INOVA™

Resource Management System (RMS)

Data Collection and Analysis: Round 1

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Group E

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Background

Project Concept Statement

Resource Management System (RMS) is a robust mobile application that supports the professional and academic activities of surgical and podiatry residents at INOVA hospitals. RMS serves as a repository of selected resources identified by both residents and residency program instructors. These resources are essential for the development of industry-leading general surgeons and podiatrists. RMS includes additional features that enable residents to manage their time and responsibilities, to prepare for exams, and to give feedback to educators on how to improve the overall quality of education and training within the residency programs.

Purpose of Round 1

Our team wanted to know how well we addressed preliminary user concerns and feedback, collected in Dec 2014, about the RMS prototype Alpha version. Our goal for this phase of the project was to collect additional feedback and to make user-supported revisions to the prototype based on both user data and best practices in mobile UX design. Round 1 user experience research focused on task structure and logical flow within the application.

Below is a snapshot of our overall process:

1. Review user feedback from Alpha version
2. Develop RMS project management plan
3. Revise Alpha version and prep for testing
4. Conduct Round 1 user testing
5. Analyze data from Round 1 user testing
6. Conduct Round 1 revisions
7. Prepare for Round 2 user testing

The remaining sections of this document describe the research goals, user experience research design, data results, inventory of changes, and examples of design changes from Alpha to Beta versions of the application.

Research Design

Goals and Research Questions
Table 1. Goals, objectives, and research questions.

Goals	Objectives	Research Questions
1. To identify what **features/functions** are **most helpful** to residents in planning learning tasks.	Determine if the cognitive affordances of the icons and button labels clearly convey the intended meaning.	Are the cognitive affordances of the icons and button labels clearly conveying their intended meaning? Do affordances allow the user to intuitively understand the purpose of the application and employ natural task-completion strategies?
2. To identify if **physical actions** (buttons) are visible and efficient for users.	Determine if the objects and layout of the RMS Alpha prototype are sufficient in size and accessibility. Determine if the font size, background, text, and object color assignments are noticeable and legible.	Are users able to correctly manipulate targets within the application?
3. To identify a **logical structure and flow** of the application.	Determine if the structure and features of the app help user accomplish their intended actions. Determine if the task flow is intuitive.	Do cognitive affordances allow the user to access each planned task? Does the task screen show users what they expect? Do user expectations match how the task functions?

Participants

Our participant profile revolves around medical residents. Our user demographic consists of adults with a medical degree and who are in a residency program at a hospital. They are familiar with technology and all have a cell phone.

Nineteen individuals participated in Round 1 user experience research. Two of the participants were ASTEC administrators and seventeen were general surgery residents from all five post-graduate years, including the incoming education chief resident. IRB approval was granted prior to research and development of the prototype.

Methodology

Testing methodologies included pre- and post-testing survey and think-aloud task-focused activities. Surveys were completed by participants and later analyzed by the data analysis team. In addition, test administrators participated in an hour-long meeting with ASTEC stakeholders after user experience research. During this meeting, we were provided general feedback on testing and collected feedback from stakeholders on desired application functions and features.

Round 1 testing focused on the following user affordances: cognitive (helps the user in knowing something), physical (helps user physically do something), sensory (helps user sense something), and functional (helps user accomplish work - back end usefulness). Because of the functional changes that may result from this round of testing, data collection of emotional impact was minimal in this stage.

Testing and Data Collection

Participants were randomly divided into three groups to make testing and data collection more manageable. Each group consisted of 6-7 users and 1 test administrator. Participants accessed the RMS Alpha prototype on their own mobile devices. For user testing, data was collected using paper surveys and paper evaluator sheets.

Test Date: 03/19/2015
Test Location: Classroom at ASTEC, INOVA Fairfax Hospital
Test Administrators: Candice Bowes, Dina Saffouri, Justin Bowes

Testing and data collection procedures were as follows:
1. Introduction and purpose
2. Instructions
3. Q&A before testing
4. Pre-test survey administration
5. Think-Aloud discussion
6. Post-test survey administration
7. Closing remarks

Pre-Test Survey

The pre-test survey consisted of demographic information and questions pertaining to participant expectations of a resource management system before seeing the prototype.

Demographic information:
- Age
- Gender
- Residency program and year
- Brand of mobile device used for testing
- How many applications they use regularly
- Do you use your phone to study? Y/N

User Experience:
- I often use the Internet to find resources.
- I have difficulty finding resources I have used in the past.
- I want better ways to find study materials.
- I access content to study on my phone on a daily basis.
- I feel comfortable identifying application icons.
- I often find resources for study materials that I would like to share with other residents.
- I like receiving recommendations for resources for study materials from other residents.
- I am quite familiar with what a resource management system is.
- I think a resource management system can help me study.

Post-Test Survey

The post-test survey was administered after testing and included the following questions:

- I found it easy to complete tasks in the RMS.
- The icons on the RMS were intuitive.
- It was clear what the next steps should be for accessing the targeted content.
- It was hard to go back to a previous page once I had drilled down to a specific one.
- The font size was easy to read.
- The font color was easy to read.
- The backgrounds on the screens facilitated my view of the content.
- The RMS was visually appealing.
- I would use this tool to study.
- This tool would not be useful to me.
- I would use the calendar feature to track my schedule.

- I think the announcements feature would be helpful.
- I think the feedback feature would be helpful.

Think-Aloud and Discussion

Think-alouds were done face-to-face with the facilitator and evaluators asking the participants to verbally express their thoughts about their interactions with the RMS Alpha prototype and to discuss their experiences with it during the session. Participants were asked to perform several application tasks. Test administrators facilitated discussions and collected data using identical scripted templates.

Questions were both structured and unstructured to assess the effectiveness of the affordances: cognitive, physical, sensory, and functional.

User Tasks:
1. Navigate to and access the Tutorial
2. Navigate to and access the Calendar
   a. Select Month view
   b. Access resource associated with event
   c. Select Day view
   d. Add an Event
3. Navigate to and access Resources
   a. Search for resources
   b. Select a search result
4. Navigate to and access Feedback
   a. Complete a pending evaluation
5. Navigate to and access Announcements
6. Logout of the application

Sample discussion questions:
- How would you describe your initial reactions as you interacted with the system?
- How would you describe this system to someone who has never seen it before?
- What parts of the design are clear or not clear?
- What suggestions for design changes might you make?

Reflections from Test Administrators

Having the residents talk through the application during the user experience research was helpful as there were suggestions that we had not thought to incorporate into the application, such as syncing the calendar in the application to the calendar that already exists on their phone. It was also interesting to see how the residents received the idea of the RMS. Participants often exclaimed "cool" or other phrases indicating they were engaged and excited while going through the prototype. Each one of the residents expressed a sincere interest in using this application should it "go live." One resident in particular really liked the announcement feature of the application. He mentioned that

they get daily emails with important information that some of the residents may not check. Having it reiterated in an announcement on the phone would be helpful and assist in letting the residents know the urgency in the announcement.

