A Patient Decision Aid Tool to Support Shared Decision-Making

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Introduction

Patient decision aid (PDA) is a tool designed to help individuals make informed choices about their treatment plan in a shared decision-making setting.[1] Multiple treatment options are usually available, and thus the benefits, harms, and practical considerations of each option should be considered before making a decision. These tools can summarize available treatment options for a particular condition, along with their benefits and harms. Several such tools are commonly used in practice such as OptionGrid and Mayo Diabetes cards[2].

However, the timeliness of the information provided by the PDA tools may not always be up-to-date, especially if the evidence base for a particular treatment option is evolving rapidly. The printed decision aids may not be able to keep up with changes in treatment guidelines or recommendations. Additionally, some decision aids can be complex or overwhelming, which may make it difficult for patients to understand and use them effectively. Patients may need additional support or guidance to use decision aids effectively.

To address these challenges, we proposed a framework to create a PDA tool based on a living systematic review and meta-analysis (SRMA) platform using advanced interactive web-based data visualization techniques.

Methods

Our proposed tool is built on a framework designed to integrate data from a living systematic reviews and meta-analyses platform and visualize the summary of findings through interactive tools. The workflow consists of three core components, as illustrated in Figure 1a.

First, we built a pipeline that accesses and continuously updates meta-analysis results from a living SRMA platform. This ensures that our tool always reflects the most recent evidence on a specific clinical question. The living SRMA platform performs regular updates based on newly available studies or clinical trials, maintaining the relevance and timeliness of the data. After curating public data sources and filtering studies to include those relevant to the clinical question, this pipeline obtains the synthesized evidence across studies by pairwise and network meta-analysis.

Secondly, visual representations of the meta-analysis results of clinical outcomes (e.g., overall survival, Progression-free survival, and adverse events, etc.) are generated using pre-defined templates, which allows flexibility and scalability in visual outputs. Scalable vector graphics (SVG) format is chosen for their adaptability and resolution-independent nature, which ensures they can be scaled across different devices without losing clarity. These images represent the core evidence and outcomes that will later be presented to users in an intuitive format.

Finally, we designed web-based application (Fig. 1b), which allows users to interact with the generated SVG images with customized panels. The application is designed to enable shared decision-making by presenting complex meta-analysis outcomes in a user-friendly format. Users, including clinicians and patients, can tailor the information by selecting different comparisons or filtering outcomes based on preferences (e.g., prioritizing efficacy, safety, or quality of life). The web interface is responsive and can be accessed on various devices, from desktop monitors (e.g., 22-inch to 27-inch) to tablet touchscreens (8-inch to 13 inch) for more portable usage. The interactive design enables users to explore treatment options dynamically, receiving updated information as they adjust the parameters.

Visualization Design

We designed the user interface of the PDA tool to presents comprehensive evidence from recent meta-analyses, including outcomes related to treatment efficacy, safety profiles, quality of life, and practical considerations. As a demonstration, we implemented a prototype for the case of first-line treatment for renal cell carcinoma (RCC).

As shown in Figure 1b, we designed a set of dropdown selections and switches to customize the scenarios to be discussed. These components allow users to filter by treatment options, study types, risk levels, or patient demographics, making the tool adaptable to various clinical scenarios.

Then, users are provided with interactive charts where they can compare treatment outcomes. For instance, users can visualize the overall survival rates across different treatment regimens, as shown in Figure 1b. For each treatment option, the system generates a visual display of mortality risk, potential adverse events, and patient-reported quality of life. Since the decision aid is built on a living SRMA platform, it continually updates the evidence as new studies are published and included in the tool.

