A Decision Aid for Colectomy in Recurrent Diverticulitis: Development and Testing

Alexander T Hawkins, Andrea Fa, Samuel A Younan, Srinivas Joga Ivatury, Kemberlee Bonnet, David Schlundt, Elisa Gordon, Kerri Cavanaugh

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Abstract

Background: Diverticular disease is a common gastrointestinal diagnosis with >2.7 million clinic visits yearly. National guidelines from the American Society of Colon and Rectal Surgeons state that “the decision to recommend elective sigmoid colectomy after recovery from uncomplicated acute diverticulitis should be individualized.” However, tools to individualize this decision are lacking.

Objective: Our aim was to develop an interactive educational decision aid to facilitate effective surgeon and patient communication about treatment options for recurrent left-sided diverticulitis.

Methods: We used a modified design sprint methodology to create a prototype decision aid. We engaged a multidisciplinary team and adapted elements from the Ottawa Personal Decision Guide. We then iteratively refined the prototype by conducting a mixed-methods assessment of content and usability testing involving cognitive interviews with patients and surgeons. Findings informed the refinement of the decision aid. Further testing included in-clinic feasibility review.

Results: Over a four-day in person rapid design sprint including patients, surgeons, and health communication experts, we developed a prototype of a diverticulitis decision aid comprised of an interactive website and handout with three discrete sections. The first section contains education about diverticulitis and treatment options. The second section clarifies the potential risks and benefits of both clinical treatment options (medical management vs colectomy). The third section invites patients to participate in a values clarification exercise. After navigating the decision aid, the patient prints a synopsis that they bring to their clinic appointment where it serves as a guide for shared decision-making.

Conclusions: Design sprint methodology emphasizing stakeholder co-design and complemented by extensive user testing is an effective and efficient strategy to create a decision aid for patients living with recurrent diverticulitis facing critical treatment decisions.

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Original Manuscript

Original Paper

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A Decision Aid for Colectomy in Recurrent Diverticulitis: Development and Testing

Abstract

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surgeon and patient communication about treatment options for recurrent left-sided diverticulitis.
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Keywords: design sprint; diverticulitis; decision aid; shared decision-making

Introduction:

Diverticular disease is the eighth most prevalent outpatient gastrointestinal diagnosis with >2.7 million clinic visits yearly. Diverticulitis accounts for >216,000 inpatient admissions, with an aggregate cost of $2.2 billion.[1] While most cases of uncomplicated diverticulitis are treated with antibiotics alone, the incidence recurrence after an initial episode is as high as 35%.[2-7] A decade ago, elective resection was recommended after two episodes of uncomplicated diverticulitis or a single episode in young patients.{Roberts, 1995 #53}[8] This practice was based on the idea that recurrence and younger age at onset comprised a more “virulent” syndrome at greater risk for recurrence. These assumptions have recently been challenged and refuted. National guidelines from the American Society of Colon and Rectal Surgeons (ASCRS) in 2020 recommended that “the decision to recommend elective sigmoid colectomy after recovery from uncomplicated acute diverticulitis should be individualized.”[9] However, little guidance is available on how to personalize this decision with each patient.

No evidence indicates the superiority of observation or surgery for recurrent diverticulitis. Surgical complications are well described and include mortality, the need for an ostomy, infection, and other morbidity.[10-12] Conversely, inappropriate observation can lead to continued recurrence with an increased risk of hospitalization and emergency surgery as well as a decreased quality of life. [13, 14] Choosing the option most consistent with patient values is critical for optimizing outcomes. [15, 16] Additionally, there is significant national variation in standardized colon resection ratios for recurrent diverticulitis, with surgeon density and hospital level factors serving as the main drivers of resection as opposed to patient factors.[17] No research has examined the extent to which shared decision-making is occurring.

Educational decision aids (DA) and shared decision-making programs have been shown to improve outcomes and reduce decisional conflict in selecting a treatment for diseases including prostate cancer,[18] breast cancer,[19]{Whelan, 2004 #62} and joint replacement.[20]{Sepucha, 2019 #63} Recurrent diverticulitis shares a number of features with joint replacement; both are benign processes whereby treatment approaches are driven primarily by an improvement in quality of life. Despite this, an extensive literature review of PubMed and Google using the search term

"diverticulitis decision aid" identified no current decision aids for treatment options for recurrent left-sided diverticulitis. While we hypothesize that such a program would be beneficial for patients with recurrent diverticulitis to improve long-term patient outcomes, function, and satisfaction, there is a foundational gap in the field in that there are no decision aids available to support this key aspect of care. The objective of this research is to use rigorous methods engaging key stakeholders throughout the process to develop an effective decision aid to support selection of either a surgical or monitoring treatment approach in recurrent diverticulitis.

Methods

From December 12-15, 2022, we conducted a four-day design sprint at Vanderbilt University Medical Center in Nashville, TN. (Figure 1) Adhering to the International Patient Decision Aid Standards (IPDAS),[21, 22] we utilized a modified design sprint methodology developed by Google Ventures (Alphabet Inc, Mountain View, CA) to create a prototype decision aid for considering colectomy in the setting of diverticular disease.[23, 24] Design sprint methodology seeks to condense the potentially months long production cycle of debate, and instead focus a small team on producing a prototype in just a few days. This approach enabled us to rapidly develop a user-centered solution in the form of a prototype that could be tested and revised iteratively, as done elsewhere.[25] The design sprint team was comprised of 13 participants from diverse backgrounds including four surgeons, three behavioral scientists, two physician experts in decision aid development, one expert in health information technology, four patients who have undergone medical and surgical treatment of diverticulitis, and one caregiver of patients with diverticulitis. Core participants of the design sprint team met in person, and all key points of the design sprint were time-constrained to facilitate timely completion of the project. KB, a masters-level psychologist with extensive qualitative research experience, facilitated the sprint.