Figures 1a and 1b. User experience research photos.
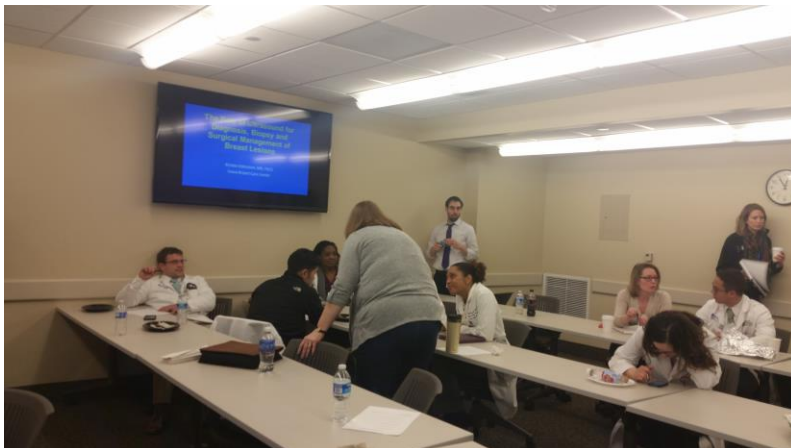
Data Summary and Results

Data analysis was lead by two team members not present during testing. This was done to avoid researcher bias. The analysis team reviewed all raw data sheets containing quantitative and qualitative data. Analysts were concerned that the quantitative data was skewed and applied additional focus on the qualitative data results to ensure a balanced analysis. The outcome of the analysis was an inventory of user feedback and proposed revisions. See **User Feedback and Ticket List** section of this document. This document was reviewed by the team to ensure data accuracy and then handed off to the development team to begin Round 1 revisions.

Highlights

- There was no issue with cell phone signal strength in the classroom, particularly with Verizon.
- Most participants agreed that they wanted better ways to find materials.
- Overall, the participants agreed that the font and color scheme of the application was readable, the icons were intuitive, and the application was visually appealing.
- Some participants had difficulty knowing next steps in the application and going back to previous screens.
  Note: This could be a function of poor usability or poor testing script, and will be evaluated before round 2.
- It was suggested to organize resources by the SCORE curriculum.
  Note: ASTEC has access to SCORE, but copyright issues associated with using that curriculum may involve INOVA's legal department.

Stakeholder Feedback
- Suggested that we look at Hopkins's program for further ideas on the feedback feature. We need to identify expectations of the evaluation function.
- The ability to upload patient files to the RMS app is not needed (system already in place in hospital) and doing so would be in violation of HIPAA laws.
- Suggested that we make this a web-based application.
  Note: We will need to evaluate whether they want a browser application or a responsive website design, and the reasons for wanting a web-based application.

Demographics Survey Result Data

Number of Users: 19 Total (9 Males and 10 Females)
Average Age: 31.2
Residency Year Totals:

PGY	Number of Users
1	3
2	5
3	2
4	3
5	1
6	5

Brand of Mobile Phone Used for Testing:
Apple/iPhone: 16, Samsung: 2, Android: 1

Number of Apps Used Regularly:

Range	Number of Users
<9	6
10-19	9
20-30	4

Number that use phone to study: 15 YES   4 NO

Pre-Test Survey: User Experience Data

Table 2. Pre-test survey results.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I often use the internet to find resources.				21%	79%
2. I have difficulty finding resources I have used in the past.	11%	26%	42%	21%	
3. I want better ways to find study materials.			16%	53%	31%
4. I access content to study on my phone on a daily basis.	5%	16%	11%	42%	26%
5. I feel comfortable identifying application icons.			5%	37%	58%

6. I often find resources for study materials that I would like to share with other residents.		16%	37%	21%	26%
7. I like receiving recommendations for resources for study materials from other residents.			16%	47%	37%
8. I am quite familiar with what a resource management system is.	11%	26%	37%	16%	10%
9. I think a resource management system can help me study.			74%	10%	16%

Post-Test Survey: User Reaction

Table 3. Post-test survey results.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I found it easy to complete tasks in the RMS.			11%	47%	42%
2. The icons on the RMS were intuitive.		5%	5%	53%	37%
3. It was clear what the next steps should be for accessing the targeted content.		16%	11%	47%	26%
4. It was hard to go back to a previous page once I had drilled down to a specific one.	10%	32%	10%	38%	10%
5. The font size was easy to read.				63%	37%
6. The font color was easy to read.				53%	47%
7. The backgrounds on the screens facilitated my view of the content. 1 user gave no response.			26%	32%	37%
8. The RMS was visually appealing. 2 users gave no response.		5%	5%	58%	21%
9. I would use this tool to study.		5%	10%	53%	32%
10. This tool would not be useful to me.	53%	32%	5%	10%	
11. I would use the Calendar feature to track my schedule.		6%	26%	42%	26%
12. I would use the Resources feature to facilitate my studies.				84%	16%
13. I think the Announcements feature would be helpful. 1 user gave no response.		5%	5%	53%	32%
14. I think the Feedback feature would be helpful.		5%	15%	53%	32%

Post Survey: Additional Comments

1. Overall, looks to be helpful.
2. Will be great for group announcements, assignments. Wouldn't use for personal organization.
3. Would be great to have option to share articles, etc. with other residents, save favorites, and make notes on them.
4. Zooming was an issue.
5. Would this be linked to the main INOVA app?
6. Ability to zoom?

Think-Aloud: Qualitative Raw Data
Table 4. Qualitative raw data.

Task List Item	Testing Script	Feedback Given / Success Rate / Problems Encountered
Tutorial	How helpful is the tutorial?	"Tutorial is helpful." "Even if it's not used at first, it's nice to refer to." -Not working from home page -Can't zoom screen
Calendar, Month View	Locate the Calendar feature and access the month view for March 2015. How could we make this better?	"Having different colors for different events. (2 users) "Dots are great." -Expressed desire to link to personal calendar. -No issues -Android too small – dead space on right
Calendar, Access the ASTEC resource associated with the event on March 18th.	Please access the Surgery Oral Exam Review scheduled for March 18. Is it readable? Would you use such a tool on your phone to study?	"The link is considered a luxury. – Very useful." -Readable "Handy" Scale changes when changing month and gets stuck. Can't shrink it. "Very good" "Zoom function is wonky."
Calendar, Day View	Access the MIS reading on March 11 calendar. This is a heavy pdf. Is this readable? How could we make this better?	No issues "It's fine." "Small text" "Text goes beyond frame" -Highlighting feature and notation ability would be helpful.
Calendar.	Please add the event	No issues

Task List Item	Testing Script	Feedback Given / Success Rate / Problems Encountered
Add Event	"Patient X-ray" to March 23rd. Do you see it on the Calendar now?	-1 user needed prompt to use Explore -"Explore not needed. Just have filters at top instead." Yes - Can see event on Calendar.
Resources .	Please access the Resources feature and find the video tab. How easy was it to locate the video? (It doesn't play as it's just a dummy image.) Do the navigation prompts here make sense?	No issues "Not intuitive enough" "Is it JSTOR or Google Drive?" "Can residents upload their own stuff?"
Resources	Please access the image file for patient John Smith and view it. Is this readable? Would such a resource be helpful?	No issues Expressed desire for zoom in option for films (x-rays) -EPIC already in use for patient records but example images from instructional sessions would be helpful,
Resources	Search Resources in order to find a webpage on multiple organ dysfunction syndrome and bookmark it. Then return to the Resources to find it there. What challenges did you have with this task?	"Works well." -Icon for bookmark not readily seen by 1 user. -Back button on article goes back 2 screens to search bar instead of to results of search. "Change Explore to Search or magnifying glass symbol." -Organizational options desired
Evaluations, Pending	Please access the pending feedback forms and select the pending feedback form on Thoracentesis and Chest Tubes, complete it, and	"Amaze Balls!" No issues "System already in place."