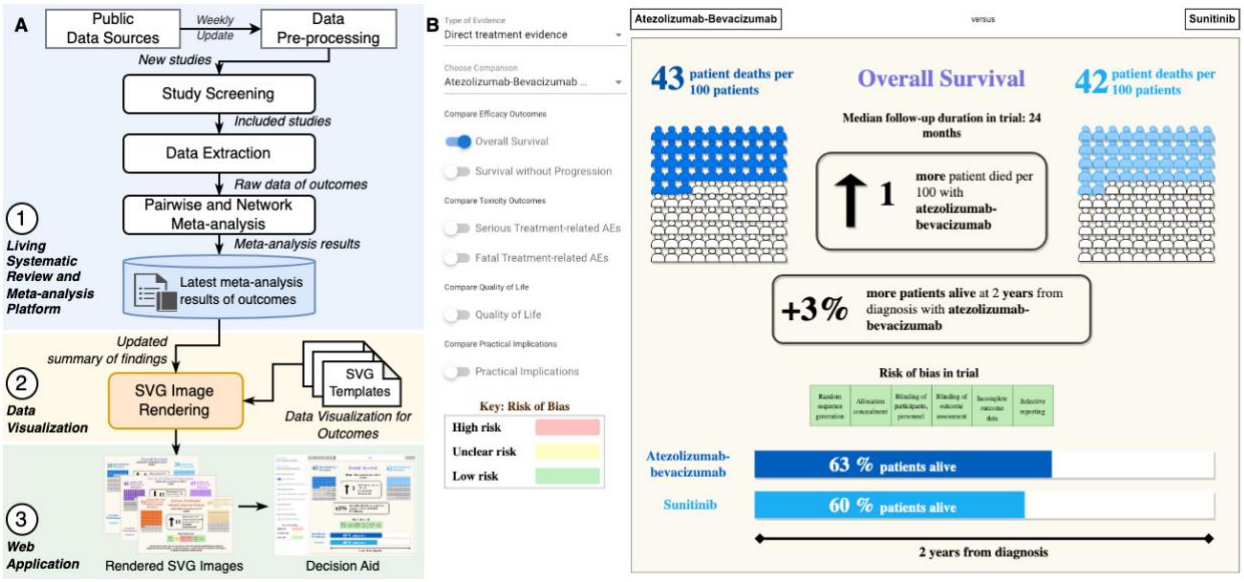

Figure 1. (a) The workflow of the proposed PDA, including three steps: 1) obtaining up-to-date meta-analysis results through a living SRMA platform, 2) rendering the outcomes into SVG templates, and 3) presenting the interactive charts through a web-based application for shared decision-making. (b) A screenshot of the proposed PDA tool, showing the ability of scenario customization and an example visualization of comparing different outcomes, such as overall survival and safety profiles in the case of first-line treatment for RCC.

Discussion and Future Work

During the design and development this tool, early demonstrations of the prototype to clinicians have provided positive feedback, suggesting that the tool could be a valuable asset in clinical settings. The interactive nature of the PDA was particularly well-received, as it allows for real-time comparisons between treatment options based on personalized patient preferences. This personalization enhances the shared decision-making process by presenting evidence that aligns more closely with the patient's situation. This initial implementation demonstrates the potential for extending the tool to other clinical domains, supporting a wide range of treatment decisions by offering living evidence in an accessible, interactive format. However, according to the comments from clinicians, there are still limitations and challenges that need to be addressed for the system to reach its full potential in clinical practice.

One major limitation of the PDA tool is the dependency on the living SRMA platform for continuous updates. While the system can integrate new evidence in real-time, the process of curating and synthesizing this data is resource-intensive and requires regular monitoring of the literature. Ensuring the accuracy and consistency of the meta-analysis results can be challenging, especially when new studies with conflicting findings emerge. Moreover, the effectiveness of the living SRMA depends on comprehensive evaluation of the included studies, and any bias in evidence could hinder the tool's ability to provide accurate information.

Another challenge lies in the complexity of presenting nuanced clinical data in a simplified format. While the tool offers customization features to adjust the data presented, there is a risk of information overload, especially for patients with lower health literacy or unfamiliarity with complex statistical data. Ensuring that the PDA remains both informative and easy to use across a wide range of user demographics remains an ongoing challenge.

Despite these challenges, the PDA tool holds great potential to improve the shared decision-making process by offering an interactive platform that presents the most current evidence available. We continue to improve the visual design of decision aids, develop decision aids for other conditions, such as castration-sensitive prostate cancer. The proposed interactive PDA will integrate the data from ongoing living reviews to facilitate shared decision-making, which can provide precise and appraised evidence regarding the explicit benefits and harms of multiple treatment options and fully integrate these tools into living evidence workflow.

References

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