Ethical Considerations

The design sprint was deemed not human subjects research by the Vanderbilt Institutional Review Board (IRB). Participants were compensated for their time at a rate of $20 per hour for patients and $50 per hour for physicians. For the usability testing portion of the decision aid development, this study was approved by the Vanderbilt IRB (IRB#: 220707) and was deemed exempt from informed consent. Participants involved in the iterative refinement phase were compensated for their time at a rate of $50 per session for patients and $200 per session for physicians. This study was not registered as a clinical trial as it only entailed creation and usability testing of the decision aid. All data was maintained on a password encrypted database and the data was analyzed anonymously.

Figure 1. Flow sheet depicting the four-day plan for our diverticulitis decision aid design sprint with specific, measurable goals corresponding to each day.

Day 1 Defining the Problem	Day 2 Ideate	Day 3 Storyboard	Day 4 Prototype
- Identifying Goals - Outlining current understanding and practices - Selecting Sprint Target	- Reviewing existing Decision Aids - Brainstorming Solutions - Selecting solution	- Solution refinement - Decision Aid content refinement	- Development of initial prototype

Decision Aid Design

Day 1 – Defining the Problem

On Day 1, we began by defining the overall goals for our project. Our decision aid aimed to: 1) be a tool for patients to make the best personalized decision possible with the available information; 2) be usable, sustainable, and adaptable; and 3) empower patients and facilitate communication with their surgeons when making a decision regarding colectomy. We then introduced our group's prior qualitative investigation to assess the key factors that both patients and surgeons evaluate when considering colectomy or observation. Themes identified included limited knowledge about treatment options, difficulty in communication, and uncertainty in important outcomes related to the decision-making process. [26, 27] Next, using the input from our core sprint group and stakeholders, we created a "workflow map" outlining a diverticulitis patient's experience within the healthcare system. (Multimedia Appendix 1) Drawing upon these themes, we curated a list of potential problems that might arise during each step of the workflow, identifying areas where our decision aid would be able to improve both patient and clinician decision making.

We met via videoconference with expert stakeholders (e.g., patients, gastroenterologist with a focus on diverticulitis, community surgeons) to assess perceptions of how best to enhance the workflow map and further understand the problems at each node of the patient's experience within the healthcare system. Each "problem" was then re-framed into an "opportunity" or "question" using the How Might We method (HMW). (Multimedia Appendix 1) The HMW statements were grouped into themes to identify the most useful ideas for building the decision aid. Major categories identified included: 1) Facilitating Communication, 2) Decision Aid Characteristics, 3) Educational Elements, 4) Design Features and 5) Functionality.

At the end of the conclusion of the first day, we had identified a "sprint target", a place in the workflow that our group hypothesized the decision aid would be utilized. This target was aimed to address the concept: "HMW add efficiency for both the patient and provider?" as the target for the sprint. Thereafter, we frequently revisited our primary goal, reflecting, "Does this design choice meet the need proposed in our goal specifically within the context of our target timeline?".

Day 2- Ideate

On day 2, we reviewed existing decision aid designs from other areas in healthcare[18, 25, 28]. These were chosen by our decision aid expert as examples of high-quality decision aids from a range of clinical decisions. They were presented so that the group could get a wide idea of potential elements to include in the diverticulitis decision aid. We also interviewed sprint group members who had previously designed and implemented decision aids to elicit insight about the development process. Next, this information was contextualized in the setting of our goals, and ideation sessions were held in which each member generated as many ideas as possible in the form of sketches or simple drawings to represent the concept. (Multimedia Appendix 2) Thereafter, the team voted to select the most promising solutions, utilizing a democratic voting process. A "super voter" was used to break ties, prevent stagnation, and facilitate the creative process. The super voter is an integral part of the design process. To avoid the tendency to move forward with several good ideas, it is the job of the super voter to decide what exactly will be prototyped. The super voter is excluded from the first round of voting for the shortlist of potential options. Once the group has voted and explained their votes, the super voter selects the strongest concepts to move forward. In our instance, the super voter was the PI.

Day 3- Storyboard

On day 3, design solutions were critiqued and further refined to better meet the need of the decision aid in the context of our patient population. (Multimedia Appendix 3) Each solution was analyzed in a group

setting; wherein potential pitfalls and improvements were discussed in turn. At the end of the process, the chosen solutions were adapted into a new workflow of our ideal decision aid. We reviewed this workflow iteratively, until we created a storyboard of both a website and handout for use by patients.

Day 4- Prototype

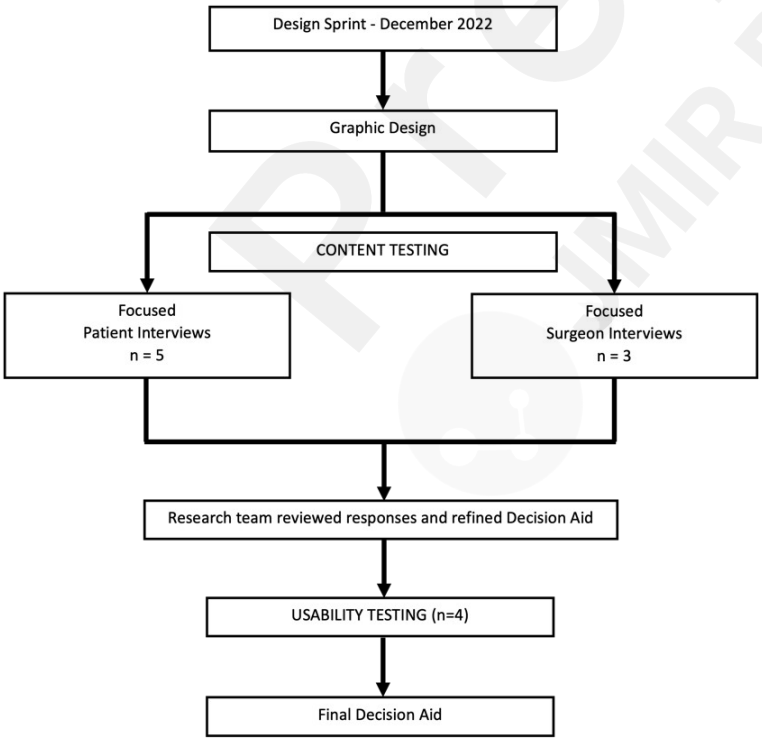
Finally on day 4, we created a mock-up of the website and handout. Attention was paid to the content of each webpage, ensuring it would be applicable and understandable to the widest audience possible.