Task List Item	Testing Script	Feedback Given / Success Rate / Problems Encountered
	submit it. What challenges did you have with this task?	
Announcements	Use Announcements to find the PowerPoint presentation sent by Dr. Graling. Do the navigation prompts here make sense? Would it be helpful to have such announcements available through this app?	"Awesome sauce!" "Rotate phone to make image bigger." "Useful tool." "Would keep my email from getting too cluttered." -Would like to scroll through the PPT instead of having to click "Next" -Expressed desire for zoom capability
Announcements	Please scroll through the other announcements and give feedback on what you see.	"IPad compatible." -Announcements well received. -Add time and day with date -Possible accordion menu -Possible subject and sender line with click to open option (like gmail) -Suggestion to use bold in titles
Log Out	Please locate and use the Log Out feature. Any challenges here?	No issues "Easiest part!"

Think Aloud: Additional Feedback

1. How would you describe your initial reactions as you interacted with the system?

- Very nice
- Lots of potential
- Helpful lecture feature
- Intuitive navigation
- What about a print function?
- Enjoyable
- Good

- The menu option on the top right where the log out is seems redundant.

2. How would you describe this system to someone who has never seen it before?
- Overall well received
- Useful for residents
- Like Blackboard or Carmen

3. What parts of the design are clear or not clear?
- Overall – good
- Explore header not clear
- It's all good!

4. What suggestions for design changes might you make?
- "The hamburger menu exits to the left and I expected it to exit to the right."
- Contact Us should be uppercase
- Having calendar sync to personal calendar on phone.
- Put the whole SCORE curriculum for the year on there preloaded.

Feedback from ASTEC Administrators
- Would like announcements to have badges or flash when new.
- Would like options to organize the resources and make them searchable by author, subject, sender, date, etc.
- Has concerns with copyright issues for textbooks.
- Suggested SCORE chapters sorted by dates and subfolders with subjects.
- Wanted option to store on device and delete later – concerned about data storage space.
- Wanted to know how a related photo and article could be linked.
- Wanted a read/not read indicator
- Not impressed with the feedback form, but has great hopes that one could be designed that would not only give residents the subjective feedback on their surgical milestones, but objective scores on their performance. These scores have not been established yet and doing so is a nationwide think tank topic.
- Curious about a dedicated PDF viewer
- Wanted print capabilities
- Curious about guest resident access
- All agreed that the app needs to be web-based
- Dr. K will be the education chief beginning in July and would love for this to be functional by then and was hopeful that it could be if it was changed to a web-based platform.

User Feedback and Revisions Ticket List

User and Stakeholder Feedback – Round 1 Ticket List

This table categorizes all user and stakeholder feedback from Round 1 testing. Within the table, we labeled Round 1 updates as "Request Change." Our team reviewed and discussed items for revisions as well as discussed prioritization. We also distinguished user feedback from stakeholder feedback and compared qualitative data with quantitative data. Finally, we identified where more data, analysis, and/or time was needed before changes would be made (items labeled: "TBD"). Items labeled as N/A are known issues with the software platform.

Table 5. Ticket list for revisions.

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
1	Home Screen	"Contact Us" should be uppercase	Design	Request Change	1st Rd	Consolidate "About" and "Contact Us" and put in hamburger	Complete
2	Menu	"The hamburger menu exits to the left and I expected it to exit to the right."	Technical	Request Change	1st Rd	In hamburger: have home, about, profile, log out	Complete
3	Tutorial	Not working from home page	Technical	Request Change	1st Rd	Clumping tutorial into one packet accessible from home screen	Complete
4	Tutorial	Can't zoom screen	Technical	Request Change	1st Rd	Increase font size	Complete

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
5	Calendar (Month View)	Having different colors for different events. (2 users)	Design	Request Change	1st Rd	Different sources for the event will be different colors (make personal events red and ASTEC events blue, like the different calendars you can assign an event to in the iPhone)	Complete
6	Calendar (Month View)	Android too small – dead space on right	Technical	N/A	N/A	N/A	N/A
7	Calendar (Resource) Access the ASTEC resource associated with the event on March 18th	Scale changes when changing month and gets stuck. Can't shrink it.	Technical	Request Change	1st Rd	Change this to a next arrow instead of a drop down	Complete
8	Calendar (Resource) Access the ASTEC resource associated with the event on March 18th	Zoom function is wonky.	Technical	Request Change	1st Rd	Increase Font Size	Complete
9	Calendar (Day View)	Small text	Design	Request Change	1st Rd	Increase text size. Mockup possible redesign for testing	Complete
10	Calendar (Day View)	Text goes beyond frame	Technical	Request Change	1st Rd	N/A	N/A

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
11	Resources	1 user needed prompt to use Explore. "Explore not needed. Just have filters at top instead." 3rd comment: Explore not clear.	Design	Request Change & More Data	1st Rd	Remove and put in search bar Need way to get back to full list: select or deselect filters Filters = Instructor, Topic (SCORE curriculum), Date, Recent Media type is a secondary filter after they have done first filter	Will add filters after results from 2nd round testing. Complete remove "Explore"
12	Resources	Expressed desire for zoom in option for films (x-rays)	Technical	N/A	N/A	Unable to control in prototype development software	N/A
13	Resources	Icon for bookmark not readily seen by 1 user	Design	Request Change	1st Rd	Change to icon used on resource	Complete
14	Resources	Back button on article goes back 2 screens to search bar instead of to results of search.	Technical	Request Change	1st Rd	Fix	Complete
15	Announcements	Expressed desire for zoom capability	Technical	Request Change	1st Rd	Increase font size	Complete
16	Announcements	Add time and day with date	Design	Request Change	1st Rd	Make like Gmail, add time	Complete

