Efficacy and Safety of Modern Biologics Compared to Conventional Therapies in Aquaporin-4 positive Neuromyelitis Optica Spectrum Disorder

A Fully AI Automated Targeted Literature Review

MSR 82

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INTRODUCTION

The exponential growth of biomedical literature has made traditional literature reviews increasingly slow and resource-intensive, often requiring 2-4 weeks or more to complete. **SYMPRO-AI**, our in-house AI based SLR suite, overcomes this challenge by conducting a fully automated, end-to-end Targeted Literature Review (TLR) covering every step from searches and screening to full-text review and report generation. Beyond automation, SYMPRO-AI delivers comparative insights, summarising key findings and clinical implications at a faster pace that allows more intensive reviews and data analysis.

RESEARCH QUESTION

To perform a fully automated TLR using artificial intelligence (AI) to compare the effectiveness of modern biologics with conventional therapies in patients with Aquaporin-4 positive Neuromyelitis Optica Spectrum Disorder (NMOSD).

METHODS

- SYMPRO-AI was employed to conduct a fully automated, end-to-end TLR based on predefined study objectives and protocol.
- SYMPRO-AI developed and executed a comprehensive PubMed search strategy specific to the study goals.
- The system performed screening of the hits and executed a generative analysis on the data extracted from the included studies. Human inputs were limited to push 'Start' buttons at each step.
- Searches as well as screening of citations were performed manually in parallel to compare SYMPRO-AI versus human efficiency for inclusion & exclusion.

RESULTS

- The SYMPRO-AI driven PubMed searches identified 1,721 citations. The search results were similar when performed manually.
- SYMPRO-AI identified 130 articles during title/abstract screening, while manual screening identified 123. After full-text review, both methods included the same 33 articles.
- Performance metrics — accuracy, sensitivity, and specificity — were calculated based on the observed results **(Table 1, Fig. 1).**

Table 1: Efficacy of SYMPRO-AI vs. manual (human) for first-pass screening

	AI Exclude	AI Include	Total
Manual Exclude	1,568 (98.6%)	30 (23.1%)	1,598
Manual Include	23 (1.4%)	100 (76.9%)	123
Total	1,591	130	**1,721**

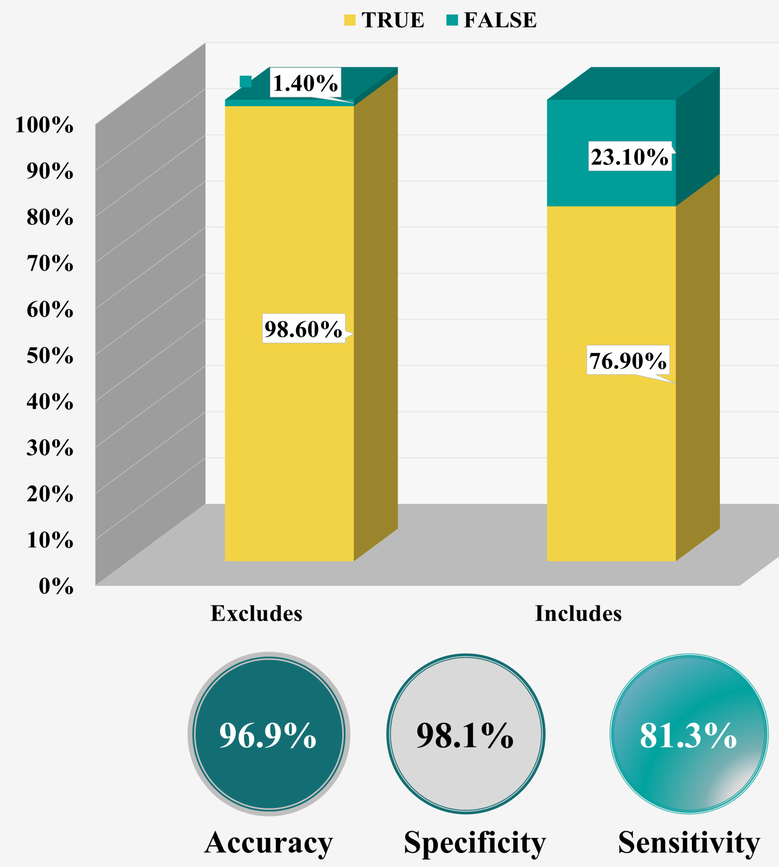

Figure 1. Comparison between manual and AI screening and performance metrics of SYMPRO-AI.

