Wise Hematology Life: Practical Integration of Large Language Models and Agentic AI into Clinical Research

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Recent large language models (LLMs) - GPT-5.2, Claude Sonnet 4.5, and Gemini 3 Pro - together with autonomous AI agents, have reshaped the way clinicians approach research. This lecture presents a hands-on framework for adopting these tools across the clinical research pipeline, with particular attention to task decomposition: deciding what the researcher handles directly and what can be delegated to AI.

The workflow is organized into three phases. In the planning phase, a hypothesis is refined through inference models (e.g., GPT-5.2, Gemini 3 Pro) to produce a Product Requirement Document (PRD) specifying data needs, analytic methods, and deliverables such as tables and figures. An agentic decision tree helps the researcher judge which steps to carry out personally and which to assign to AI. In the execution phase, literature review is conducted via Deep Research and Perplexity AI with strategies to detect and mitigate hallucinated references. Data preprocessing and statistical analysis rely on AI-generated Python and R scripts, followed by mandatory local re-execution to confirm reproducibility. Visualization - from individual figures to graphic abstracts - is repeatedly refined with AI assistance. Productivity tools such as Google Sheets with built-in GPT functions, Claude for Excel, and Google Colab with Gemini further streamline data handling. In the documentation phase, AI assists in composing manuscripts in IMRAD format, drafting IRB applications and administrative forms using institution-specific templates, and adjusting formatting to meet target journal requirements. Especially, the latest agentic coding platforms - Claude Code for terminal-based autonomous coding, Antigravity for orchestrated sub-agent workflows with file and browser control, and MCP (Model Context Protocol) for connecting external tools and data sources to AI - allow researchers to coordinate specialized agents (Research Agent, Analysis Agent, Assembly Agent) that run tasks in parallel, substantially reducing turnaround time for multi-project environments.

However, there are some preclusions. Structured prompting and reference cross-checking to control hallucinations, routine code archiving for reproducibility, compliance with journal AI-use disclosure policies and awareness of plagiarism and AI-detection concerns. The core message is that generative AI serves as an advanced instrument - comparable to the historic shift from handwriting to word processors, or from manual calculation to statistical software - and that a published paper must still represent the author's own intellectual process. The researcher remains the project leader who designs the study, decomposes the work, reviews every output, and guarantees that AI-assisted content accurately delivered their scientific own insight. This guide offers a reproducible, modular approach for clinician-scientists across disciplines, including hematology, to adopt AI responsibly while safeguarding research quality.