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
17	Other – Improvements	Having calendar sync to personal calendar on phone. (2 users)	Design	Request Change	1st Rd	Add a sync button; sync out. NONFUNCTIONAL message pops up saying "Synced"	Complete
			The feedback below is from ASTEC stakeholders and not primary users (#18-21)				
18	Administration – Announcements	Would like announcements to have badges or flash when new.	Design	Request Change	1st	Add so they know one is read. Make it a red circle with a number one as if you had an email or notification on your iPhone.	Complete
19	Administration – Announcements	Wanted a read/not read indicator	Design	Request Change	1st	Ask about collapsing versus new window in next round Bold if hasn't been read, light if has been read; white background if unread	Complete
20	Administration – Other	Wanted print capabilities	Design	N/A	TBD	Wish list – would need wireless printer or share function Ask about how they would want to print	TBD

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
21	Administration – Profile	Curious about guest resident access	Design	N/A	N/A	Don't have profile function right now, too difficult to build on short timeframe.	N/A
The feedback items below require discussion and potentially more data before revisions (#22-43)							
22	Resources	Not intuitive enough	Design	Discuss	N/A	Singular comment	N/A
23	Resources	Can residents upload their own stuff?	Design	Discuss	1st Rd	Add upload	Complete
24	Resources	EPIC already in use for patient records but example images from instructional sessions would be helpful	Content	Discuss	1st Rd	Remove patient information from image	Complete
25	Resources	Organizational options desired	Design	Discuss & More Data	TBD	Focus for Round 2 Testing	Testing Round 2
26	Evaluations	System already in place.	Design	Discuss	TBD	Need to identify expectations of the evaluation function. Was originally a way to make the paper questionnaires digital.	TBD
27	Announcements	Rotate phone to make image bigger.	Technical	N/A	1st Round	Increase font size	Complete

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
28	Announcements	Would like to scroll through the PPT instead of having to click "Next"	Design	N/A	N/A	Interactions on resources themselves would function in a real app but this is just a prototype	N/A
29	Announcements	IPad compatible	Technical	Discuss	TBD		TBD
30	Announcements	Possible accordion menu	Design	Discuss	TBD		TBD
31	Announcements	Possible subject and sender line with click to open option (like gmail)	Design	Test	1st	Secondary information on separate pages	Complete
32	Announcements	Suggestion to use bold in titles	Design	Request Change	1st		Complete
33	Other – Initial Reactions	What about a print function?	Design	Discuss	TBD		TBD
34	Other – Initial Reactions	The menu option on the top right where the log out is seems redundant.	Design	Request Change	1st		Complete
35	Other – Improvements	Put the whole SCORE curriculum for the year on there preloaded	Design	Request Change & More Data	1st		Complete

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
The Feedback below is from ASTEC Stakeholders and not Primary Users (#36-43)						
36	Administration – Resources	Would like options to organize the resources and make them searchable by author, subject, sender, date, etc.	Design	Test & More Data	1st	This relates to organization of resources, which will be tested further in round 2.	Round 2 testing
37	Administration – Resources	Suggested SCORE chapters sorted by dates and subfolders with subjects.	Design	Test		This relates to organization of resources, which will be tested further in round 2.	Round 2 testing
38	Administration – Resources	Wanted option to store on device and delete later – concerned about data storage space.	Design	Discuss	1st	Will need to assure testers that resources are stored in the cloud and not downloaded/archived to mobile device.	Round 2 testing
39	Administration – Resources	Wanted to know how a related photo and article could be linked.	Design	Discuss	2nd		Not addressed

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
40	Administration – Feedback	Not impressed with the feedback form, but has great hopes that one could be designed that would not only give residents the subjective feedback on their surgical milestones, but objective scores on their performance. These scores have not been established yet and doing so is a nationwide think tank topic.	Design	Discuss & More Data	TBD	Need to identify expectations of the evaluation function. Was originally a way to make the paper questionnaires digital.	
41	Administration – Other	Curious about a dedicated PDF viewer	Design	Discuss	TBD		Resource interaction
42	Administration – Other	ALL AGREEED THAT THE APP NEEDS TO BE WEB-BASED!!!!	Platform	Discuss & More Data	2nd		

#	App Feature	User Feedback / Data Point	Type	Planned Action	When to Make Change	Notes	Status
43	Administration – Other	Dr. K will be the education chief beginning in July and would love for this to be functional by then and was hopeful that it could be if it was changed to a web-based platform.	Platform	Discuss & More Data	2nd		

Additional Changes Based on Best Practices

1. All input interfaces (drop down menus and forms) changed to imagines because of scaling problems between Axure and iPhone
2. Implementation of best UI best practices based on flat design for testing in round 2
   - Helvetica light throughout
   - Consistent design in alert panels
   - Larger font sizes where possible

Round 2 Updated Approach

The purpose of Round 2 user experience research is to hone in on task flow and emotional experience to assess and sift through the fine-tuning stage of the user experience design. This focus will include a look at the user interface as best practice changes were incorporated in the Beta prototype. We also need clarification on how the users want the resources presented, both initially and in a resource search.

Changes to Prototype: Alpha to Beta

The Beta prototype can be accessed here: http://qxawad.axshare.com/#c=2.
The following are screenshots from the Alpha prototype (left, titled "a") and the Beta prototype (right, titled "b").

