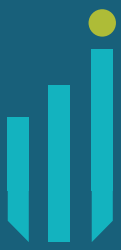

WISE MD

A feedback tool for doctors
to enable cost-conscious,
quality care decisions.

AKSHATA MALHOTRA

THESIS PAPER 2015

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INTRODUCTION

The Problem

United States has the highest per capita healthcare spending ($9146) in the world. Approximately 1/3rd of it (more than $750 billion annually) is contributed by wastage in the form of unnecessary care. Majority (80% of this wastage) is within the control of doctors.

My approach was to understand doctors' behavior to solve for reducing this wastage (particularly in tests) and promoting high value care: cost conscious, high quality care.

> "No test is expensive if it is necessary— even if it is a 2000$ test. But if it is unnecessary, it is expensive— even if it is just 2$."

- Dr. Nayan Kothari,
Program Director,
Saint Peters University Hospital

Why it matters

It's not about the cost.

It's about the waste.

1/3 of every dollar spent in US healthcare is unnecessary.*

80% of these are within the control of doctors.

More is not always better.

With increase in defensive medicine and unnecessary care, there is increased harm and risks to patients.

**Sources: Kaiser Health News, National Academy of Sciences*

Objective

I began my thesis journey by understanding why doctors order unnecessary tests.

The objective was to change doctors' behavior to be more cost-conscious in their decision making.

I AM CREATING A FEEDBACK LOOP FOR RESIDENT PHYSICIANS TO ENABLE BETTER INFORMED DECISIONS.

Target Population

I decided to focus on second year and third year resident physicians because they are in a state of transition and have a steep learning curve. Second year residents are at a stage that they start to think about the plan for patient independently and hence, it is critical to start here, where habits have not developed yet.

