



مستشفى الملك فهد التخصصي بالدمام  
King Fahad Specialist Hospital - Dammam

# Cathode selection affects SNM success: An Analysis of Predictor(s) of SNM Failure

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## Hypothesis / aims of study:

Sacral neuromodulation (SNM) is a key treatment for refractory voiding and bowel dysfunction, but failure remains a challenge. This study investigates the impact of reprogramming frequency and other clinical factors on SNM outcomes.

## Materials and Methods:

This retrospective cohort study included patients from January 2017 to June 2022. We enrolled all adults with voiding and bowel dysfunction who underwent SNM implantation and maintained follow-up for at least 18 months with confirmed proper lead position. We excluded patients aged <18 years, those with non-neurogenic etiology, and cases with lead migration or device damage. Failure was defined as symptom response <50%, chronic device-related pain, or device removal despite multiple reprogramming attempts. The primary aim was to determine if reprogramming predicts treatment failure. Secondary outcomes included the influence of primary diagnosis, BMI, abdominal surgeries, electrode configuration, and voltage on failure rates.

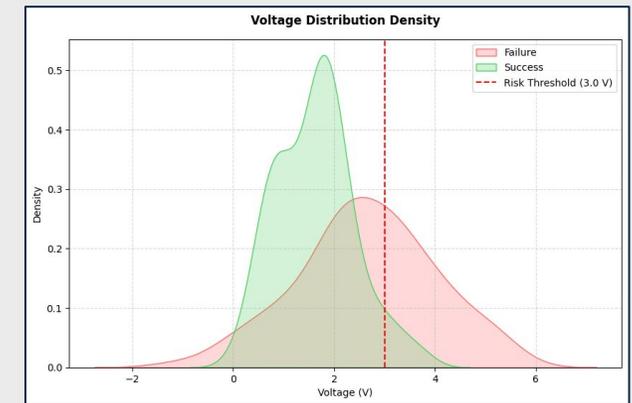
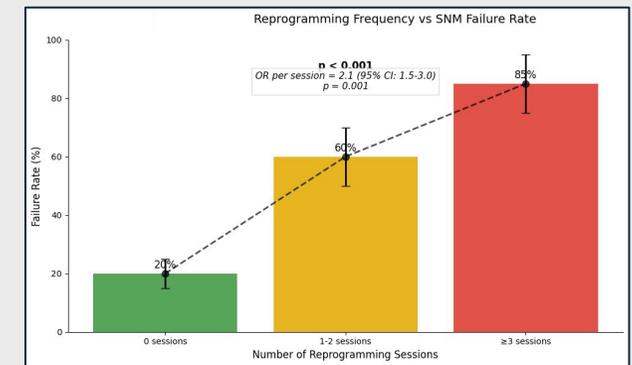
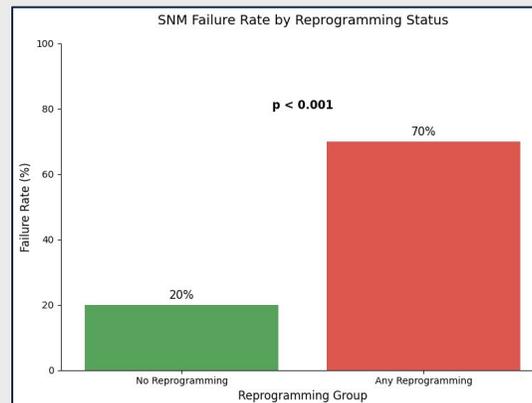
## Results:

We found 50 patients from the **age of 18 to 72 years (mean 44.2 years)** who had SNM implantation. **35 female (70%) and 15 male (30%)**. **Diagnoses:** 23 NOR, 15 OAB, 8 BPS/ IC, and 4 FI. We analyzed demographic variables (age, gender, BMI), clinical history (abdominal surgery, comorbidities), reprogramming parameters (electrodes, voltage), and failure criteria (symptom response <50%, device removal, or pain).

We found reprogramming was strongly associated with failure. Patients with **any reprogramming had a 70% failure rate vs. 20% in non-reprogrammed cases** (OR: 5.2, 95% CI: 1.8–15.0,  $p=0.002$ ).

A frequency-response relationship was found: No reprogramming:20% failure. 1–2 sessions: 60% failure.  $\geq 3$  sessions: 85% failure ( $p<0.001$ ). Each additional session increased failure odds by 2.1-fold (95% CI: 1.5–3.0,  $p=0.001$ ).

Use of cathode (-3) was associated with a 75% failure rate (vs. 30% without,  $p=0.004$ ; OR: 3.5, 95% CI: 1.4–8.7). Higher voltages (mean:  $2.8 \text{ V} \pm 1.5$  in failures vs.  $1.6 \text{ V} \pm 0.8$  in successes,  $p=0.001$ ) correlated with failure, with voltages  $\geq 3.0 \text{ V}$  conferring a 4.0x higher risk (95% CI: 1.7–9.4).



Patients with BPS/IC had the highest failure rate (87.5%) but no significant difference between the diagnoses ( $p=0.15$ ). Older patients (mean age 48.6) had significantly higher failure rates ( $p = 0.008$ ). Every 10-year age increase raised failure odds by 1.5x (OR: 1.5, 95% CI: 1.1–2.0). Patients with (BMI  $\geq 30$ ) were linked to a 65% failure rate vs. 35% in non-obese patients ( $p=0.02$ ). Each 5-unit BMI increase raised failure odds by 1.8-fold (95% CI: 1.1–2.9). Abdominal surgeries showed a non-significant trend toward higher failure rates (60% vs. 40%,  $p=0.08$ ). Multivariate analysis confirmed reprogramming frequency (OR: 2.1,  $p=0.001$ ), BMI  $>30$  (OR: 1.8,  $p=0.03$ ), and cathode -3 use (OR: 3.5,  $p=0.007$ ) as independent predictors of failure.

## Conclusion:

Although this study is retrospective with a small sample, we conclude that reprogramming frequency is a potential predictor of SNM failure, with the escalating risk per session. Patient-specific factors (BMI) and technical parameters (cathode configuration, voltage) further modulate outcomes. This advocates for careful programming strategies and cautious monitoring of high-risk patients to enhance SNM efficacy. Future RCTs are needed to further explore those findings.