Figures 2a and 2b. Changes to the home screen.
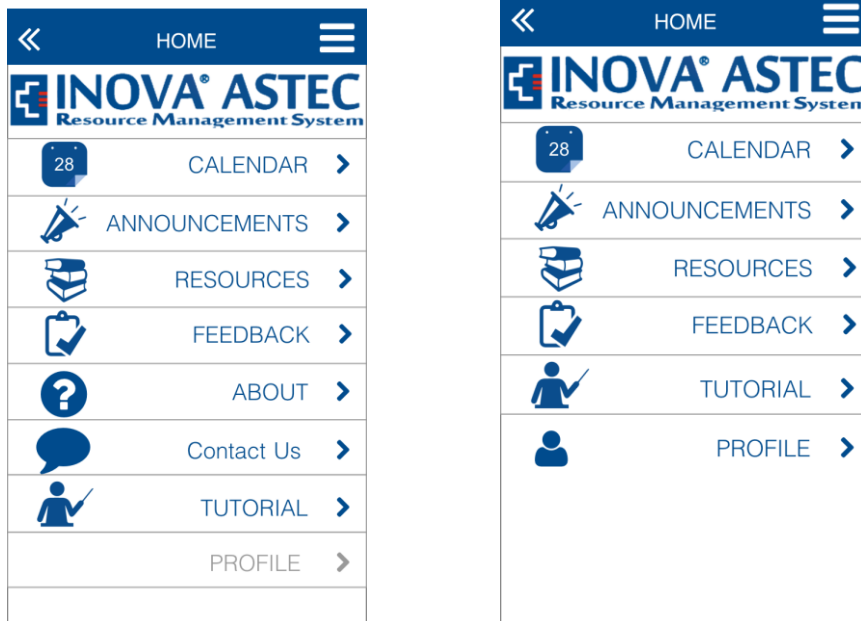
Figures 3a and 3b. Changes to the hamburger menu.
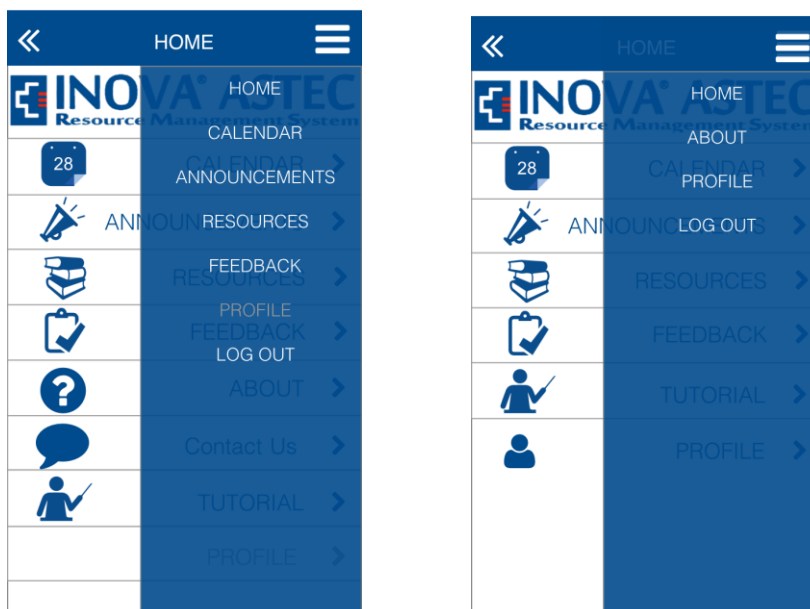
Figures 4a and 4b. Changes to the tutorial. (Not pictured: tutorial now can only be accessed through home screen and does not automatically appear when navigating to feature for first time.)
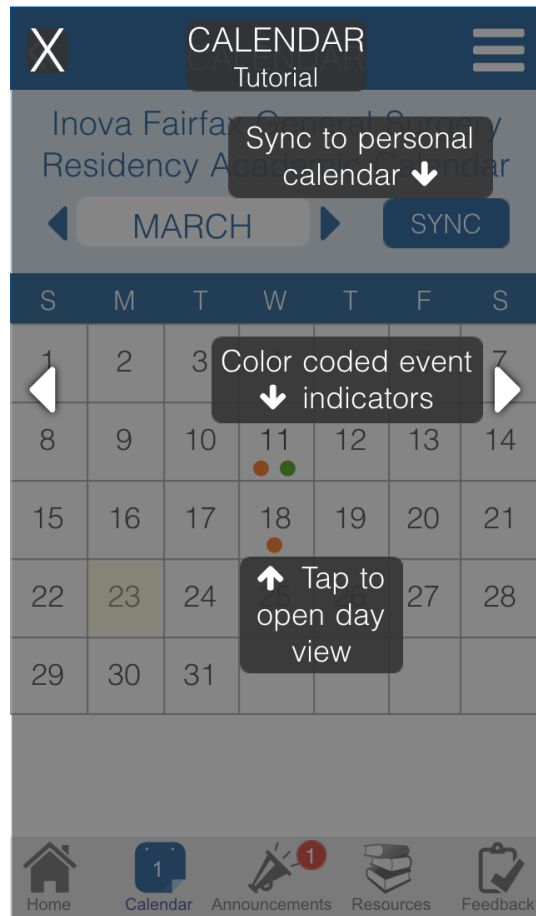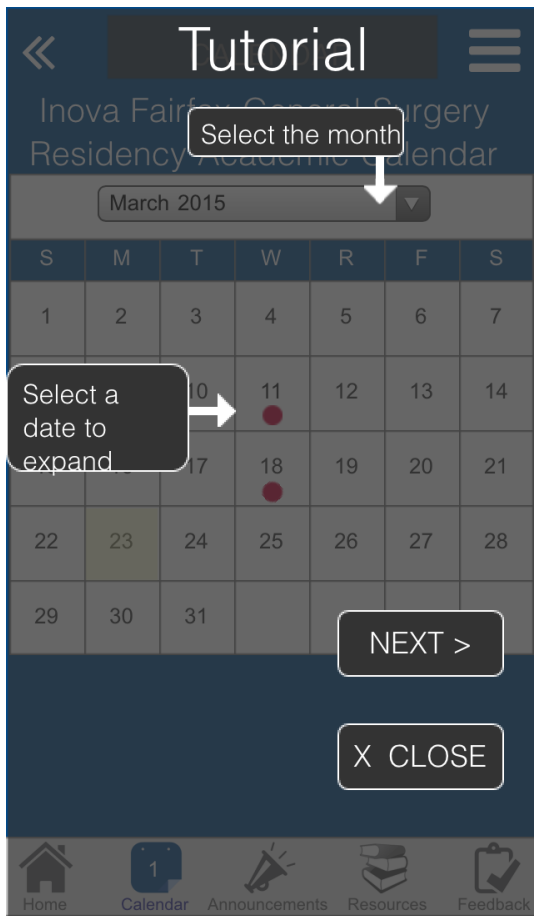
Figures 5a and 5b. Changes to the calendar feature.
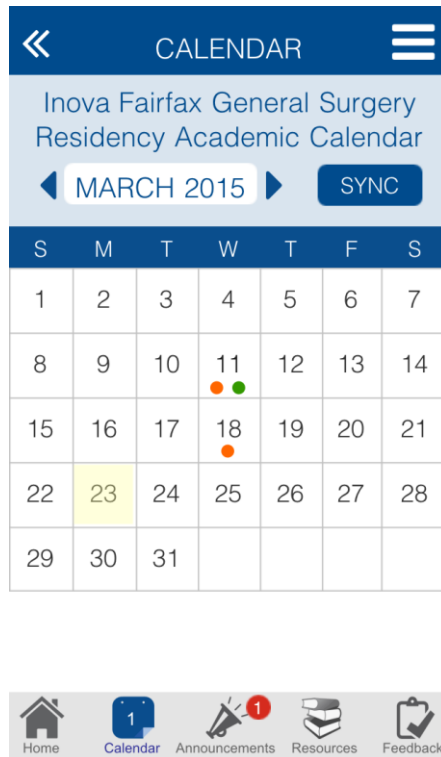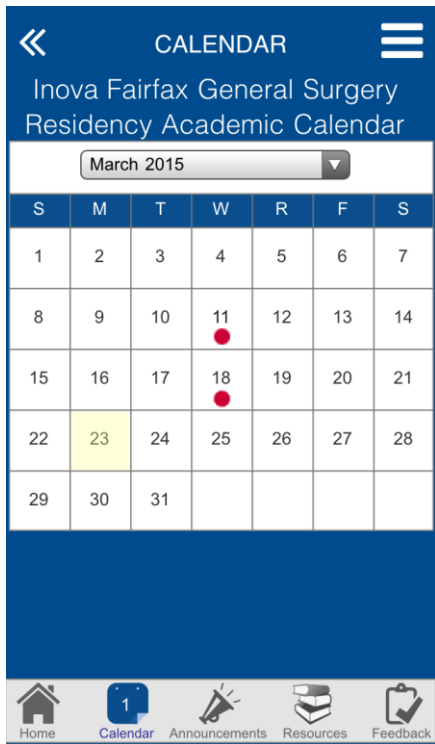
