Outpatient Surgery Noncompliance Costs Millions, Creates Complications

- 25% of patients believe pre-operative fasting doesn’t include liquids
- 55% of patients don’t “clearly understand” when to stop eating/drinking

Cancellations
- There are 53 million outpatient surgeries in the US annually
- 3.7 million (7%) of these get canceled
- Each cancellation costs the healthcare system $3,000
- In total, this is $11 billion lost annually

In order to verify this grander motivation, we analyzed local data sources to evaluate impact.

Datasource: 12,656 outpatient surgeries at Pennsylvania Hospital in 12 months
- 474 cancellations with reasons for cancellation

Analysis: Of these cancellations, patient noncompliance could be responsible for ~10-30% (n = 50-150)
- Top cancellation reasons: no-show, no ride, ate food, took meds

Collaboration, Feedback Required for Impactful Solution

- Complicated hurdles like the Health Insurance Portability & Accountability Act (HIPAA) prevent unique technical challenges
- Patient, surgeon, and other medical staff perspectives required for input

Collaborators
- Dr. Ali Brooks, M.D.
- Dr. Ali Naderi
- Katherine Choel

Penn Medicine
ABRAMSON CANCER CENTER

mHealth Labs

- Made several trips to the Abramson Cancer Center’s location at the Integrated Brest Center (IBC) at Pennsylvania Hospital to shadow patients and interview surgery schedulers
- Collaborated with schedulers to pilot test our solution

- UPHS’s mHealth Labs provides guidance for medical-technical collaboration projects
- Collaborated to develop HIPAA-compliant architecture, pilot testing, surveys

Designed and Implemented Scalable, HIPAA-Compliant Solution

- Medical staff contributes templates and protocols for peri-operative stages of any relevant surgery procedures
- Surgery scheduling staff chooses from these templates and assigns them to patients for particular surgery dates
- Patients receive these instructions via customized print-out, SMS reminders, and/or downloadable calendar events

Data Analysis First Step Towards Future System Enhancement

Pill Data Analysis
- Same datasource as above: 8,063 surgery patients’ medication lists over 7 month surgery period
- “Hot list” of 17 medications relevant to certain surgeries at IBC
- Shows relevance of providing interface that suggests common medications to add to instructions

- Left chart describes how many patients were taking how many meds
- Omitted 1 med (1,960), 2 (1,004), 31+ (outliers)

Protocol Template Analysis
- Reviewed pre-surgery templates to identify types of typical instructions
- Sources: IBC, OncoLink, HUP, Marquette, Pennsylvania Hospital
- Aggregated to determine overlap/types of instructions in common

- Above chart breaks down how many like instructions could be found across the set of protocols
- 54 instructions, 23 (42.6%) were not unique to any particular protocol
- Can be integrated into system by allowing future template creators to use previous templates’ existing instruction sets

Pilot System Deployed and Tested with Actual Patients

Pilot Testing
- Simplified version of scheduler UI for IBC (pictured right)
- Patient checks boxes relevant to him/herself (what meds they’re taking, personal details, etc)
- Patient has opportunity to download a personalized PDF of instructions generated, receive SMS reminders, or download a digital calendar of the reminders

Surveys Distributed to Willing Volunteers & Workers
- Two sets of surveys were administered: one set to 124 volunteer peers and the other set to 200 CrowdFlower users
- Respondents were asked to compare the utility of the original PDF provided by the hospital and of the customized PDF generated by our system
- They were also asked to consider how likely they were to use each of the three possible reminder options: PDFs, text messages, and calendar events

Results Measured Using Non-Surgery User Feedback and CrowdFlower Platform

- Most survey results show support for our solution’s approach to increase clarity, delivery of instructions
- Actual patients have used our system, although we have not yet been able to collect feedback

Next Steps
- Integration with EMR of patients to simplify or automate the scheduler’s role by assigning instructions based on the patient’s prescriptions
- Generalization of this architecture to be used in different medical facilities and procedures
- Refinements of the aesthetic and functionality of the reminder options provided to the patients