Usability Study Design

The mockup was further developed by the Vanderbilt design department into a working prototype website and handout. This website underwent review and revision by a group of content and design experts including members from the original sprint team.

We conducted iterative testing and refinement via a mixed methods study utilizing semi-structured interviews and surveys from February to May 2023. (Figure 2) Patients were recruited from the Vanderbilt Colorectal Clinic. Inclusion criteria included patients who had previously been seen in consultation for colectomy for recurrent diverticulitis. Exclusion criteria included patients with colo-vesical fistulas, colo-vaginal fistulas, persistent pain, and colonic strictures, as these conditions markedly favor surgical intervention. Semi-structured interviews were conducted over video conferencing using a standardized script developed by a team with experience in qualitative research and patient care. (Multimedia Appendix 4) Subjects interacted first with the website and then the handout. We used video recording to collect responses. We utilized both scripted questions as well as the thinking aloud technique to assess interaction with both elements of the decision aid. Patients also completed surveys including the Net Promoter Score (1-item)[30], the System Usability Scale (SUS; 10-item)[31], and the Cultural Sensitivity Questionnaire (10-item)[32].

Figure 2. Flow chart demonstrating overall design strategy and steps, beginning with the design sprint and moving towards iterative refinement and usability testing.



Analysis plan

General satisfaction scores were analyzed using top box scoring with the two top scores on a 7-point

Likert scale considered to be “top box”. The composite SUS score was calculated by reverse scoring even-numbered items so that all items were scored in the same direction. Composite scores were calculated by summing the item responses and multiplying them by 2.5 so that they fell on a scale of 0-100 with 100 representing the greatest usability. Summary statistics were calculated for the composite scores and frequencies are reported for the overall rating of user-friendliness. The Cultural Sensitivity Questionnaire was calculated by dividing the score for each question by the adjusted question number. A category score greater than 2.5 denotes a category that is acceptable; scores of 2.5 or less denote categories that are unacceptable.

For analysis of the open-ended interview questions, two authors organized the responses by group (e.g., barriers and facilitators) and conducted a thematic analysis of all responses based on the steps outlined by Braun and Clarke.[33] First, we reviewed all the responses and generated initial themes and categories. These categories were reviewed by two of the authors (AF & KB) and confirmed by a third author (AH). Finally, we categorized the themes to provide a description and examples in this report. We quantified the comments in each category to provide a frequency related to participants’ ideas, suggestions, and ideas provided related to the usability of the decision aid.

After revisions from this group, the decision aid underwent iterative usability testing using focused interviews with both patients and surgeons of the target population. In addition to the sprint participants, we met with experts and stakeholders outside the group, including a community surgeon, healthcare professionals with experience designing and implementing decision aids, and additional patients and caregivers.

Results

At the end of the design sprint, we successfully developed a prototype of a diverticulitis decision aid in the form of a complimentary interactive website and handout. The decision aid has three discrete sections.

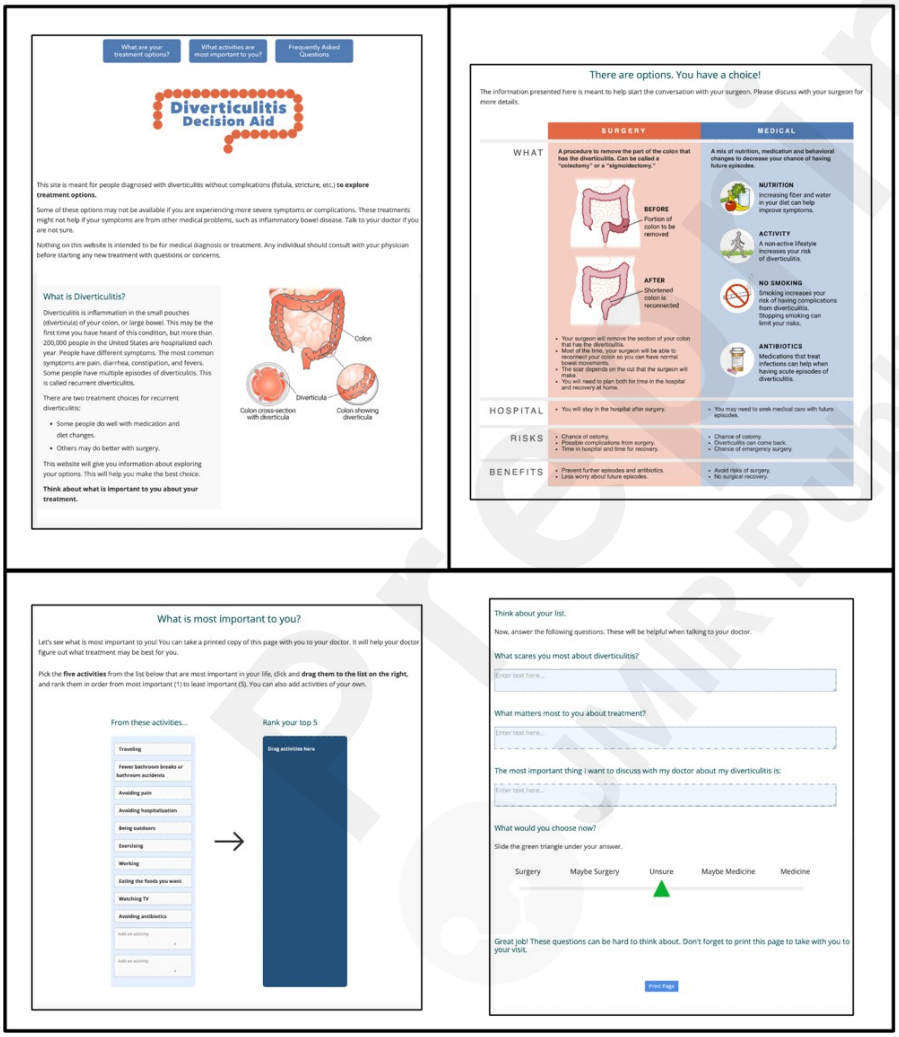
The first section (Figure 3) includes background information designed to increase patient’s knowledge about diverticulitis as a disease entity, and to introduce the treatment options of colectomy and observation. This section provides a generic working definition of diverticulitis as a disease process and encourages patients to engage the website while reflecting on their values regarding their treatment.