➢ **All the studies finally included in the TLR report had been included by SYMPRO-AI at the Title/Abstract screening.**

➢ **Speed:** The screening step, report writing and the overall TLR process was faster compared to the manual approach (**Fig. 2**).

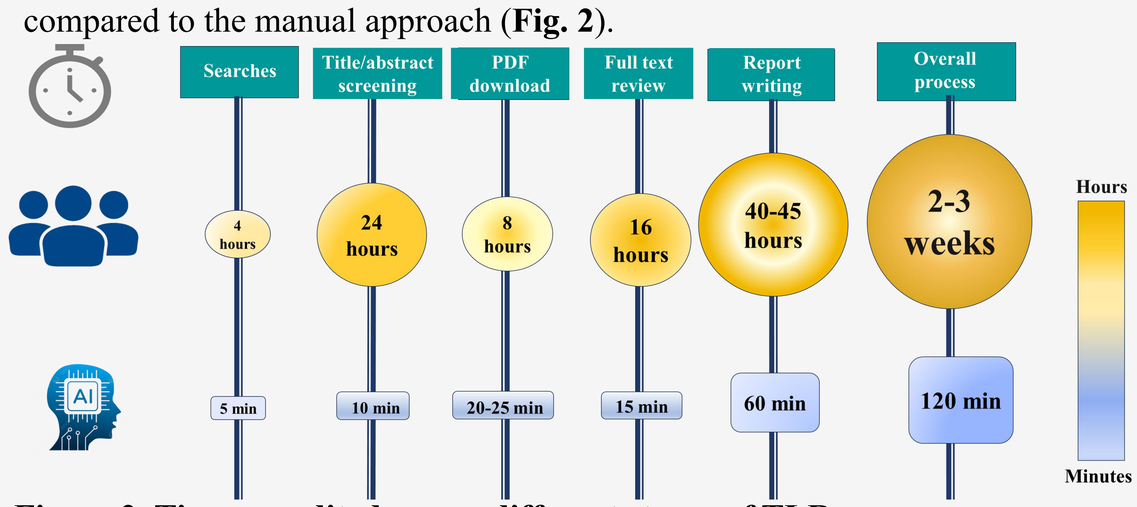

Figure 2. Time expedited across different stages of TLR.

➢ **Key Comparative Efficacy Insights:** A clear efficacy hierarchy emerged, with eculizumab (94%) demonstrating the highest effectiveness-relapse rate reduction, followed by satralizumab (74-79%), rituximab (74%), inebilizumab (73%), mycophenolate (65%), and azathioprine (58%). Satralizumab maintained 71–73% relapse-free rates at 192 weeks, while inebilizumab achieved an 83% attack-free probability at 4 years (**Fig. 3**).