Figures 5c and 5d. Addition of the "Sync" button. When the user selects the "Sync" button, they can choose to sync out to their personal calendar and will receive these pop-up affordances.
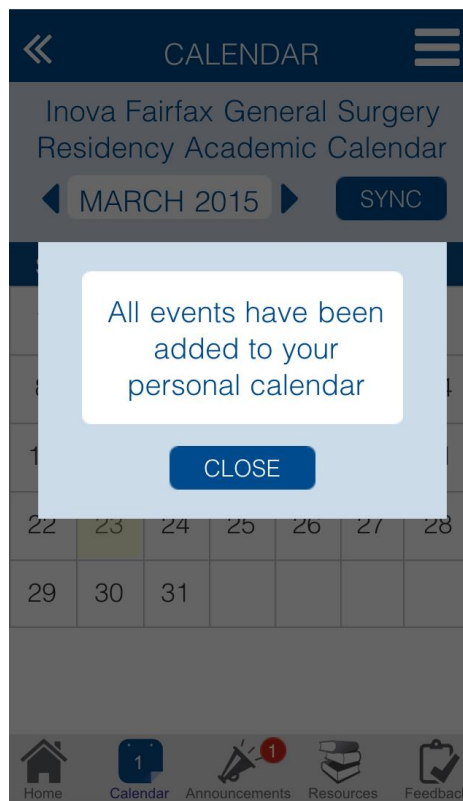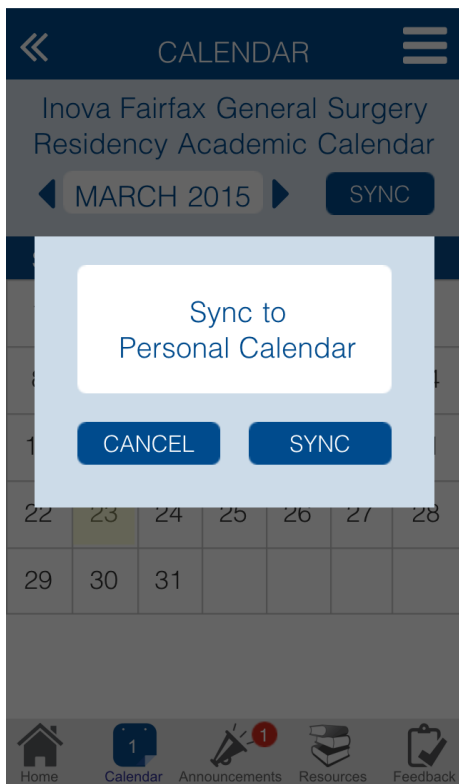
Figures 6a-d. Changes to calendar day view and add event pop-ups. (NOTE: In figures 6c and 6d, we had to remove text boxes and drop downs to address scaling issues, so assume the functionality in the real application.)
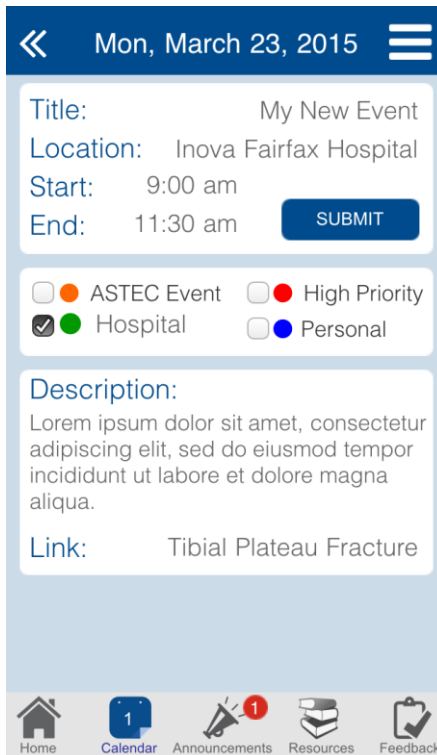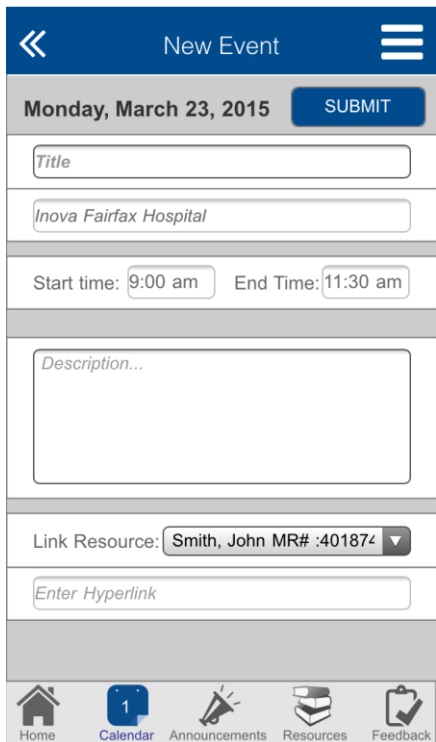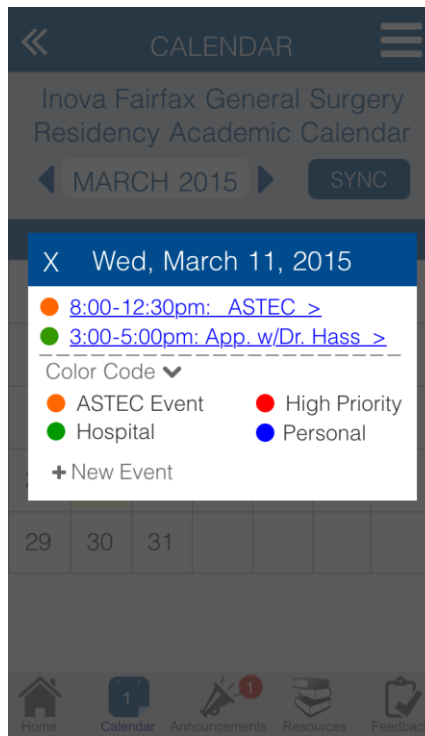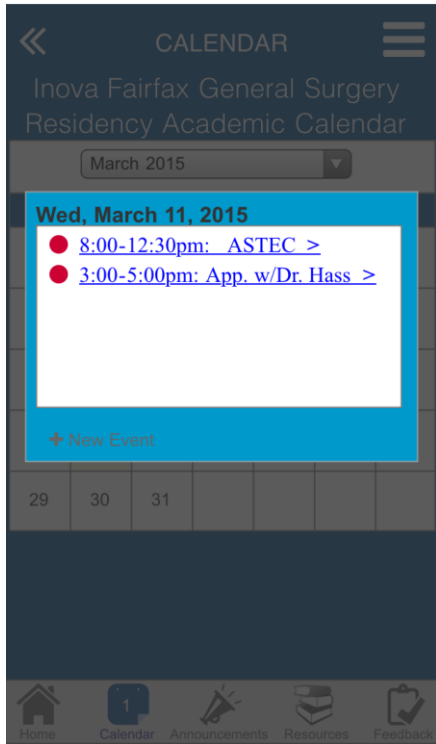