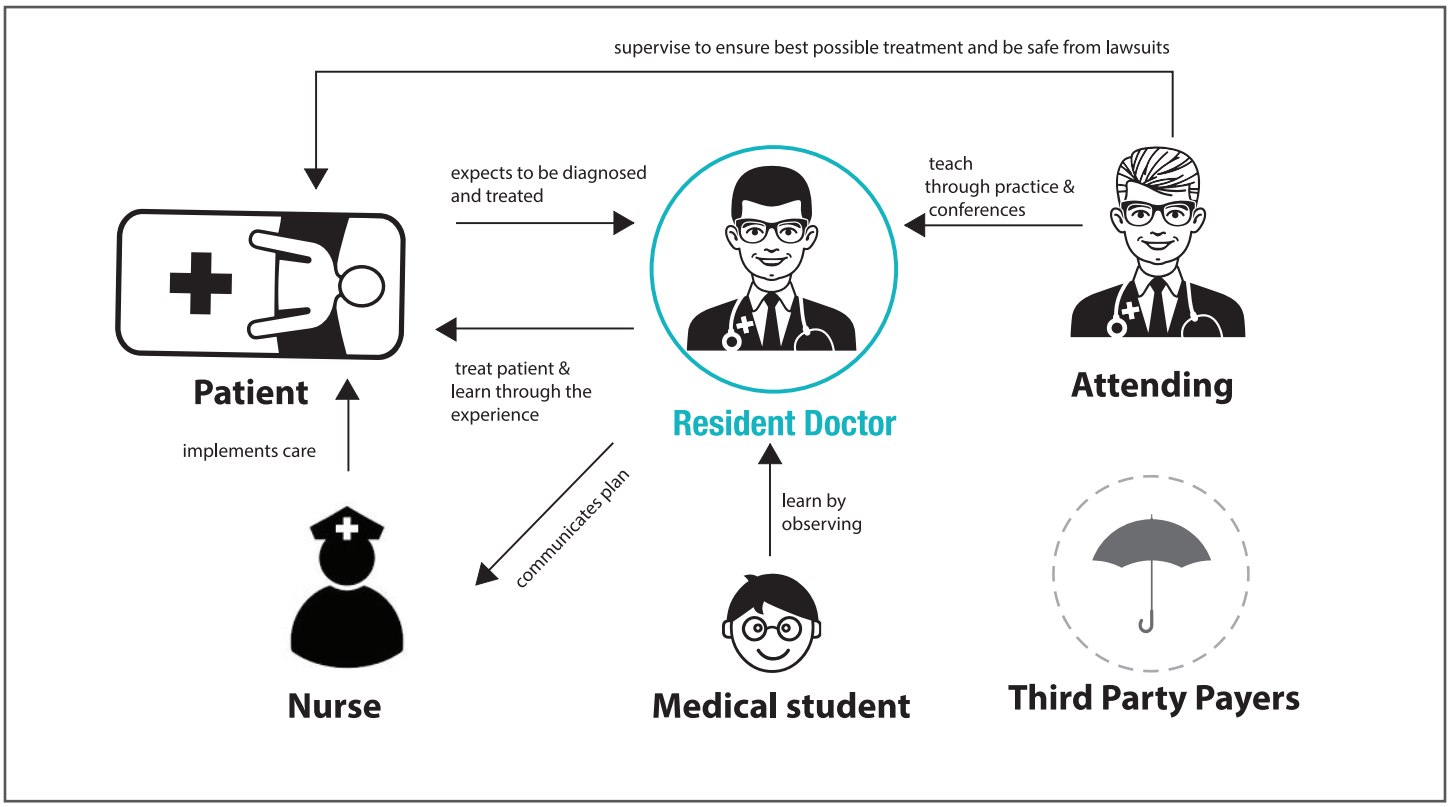
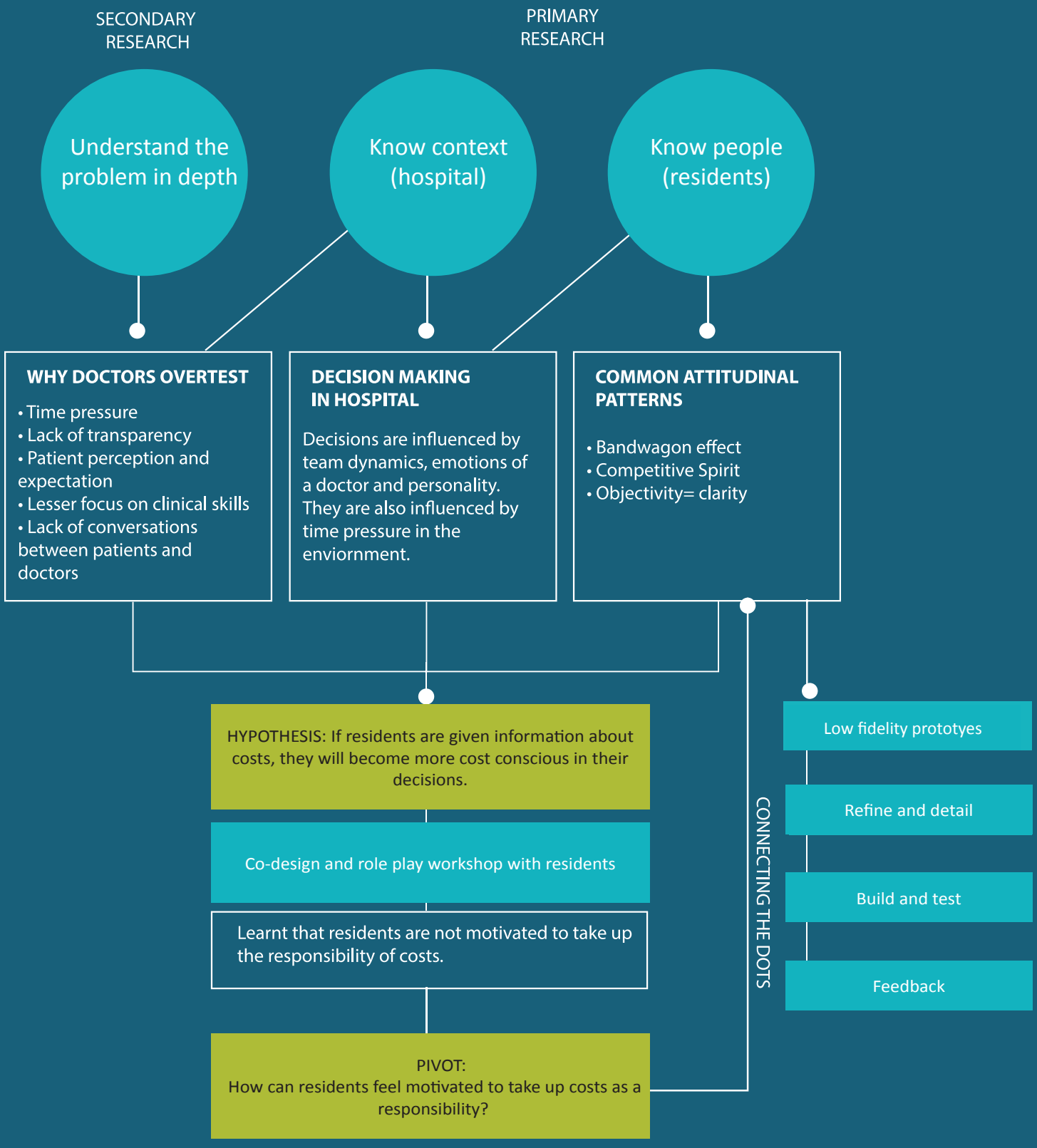


Fig 1.1 Residents have many roles to play and are the central touchpoint to many different interactions; The payer is far removed from the decision making process.

PROCESS



Flig 2.1 Process Map

Process at a glance

Designing with

I worked with resident physicians, attendings, and subject matter experts throughout the process—starting from discovery phases to validation. Because of having constant and easy access to my end users, I was able to involve some of them throughout my design and research process. This helped me constantly learn and test my hypothesis with sketches, low fidelity prototypes and sometimes even ideas.