The second section (Figure 3) includes detailed information about each treatment option and a section on the risks and benefits of surgery and observation. This section provides patients with a framework for what their life might look like should they decide on colectomy or observation, empowering them with information to reflect on prior to their surgical appointment. After patients gain a general understanding of the disease process and their options, they proceed to the interactive portion of the decision aid.

In the third section (Figure 3), patients are invited to engage in a values clarification exercise that will help them prepare for a discussion with their surgeon. They are instructed to pick the five activities that are most meaningful in their life and rank them in order from most to least important. Thereafter, patients are provided the opportunity to engage in self-reflection regarding fears, priorities, and important topics they want to discuss with their surgeon concerning their diverticular disease, through several open-ended questions to document their answers prior to their appointment. Lastly, on a Likert scale between ‘surgery,’ ‘maybe surgery,’ ‘unsure,’ ‘maybe medicine,’ and ‘medicine,’ patients are asked to pick what they would choose now for their treatment option after reading the relevant background information and completing the decision aid. Following completion, patients can print and/or email a report of this activity.

Patients are expected to bring their completed clarification exercise to their clinic appointment to help initiate the conversation with their surgeon. The decision aid serves as a guide for shared decision making and equips surgeons with the relevant information to help guide patients in seeking the best individualized treatment for their recurrent uncomplicated diverticulitis.

Figure 3. Graphic depicting the diverticulitis decision aid website pages. The first section contains background information about diverticulitis. The second section explains the different treatment options. The third section is a values clarification exercise for patients.



After initial drafting based on the design sprint prototype, the Diverticulitis Decision Aid underwent two phases of usability testing with patients. First, semi structured interviews were conducted with both patients and surgeons with associated surveys. Table 1 reports patient demographics for both rounds. (Table 1) Table 2 reports patient satisfaction with the decision aid from the initial round. (Table 2) Overall, patients reported being highly satisfied with both the website and the handout. Regarding the Net Promoter Scale, 80% reported that they would be “Extremely Likely to Recommend Website”. The System Usability Scale Scores were both > 90%. The Cultural Sensitivity Questionnaire mean score was 3.7, indicating acceptable sensitivity. Almost

universally, surgeons were positive about the tool and in agreement with the content and material. Illustrative quotes from the patient and surgeon interviews are reported in Tables 3 and 4 respectively. (Tables 3-4)

Table 1. Baseline demographics of patients who participated in both rounds of usability testing of the diverticulitis decision aid prototype.

Variables	**Total (n=9)**	**Round 1 (n=5)**	**Round 2 (n=4)**
Age (years), Mean (SD)	56.7 (8.6)	58.2 (10.2)	55.0 (6.0)
Female Gender, n (%)	4 (44%)	2 (40%)	2 (50%)
Race, n (%)			
White	6 (67%)	3 (60%)	3 (75%)
African American	3 (33%)	2 (40%)	1 (25%)
Education			
College Graduate	6 (67%)	3 (60%)	3 (75%)
Post Graduate Degree	3 (33%)	2 (40%)	1 (25%)
Employment			
Full time	7 (78%)	4 (80%)	3 (75%)
Retired	2 (22%)	1 (20%)	1 (25%)
Insurance			
Private	6 (67%)	4 (80%)	2 (50%)
Other	3 (33%)	1 (20%)	2 (50%)
Health Literacy Support			
Never	9 (100%)	5 (100%)	4 (100%)
Health Status			
Good	2 (22%)	1 (20%)	1 (25%)
Very good	5 (56%)	3 (60%)	2 (75%)
Excellent	2 (22%)	1 (20%)	1 (25%)

Table 2. Patient survey responses after initial round of usability testing of the diverticulitis decision aid.

	n=5
Overall, I am satisfied with the ease of completing the task in this scenario, Topbox	5 (100%)
Overall, I am satisfied with the amount of time it took to complete the task in this scenario, Topbox	5 (100%)
Overall, I am satisfied with the support information when completing this task, Topbox	4 (80%)
Rate your overall experience with this website, Topbox	5 (100%)
Rate your overall experience with this handout, Topbox	5 (100%)
Net Promoter Scale	
Extremely Likely to Recommend Website	4 (80%)
System Usability Scale	
Website, mean (SD)	93 (4.1)
Handout, mean (SD)	93 (4.1)

Cultural Sensitivity Questionnaire, Mean (SD)	3.7 (0.16)

Table 3. Illustrative quotes from patient focused interviews during content testing of the diverticulitis decision aid.

		THEMES		
		Initial Impression	**Content**	**Navigation**
Web Page	Home Page	"Very much about the patient, empowers the patient"	"I didn't realize there was more below it"	"Navigates immediately to options, does not scroll down to view home page"
	Options	"I'm a number/ details guy and I'd like a little more details."	"I like the images. Simple but shows exactly what you it is."	"Navigates to next page using bottom button without issue."
	Value Clarifications	"Gives you talking points when going into your doctors visit."	"Pain was the primary symptom, not on the list. "	"Easy to navigate back to from other pages."
	FAQ	"Very helpful; I like FAQ and Q&As to give an introduction."	"Can you write from the patient's point of view?"	"Big red "forward/backward" arrow might be good for navigation."
Handout		"I could fill this out in a doctor's office."	"Is this really any different than the website? If I had this, would not use the website."	"The handout doesn't tell you there's a backside."

Table 4- Illustrative quotes from surgeon focused interviews during content testing of the diverticulitis decision aid.