Figures 7a-c. Changes to the announcements page. The left image is the Alpha version. The right images are the Beta version. We added time announcement was sent, removed secondary information, and created a single page to show full announcement.
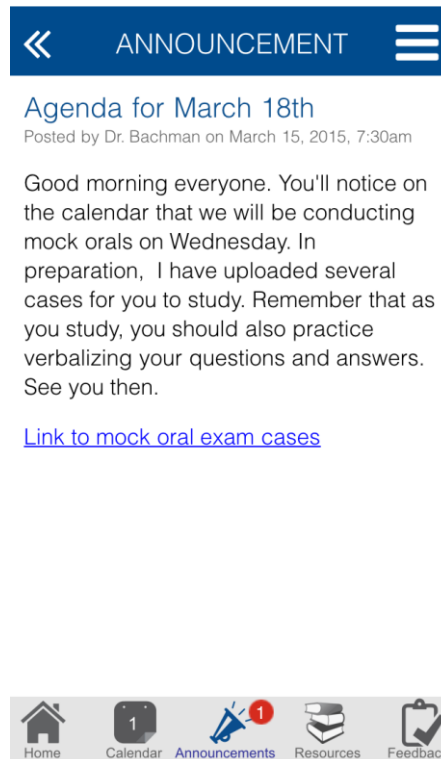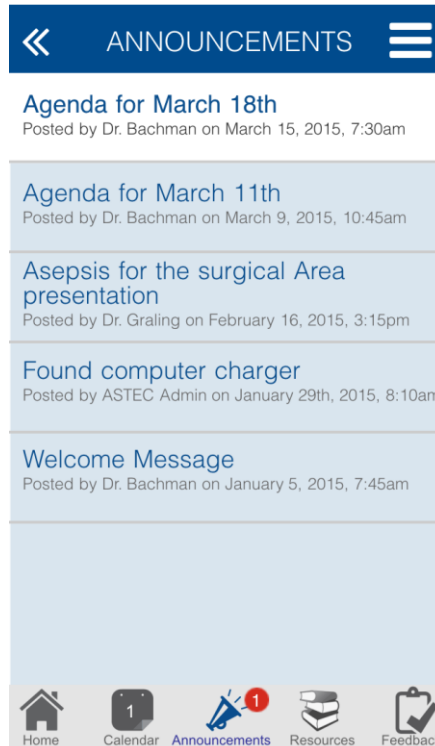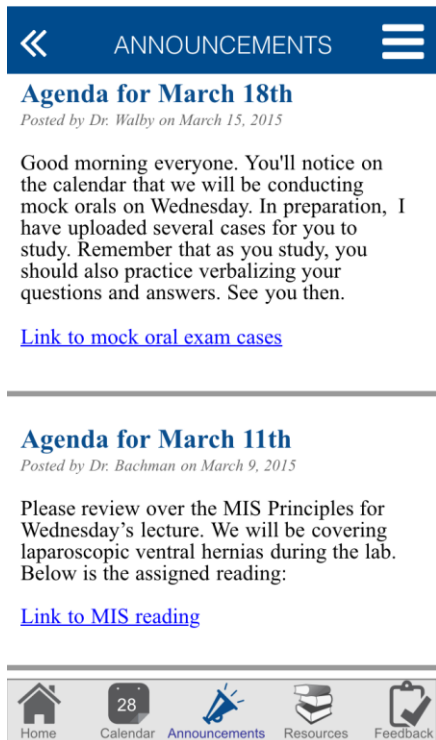
Figures 8a and 8b. Changes to the resources main page.
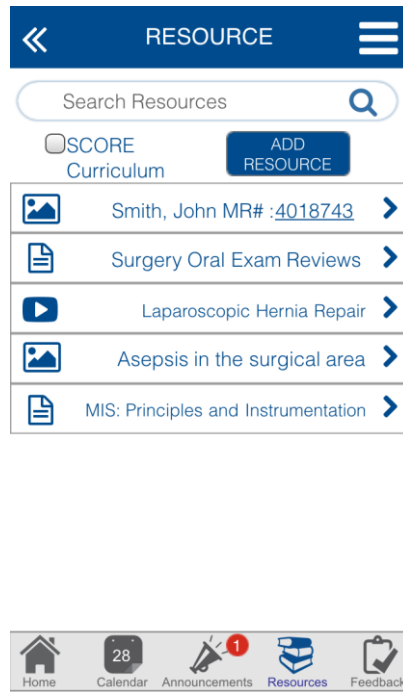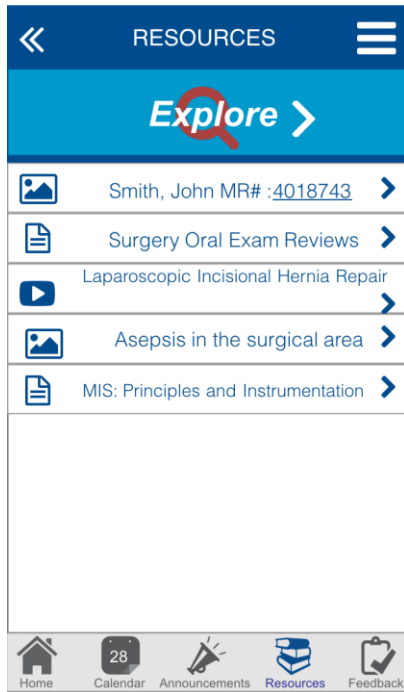