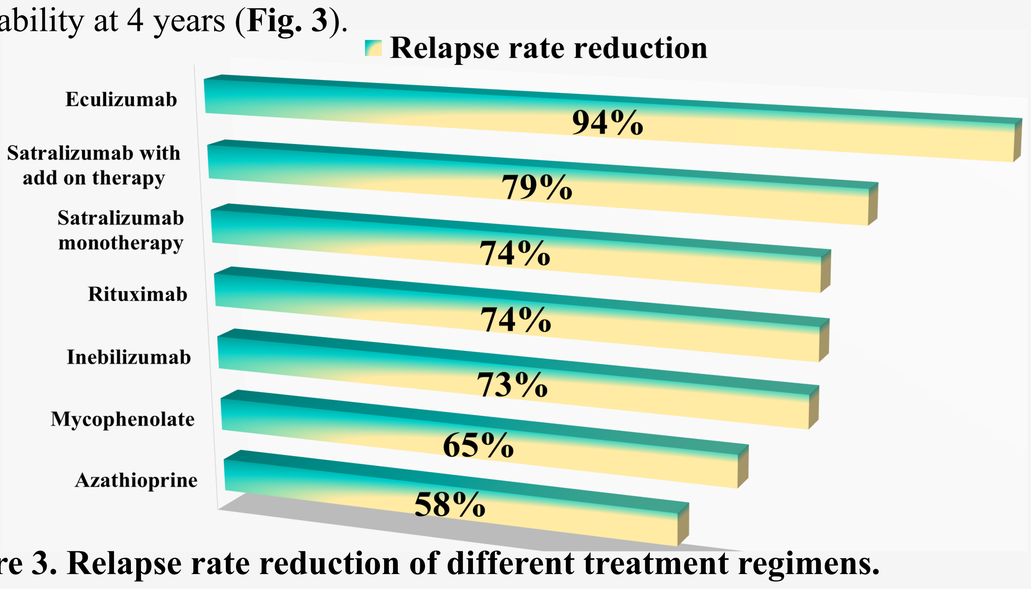

Figure 3. Relapse rate reduction of different treatment regimens.

➢ **Safety analysis:** SYMPRO-AI was able to compare different FDA approved biologics against the conventional immunosuppressants, with the former demonstrating better safety profile (**Table 2**).

Table 2. SYMPRO-AI safety analysis of biologics versus immunosuppressants

Drug	Eculizumab (C5 inhibitor)	Satralizumab (IL-6 receptor blocker)	Inebilizumab (CD19 depleting)	Rituximab (CD 20 depleting)	Mycophenolate mofetil (Immunosuppressant)	Azathioprine*
Serious AEs	8.6-30.7 per 100 PYs [7,9]	• Satralizumab monoTx: 22% (10.9 per 100 PYs) • Satralizumab ± IST: 28% (10.4 per 100 PYs) [6]	9.3% [5]	20%	TEAEs: 43% (39/90) [10]	13.63% [8]
Serious infections	Upto 10.2 per 100 PYs [4,9]	• Satralizumab monoTx: 8.8% (3.2 per 100 PYs) • Satralizumab ± IST: 10.7% (2.8 per 100 PYs) [6]	Up to 2.7% [5]	15.3% [3]	• Severe Pneumonia: 3 patients • Varicella-zoster virus infection: 5 patients [10]	Tuberculosis: 1.1 [8]
Deaths	• Rare in CTs (Only 1 death) • 8% in RWE [2]	Rare (only one in post marketing surveillance) [6]	0 [5]	1.8–2.7% [1,3]	Death due to ARDS: 1 [10]	1 death [7]

Abbreviations: AEs, Adverse events; ARDS, Acute respiratory distress syndrome; CTs, Clinical trials; IL, Interleukin; IST, Immunosuppressive therapy; monoTx, Monotherapy; PYs, Patient years; RWE, Real world evidence; TEAEs, Treatment emergent adverse events.
*Includes Immunosuppressive agent; purine metabolism antagonist

FDA-approved monoclonal antibodies demonstrate substantially lower discontinuation rates (up to 4%) compared to conventional immunosuppressants (2-14.8%).[1,6,8]

CONCLUSIONS

🚀 **From Search to Insight: Power of SYMPRO-AI**

- ✓ **Faster** end-to-end TLR development
- ✓ **Enhanced accuracy** 🎯
- ✓ **Generative Insights**: Automates evidence synthesis, generates comparative analysis, and highlights clinical implications

Limitations: The TLR was designed to test full automation by SYMPRO-AI and searches were limited to the free PubMed API. Other databases like Embase will capture additional literature.

- The AI driven decisions are subject to extensive human review.
- Larger studies are required to fine-tune the AI capabilities.

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