		THEMES		
		Initial Impression	**Content**	**Navigation**
Web Page	Home Page		"Simple and straightforward"	"Proceeds to treatment options immediately"
	Options	"Overall good overview."	"Chance of Ostomy" as first option is kind of fear mongering as it's very unlikely	"Navigates easily to next page using bottom button."
	Value Clarifications	"Meant to get at the root of the problem."	"Did not initially understand click and drag."	"Navigates to FAQ."
	FAQ		"Likes the simplicity; don't want it to be too complicated or onerous for the patient."	"Navigates back to previous pages using the top bar easily."
Handout			"Would work best if they had it prior to surgical consultation. If they could fill it out either at home or in the waiting room waiting to see the surgeon."	

Discussion

We applied a modified version of the design sprint methodology to create an interactive decision aid in the form of a deliverable webpage and handout aimed at facilitating communication between patients and surgeons alike. By using this design approach, we rapidly created a prototype that is constructed to be informative, sustainable, adaptable, and widely applicable. Our prior research identified several key decisional needs in the complex decision-making process that we made sure to address in our final product.[26, 27] We incorporated feedback from our expert consultants, stakeholders, and patients to ensure the decision aid was informative yet easy to use and relevant. Examples of this include changing the website navigation to make it more intuitive, the addition of pain to the values clarification exercise and additional content regarding ostomies to both the information portion and the FAQ sections. Assessments of satisfaction and usability indicated high levels of both with adequate cultural sensitivity.

This study has several strengths. This is the first DA designed to facilitate difficult conversations between surgeons and patients with recurrent uncomplicated diverticulitis about treatment options per ASCRS guidelines.[9] Our design process offers a road map for quality decision aid development that builds on IPDAS guidelines, incorporates feedback from stakeholders, and highlights the importance of iterative usability testing. Initial testing indicates high levels of satisfaction and usability. In addition, the DA is online, which makes it relatively easy to update as information changes. This allows for easier integration with health care systems and disseminating to patients before a visit.

There are limitations to this study. The initial design sprint was performed at a single academic

medical center, which raises concerns about generalizability. Although a standard 5-day approach is recommended as initially developed by Google Ventures[23, 24], this relies on the premise that participants have a strong understanding of the disease process as well as user needs and challenges. Additional time or informative sessions may be needed to lay the necessary groundwork prior to initiating the sprint design process.

While we present here the initial development of this decision aid, additional work is required before it may be integrated into clinical practice. Next steps include feasibility testing and preliminary data collection on implementation of the decision aid in the form of a pilot trial, followed by a multicenter, randomized controlled trial comparing the interactive decision aid with standard clinical consultation. During these stages, we will use focused interviews of both providers and patients to further improve the tool. Should efficacy be demonstrated, implementation study will be crucial to ensure appropriate integration into clinical workflow.

Our study illustrates the use of a modified version of a design sprint methodology to create a decision aid for patients with recurrent diverticulitis considering colectomy aimed at facilitating communication between patient and clinician that was well received by patients. Our experience with this method illustrates the value of the design sprint methodology in the creation of tools to improve the overall care of patients.

Acknowledgements

The authors wish to thank Shilo Anders PhD as well as all the patients and physicians who participated in the development of the decision aid.

Data Availability

The data sets generated during and/or analyzed during this study are available from the corresponding author on reasonable request.

Conflicts of Interest

None declared.

Abbreviations:

ASCRS: American Society of Colon and Rectal Surgeons

DA: decision aid

HMW: how might we

IPDAS: international patient decision aid standards

NPS: net promoter score

SUS: system usability scale

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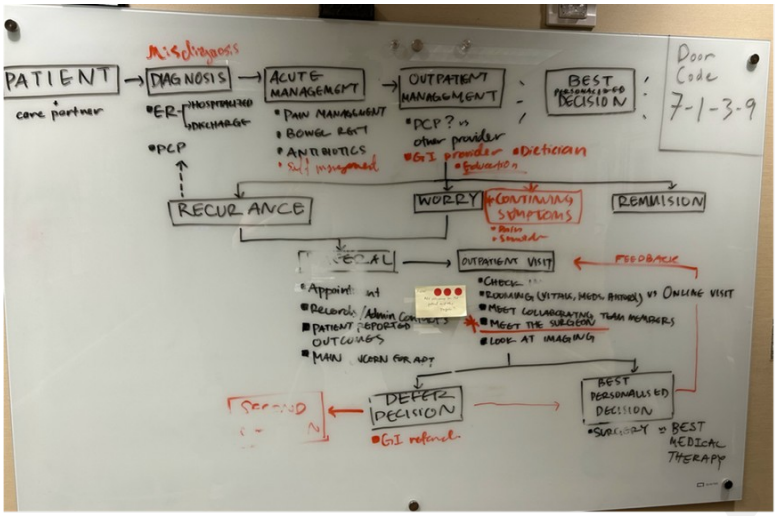
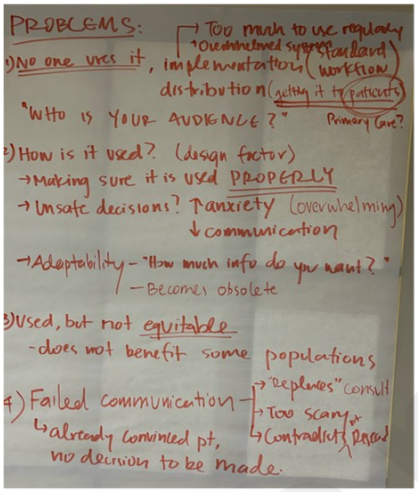
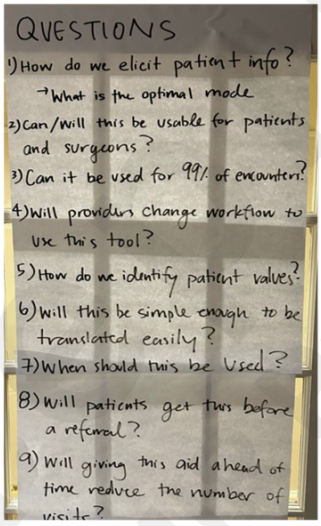
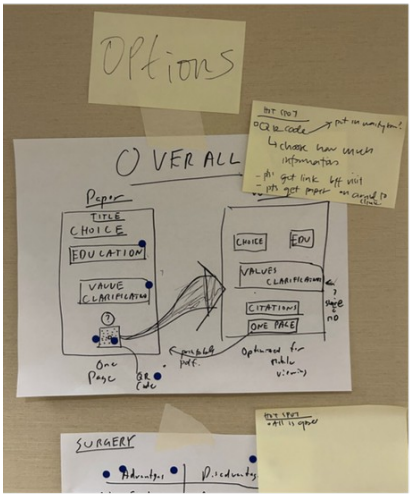
Multimedia Appendix 1: [Day 1 images]