Figure 9a and 9b. Changes to the sort filters.
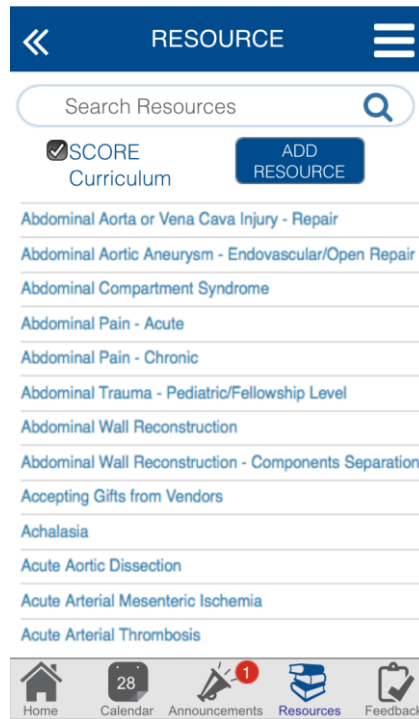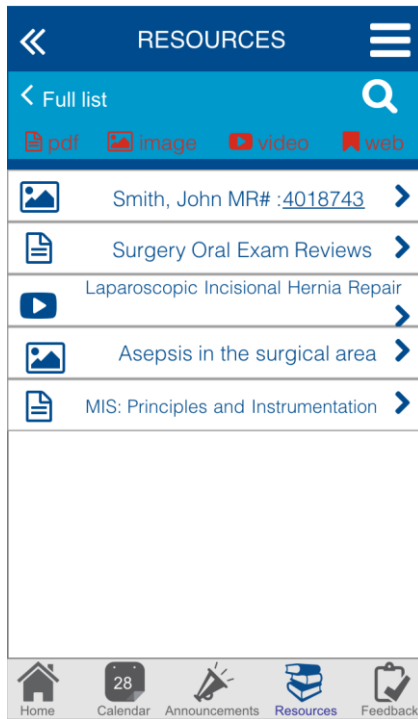
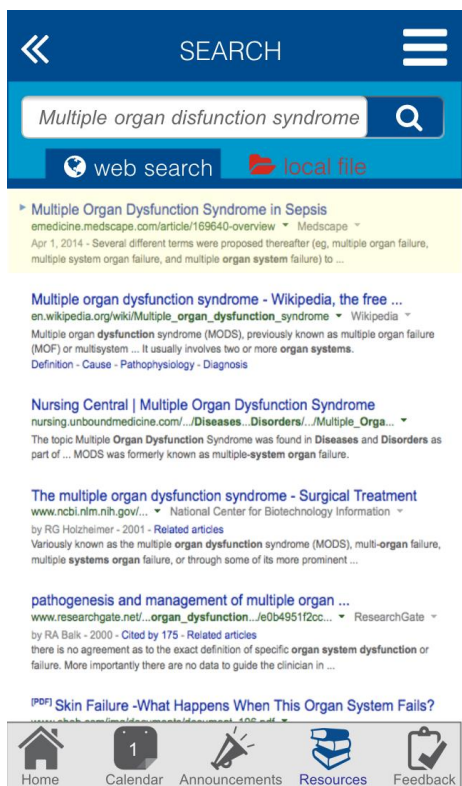**Figure 10a-c. Changes to search the web. Both left images are from the Alpha version.**
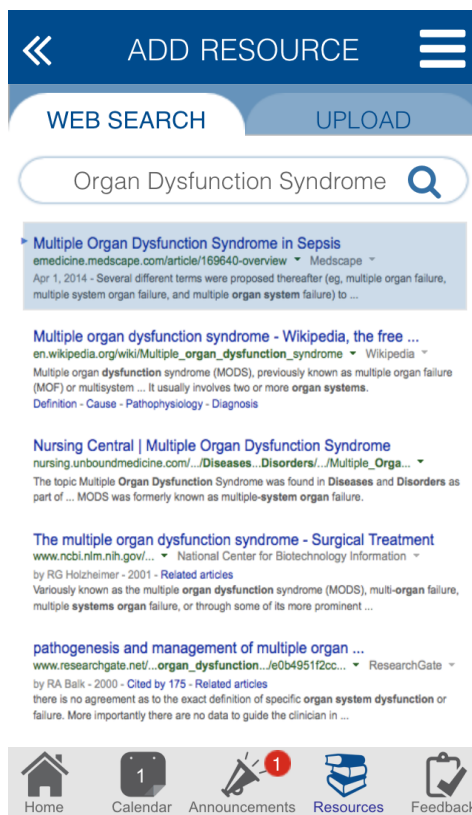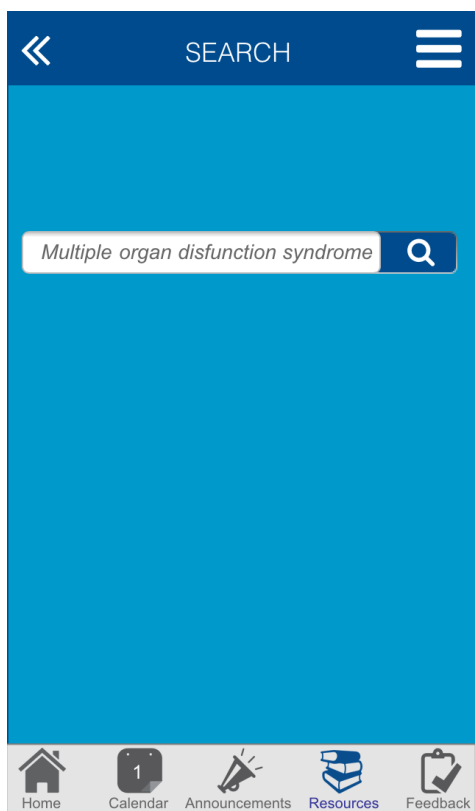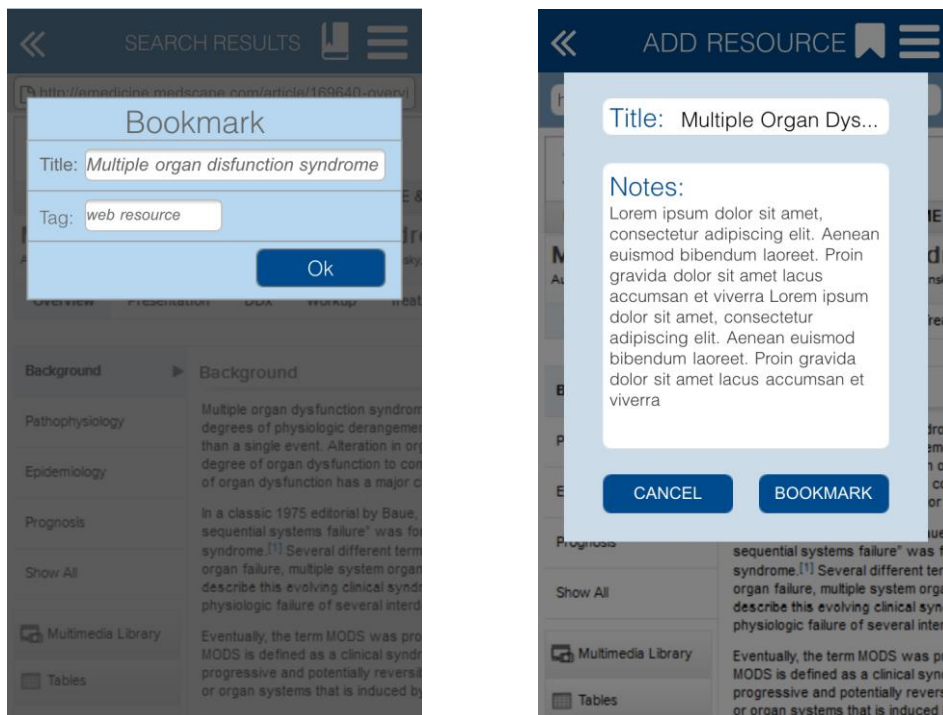
Figure 11a and 11b. Changes to bookmarking a web resource.

Figures 12a and 12b. Upload resources from mobile device. Both these images are from the Beta prototype, as upload did not work in the Alpha prototype.