Category: Clinical Trial Operations (Trial Start-up, Regulatory, Finance, Data Management, IITs) – Idea

Enhancing Efficiency in Beacon Treatment Planning Through AI-Based Layout Generation

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1. Background
Oncology clinical trial protocols are complex and require translation into structured treatment plans for electronic health record systems such as Epic Beacon—a workflow that is labor-intensive for clinical research nurses, pharmacists, physicians, and informatics teams.

A targeted literature review across PubMed, Google Scholar, IEEE Xplore, ACM Digital Library, medRxiv/arXiv, and conference proceedings (AMIA, HIMSS) found limited to no peer-reviewed studies specifically describing artificial intelligence (AI)-based generation of Epic Beacon Treatment Plans or Beacon build artifacts. However, adjacent evidence supports the feasibility of the core capabilities required: (1) natural language processing (NLP) and transformer-based methods can reliably extract oncology protocol elements from PDFs and registries (agents, schedules, labs, eligibility); (2) standardized chemotherapy computerized provider order entry and decision support frameworks define the data elements, safety checks, and dose-modification logic relevant to Beacon; (3) large language models can translate semi-structured clinical documents into structured order sets. This evidence base suggests that an AI system integrating document parsing, oncology-specific NLP, rules for toxicity management and dose adjustments, and terminology normalization—combined with human-in-the-loop validation by pharmacists and research nurses—can accelerate Beacon build workflows while maintaining safety and consistency.

2. Goals
The identified gap in Beacon-specific AI publications underscores the need for formal evaluations comparing efficiency, error rates, and revision burden versus manual processes, and for publishing implementation outcomes to establish best practices.

3. Solutions and Methods
We propose an AI-driven approach that automatically generates Beacon Treatment Plan layouts from protocol documents, producing standardized templates for submission to Epic Willow for Beacon build. The system extracts and structures regimen components (agents, dosing, cycles, schedules), operational parameters (labs, pre-medications, supportive care, infusion instructions), nursing and physician communications, toxicity management strategies, and dose modification rules, aligned with Beacon configuration requirements to reduce manual transcription, variability, and errors and subsequently adjudicated by trial nurse coordinator for accuracy.

4. Outcomes
Early internal assessments indicate improved plan creation speed, fewer downstream configuration revisions, and clearer interdisciplinary communication, supporting the potential for faster research protocol activation in clinical practice. Two protocols with differing complexity were tested involving multiple arms and multiple regimens and treatment discipline (e.g., radiation therapy and infusion treatment). AI produced standardized layout of the treatment plan, capturing all the categories in the submitted template (e.g., pre-treatment, support and emergency medication information, drug regimen, including dosing, schedule, treatment parameters, toxicity guidance, dose modification) and

included radiation therapy regimens to align/coordinate the Beacon treatment plan with 100% alignment with both protocols and saving an average of 40% time spent compared to manual process.

5. Lessons Learned and Future Directions

As expected, the initial AI prompt required several iterations of fine-tuning. Standardizing prompts with the two test protocols produced improved standardization of the information on the Beacon treatment plan layouts.