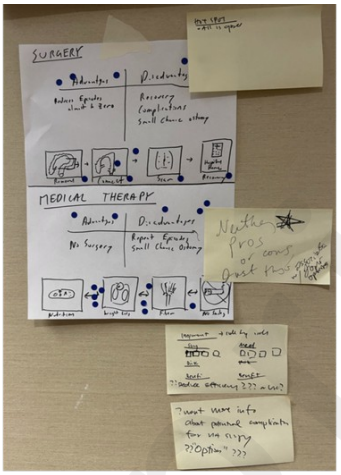


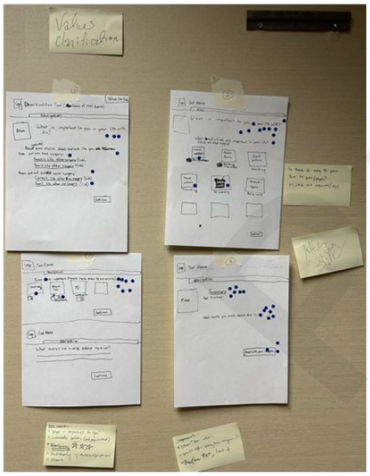


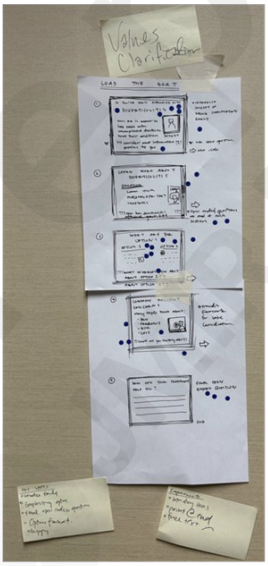


Multimedia Appendix 2: [Day 2 images – ideate with voting]









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Multimedia Appendix 3: [Day 3 image – storyboarding]

Multimedia Appendix 4: [Usability testing interview script]

WEBSITE

Interview Instructions

- Now we will move on to the website
- We will start by having you take a few minutes to get familiar with the website
- Please talk out loud as you're looking at this website and moving through it. Feel free to share your initial thought process and impressions; there are no right or wrong answers.
- Then I'll ask you a few questions about your experience both overall and more specifically

- Please take some time to review this website

[Ask for each website page]

Initial Impressions

- Overall, what is your first impression of this page?
- What is this page meant to do?

Navigation

- What made this page hard to navigate?
- What would make it easier to navigate?

Content

- What do you think of the content of this page?
- What topics do you think were the most helpful?
- What content is hard to understand?
- What content is missing?
- What content should we cut?

Searching Tasks

1. What are the pros/cons of surgery for diverticulitis?

2. What are some things you need to consider when thinking about surgery/medical treatment? (values clarification page)

3. What can you eat if you have diverticulitis?

If participant lands on wrong page, ask (as needed):

- Did this page answer that question?
- Can you tell me where on this page the answer is?

- Is there anywhere else you can look that might answer the question better?

When participant lands on correct page ask:

- As you navigated your way to [the correct page], what navigation steps should have happened but didn't?
- What navigation steps did happen, but shouldn't have?

For each question, prompt the following response.

How easy was it to find what you were looking for?	Not at all Easy	A Little Easy	Somewhat Easy	Very Easy	Entirely Easy
How satisfied are you with the information presented in this page?	Not at all Satisfied	A Little Satisfied	Somewhat Satisfied	Very Satisfied	Entirely Satisfied

Overall

- How useful was this website for people with diverticulitis?
- How can we make this website more user-friendly to people navigating the website?
- What can we improve in the content?
- What section was most helpful?
- What section was least helpful?
- How do you see yourself using this website?

After scenario questionnaire → Redcap?

For the next three questions please rate how much you agree or disagree with each statement that I will read, rating from 1 (strongly agree) through 7 (strongly disagree).

1. Overall, I am satisfied with the ease of completing the task in this scenario.

2. Overall, I am satisfied with the amount of time it took to complete the task in this scenario.

3. Overall, I am satisfied with the support information (on-line help, messages, documentation) when completing this task. [Re: #3, If participant asks: “Support information” can mean the glossary, the references/reference citations, etc.]

Satisfaction score (1-5)

How Satisfied are you with your experience with this website?

Rate your **overall** experience with this website.	Not at all satisfied			Neutral			Entirely satisfied
	1	2	3	4	5	6	7

Net promotor Score (NPS)

How likely are you to recommend this website?

Not at all likely					Neutral					Extremely likely
0	1	2	3	4	5	6	7	8	9	10

SUS Score (usability)

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Instructions: *For this next set of questions, I'll read several statements and ask you to rate how much you disagree or agree with each one, rating from 1 (strongly disagree) through 5 (strongly agree). In these statements, the word* ***"system" means "website"****.*

System Usability Scale (SUS)	**Strongly Disagree**				**Strongly Agree**
1. I think that I would like to use this system frequently.	1	2	3	4	5
2. I found the system unnecessarily complex.	1	2	3	4	5
3. I thought the system was easy to use.	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system.	1	2	3	4	5
5. I found the various functions in this system were well integrated.	1	2	3	4	5
6. I thought there was too much inconsistency in this system.	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly.	1	2	3	4	5
8. I found the system very cumbersome to use.	1	2	3	4	5
9. I felt very confident using the system.	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system.	1	2	3	4	5

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535 **HANDOUT**

536 Interview Instructions

537 • We will start by having you take a few minutes to get familiar with [the handout].

