect health state and zero in death. Since Urinary incontinence affects quality of life, based in a systematic search for health-related quality of life data [3], we defined a QALY value for the health state with treatment success and a QALY value for the health state with treatment failure. The treatment by itself affects the Quality of life, and a disutility factor was included into the projections. The incontinence episodes per day were also included in the model. A 10 year horizon and a 3% discount rate for the QALYs were used. A probabilistic sensitivity analysis with 1000 iterations of a MonteCarlo Simulation was done.

Results
The treatment with SNM obtained 5.67 QALYs vs. 5.38 QALYs obtained with BoNTA with 0.28 incremental QALYs. All of the simulations in the Probabilistic Sensitivity analysis were more effective for SNM than BoNTA. (Table 1). The Deterministic (0,284) and the probabilistic (0,287) means had similar incremental QALYs and the Upper and lower bounds for 95% CI were 0,147 and 0,430
The average of incontinence episodes per day were 4,04 (95% CI 3,83– 4,25) for SNM and 4,68 (95% CI 4,45-4,89) for BoNTA

Interpretation of results
In a projected ten year horizon analysis, SNM produces more QALYs than BoNTA and fewer incontinence episodes which mean higher quality of life for the patient in a 10 year term. When a probabilistic sensitivity analysis was done using Monte Carlo simulations, all iterations show a higher value for QALYs for the hypothetic cohort treated with SNM (Fig. 1). The probabilistic and deterministic means results as well the 95% CI demonstrated the robustness of the results.
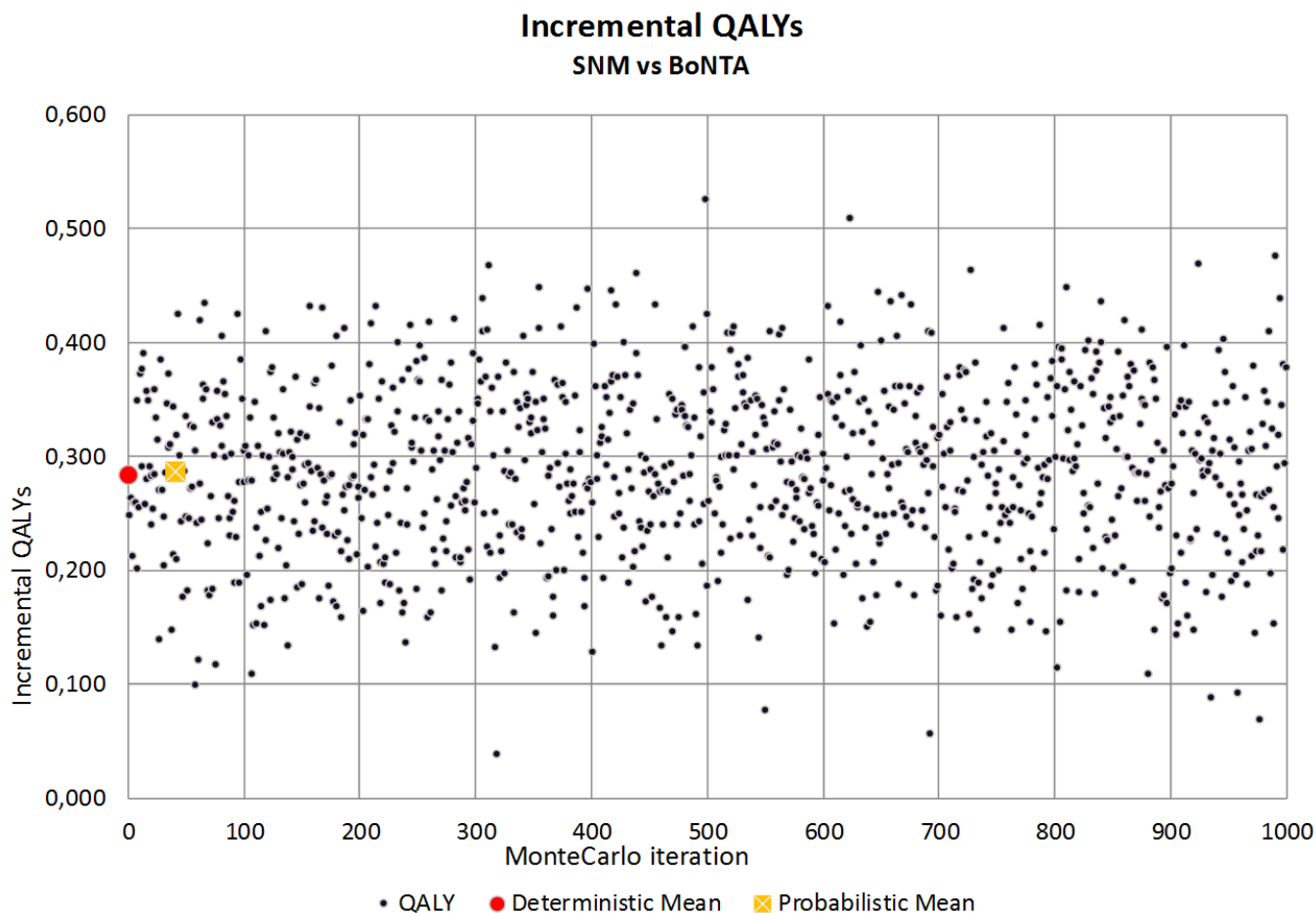
Concluding message
Although the Randomized Clinical trials are the gold standard for efficacy outcomes, their horizon analysis are typically short. This mathematical analysis allows projection of the results in the long term so the impact in quality of life can be adequately captured. In our model, we projected it to ten years and we found that SNM has a higher utility in terms of Quality of Life and produce fewer incontinence episodes per day than BoNTA.

Table 1
Base Case Results

Treatment	QALY	Incontinence episodes (per day)
Sacral Neuromodulation	5,6673	4,04
Botulinum toxin type A	5,3830	4,68

Figure 1
Probabilistic Sensitivity Analysis

Incremental QALYs
SNM vs BoNTA

In the probabilistic sensitivity analysis, all the effectiveness iterations had positive incremental QALYs demonstrating the robustness of the model result.

References
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