- Then I'll ask you a few questions about your experience both overall and more specifically
- Think out loud
- Please take some time to review this handout

Initial Impressions

- Overall, what is your first impression of this handout?
- Can you describe to me what the purpose of this handout is?

Readability

- What do you think about the organization of the handout?
- What is confusing in the instructions?

Content

- What do you think of the content of this handout?
  - What content is hard to understand?
  - What content is missing?
  - What content should we cut?
- What topics do you think were the most helpful?

Overall

1. What were your expectations for this handout?
   a. How useful is this handout with regards to the website? ~~Which do you prefer?~~
2. How could you see yourself using this handout?
3. What suggestions do you have for improving handout content, navigation, and design?

5. What section of the handout interested you most?

6. What section do you think people will be most drawn to?

REDCAP [do not go to the next section until prompted by the interviewer]

How Satisfied are you with your experience with this handout?

Rate your **overall** experience with this website.	Not at all satisfied			Neutral			Entirely satisfied
	1	2	3	4	5	6	7

Net Promoter Score (NPS)

How likely are you to recommend this handout?

Not at all likely					Neutral					Extremely likely
0	1	2	3	4	5	6	7	8	9	10

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580 ENDING QUESTIONS:

581 Cultural Sensitivity

582 For the next set of questions, I will ask how much you agree or disagree with each statement I read.
583 The response options are: Strongly Agree, Agree, Neutral/Unsure, Disagree, and Strongly Disagree.

Cultural Sensitivity Questions						
1.	The words, phrases, and expressions are familiar to the intended audience.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
2.	The words, phrases, and expressions are free from stereotypical meaning.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
3.	The message(s) is(are) linked to sources credible to the intended audience.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
4.	The message(s) address(es) stereotypes and myths.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
5.	The graphics accurately depict the physical features (hair style, clothes, etc.) of the intended audience.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
6.	Symbols are representative of the intended audience.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
7.	The stature and/ poise of the individual(s) is representative of the gender and social roles of the intended audience.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
8.	The educational materials are culturally sensitive to ethnic minority communities.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
9.	The words, phrases, and expressions are familiar to the intended audience.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree
10.	The website materials seemed neutral and unbiased. That is, the website was neither in favor of nor against hand/upper limb transplantation.	Strongly Agree	Agree	Neutral/ Unsure	Disagree	Strongly Disagree

W
hat can we do to improve the cultural sensitivity of the website or handout?

Demographics: (at end)

- Age
- Gender
- Hispanic/Latino
- Race
- Marital Status
- Education
- Employment status
- Occupation
- Income
- Health Insurance
- Do you have someone to help you when reading instructions/processing information?
- Health Status
- First episode of diverticulitis
- How often do you have diverticulitis episodes?
- Did you have surgery? When, what. Experience with ostomy
- Questions/Computations

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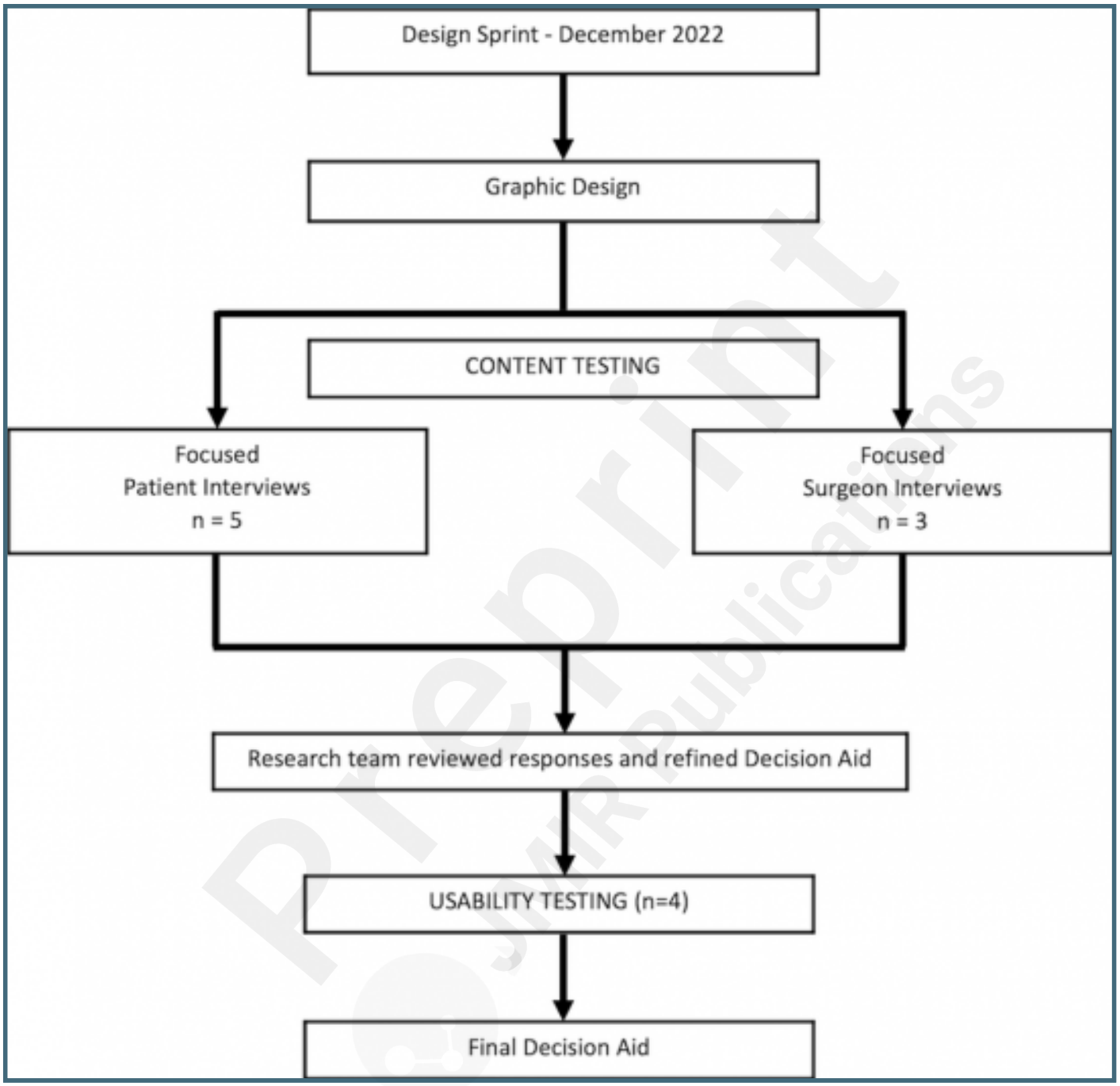
Supplementary Files

Figures

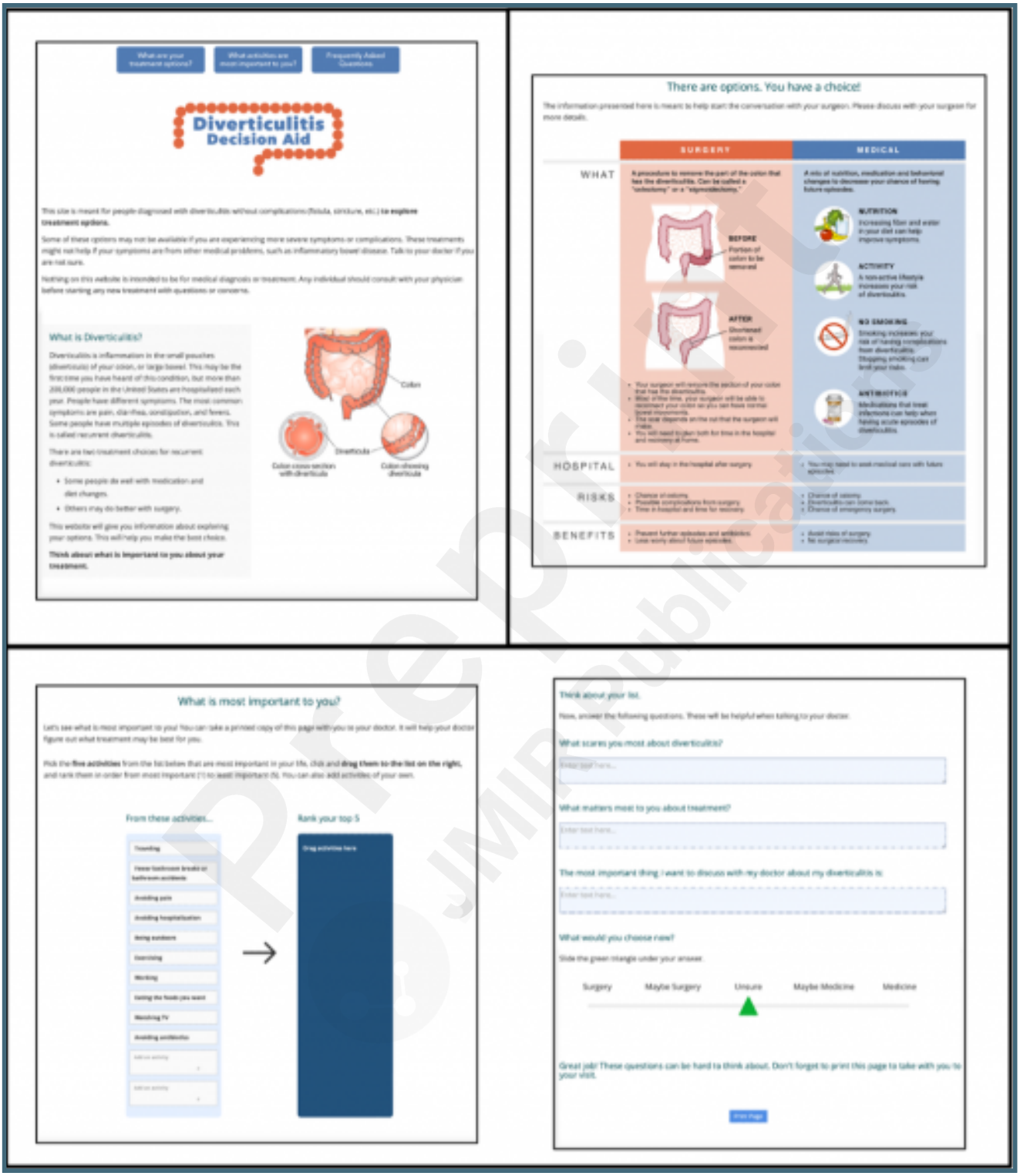
Flow sheet depicting the four-day plan for our diverticulitis decision aid design sprint with specific, measurable goals corresponding to each day.

Day 1 Defining the Problem	Day 2 Ideate	Day 3 Storyboard	Day 4 Prototype
- Identifying Goals - Outlining current understanding and practices - Selecting Sprint Target	- Reviewing existing Decision Aids - Brainstorming Solutions - Selecting solution	- Solution refinement - Decision Aid content refinement	- Development of initial prototype

Flow chart demonstrating overall design strategy and steps, beginning with the design sprint and moving towards iterative refinement and usability testing.



Graphic depicting the diverticulitis decision aid website pages. The first section contains background information about diverticulitis. The second section explains the different treatment options. The third section is a values clarification exercise for patients.



Multimedia Appendixes

Day 1 images.
URL: http://asset.jmir.pub/assets/a547ad0b8e78329bec4dbbcf18c3adab.png

Day 2 images – ideate with voting.
URL: http://asset.jmir.pub/assets/5608222887a4107861c41cfaff9da718.png

Day 3 image - storyboarding.
URL: http://asset.jmir.pub/assets/e70ea3218c7be902002c8e503943ef31.png

Usability testing interview script.
URL: http://asset.jmir.pub/assets/540f0e2128b058c3ec40aba53384b2ee.docx