Understanding Emotions to change behavior

Facing difficult and urgent situations everyday, most of them are not very expressive about their emotions. However, it was my challenge as a designer to recognize the underlying emotions. I found that it is the emotion that leads to an action or a decision. This formed the backbone of me understanding why doctors behave in a certain way. It helped me approach the problem from their point of view.

Use the existing motivation to develop new behavior.

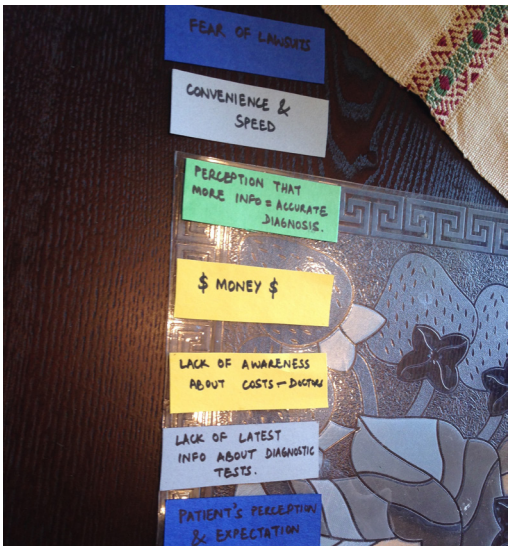
I studied the Behavior Change Model by BJ Fogg to analyze the behavior of residents: of ordering unnecessary tests. I broke the existing behavior and target behavior (of ordering only appropriate tests) down to Trigger, Motivation and Ability. My biggest learning was that it is essential to use people's existing motivation to develop target behavior. This came from learning that doctors lack motivation to take up an additional responsibility of costs.

Giving them ownership

Getting residents to talk about costs wasn't difficult, but having them accept it as a responsibility took some time, effort and realization from my side.From showing them concepts that could inform them about costs to asking them their personal goals as a doctor, I evolved drastically in my approach. So instead of thinking about achieving my thesis goal, my approach focussed on helping them to make better decisions, for themselves.

Knowing how they think and what they value

After doing a lot of desk research on personality types and decision making, I applied it to my user group. Residents are usually highly academic. Typically, they value "information" and "data" that is objective. Subjectivity is fuzzy for them and therefore, they do not trust it. Therefore, I decided to use objective data as the language for giving them feedback about the consequences of their decisions. My role as a designer is not to judge what is wrong or right, but to give them the information that they need to make better decisions.



DISCOVER

Why doctors overtest

As a starting point, I started doing secondary research on why doctors have a tendency to order more tests than necessary. To begin with, I had a hypothesis that it is not just for money reasons. Through various sources (medical articles, news articles, blogs and lectures), I discovered that there are many reasons why this happens:

- Lack of guidelines
- Lack of knowledge
- Erosion of physical examination skills
- **Patient expectations**
- **Discomfort with uncertainty**
- Inadequate time - takes lesser time to order them than to explain to patient why they don't need it.
- Fear of malpractice
- **Habit**- being used to do it
- Lack of EMR interoperatibility: inability of electronic records (like MRI reports) to communicate.
- Omission worse than commission: It is a cultural perception- it is better to find something and treat it than missing something.
- Personal gain: In cases when doctors have their own equipment to do tests, it makes a big difference

I chose to dig deeper into the three bolded above, which were patient expectations, discomfort with uncertainty and habit.

Time and convenience

Next, I interviewed 7 residents one to one to understand their point of view. I drew with them the diagnostic process to understand each step in depth.

I learnt that for them the challenges are:
- Time pressure
- Patient expectations
- Not being aware of costs

> "It is faster to order a test with one click of a mouse than to think about it when another patient is waiting"

Emotions influence decisions

Next, I went on rounds with the Internal Medicine team to understand the context better— the environment in which decisions are taken, the kind of tools they use, different stages of the diagnostic process etc.

This really helped me understand the problem from the perspective of residents. I mapped out the diagnostic process from the point of view of residents.

The Diagnostic Process (from the p.o.v of a resident)

	Patient admission	Differential diagnosis	Attending rounds	Plan implemented
				
 DOES	History Physical examination	**Thinking about plan (Deciding)**	Presents plan Answers questions Final plan materializes	**Orders tests** Orders medicine Communicates to nurse Writes note
	 In a rush Apathetic	 Uncertain	 Stressed	 Rushed
Influence on decisions	Risk avoiding behavior	"Default" decisions	Tunnel vision: narrower focus of attention Fear the worst	Bias towards action

Fig 2.2 A map of how emotions influence decision making by doctors.

Disconnect between actions and consequences

The lack of transparency in the healthcare system leads to a broken feedback loop. Because of this, there is no effect of consequences of decisions on future decisions. On top of that, the insurance system has led to the absense of the payer from the moments of decision making. This leads to a feeling of indifference towards cost.

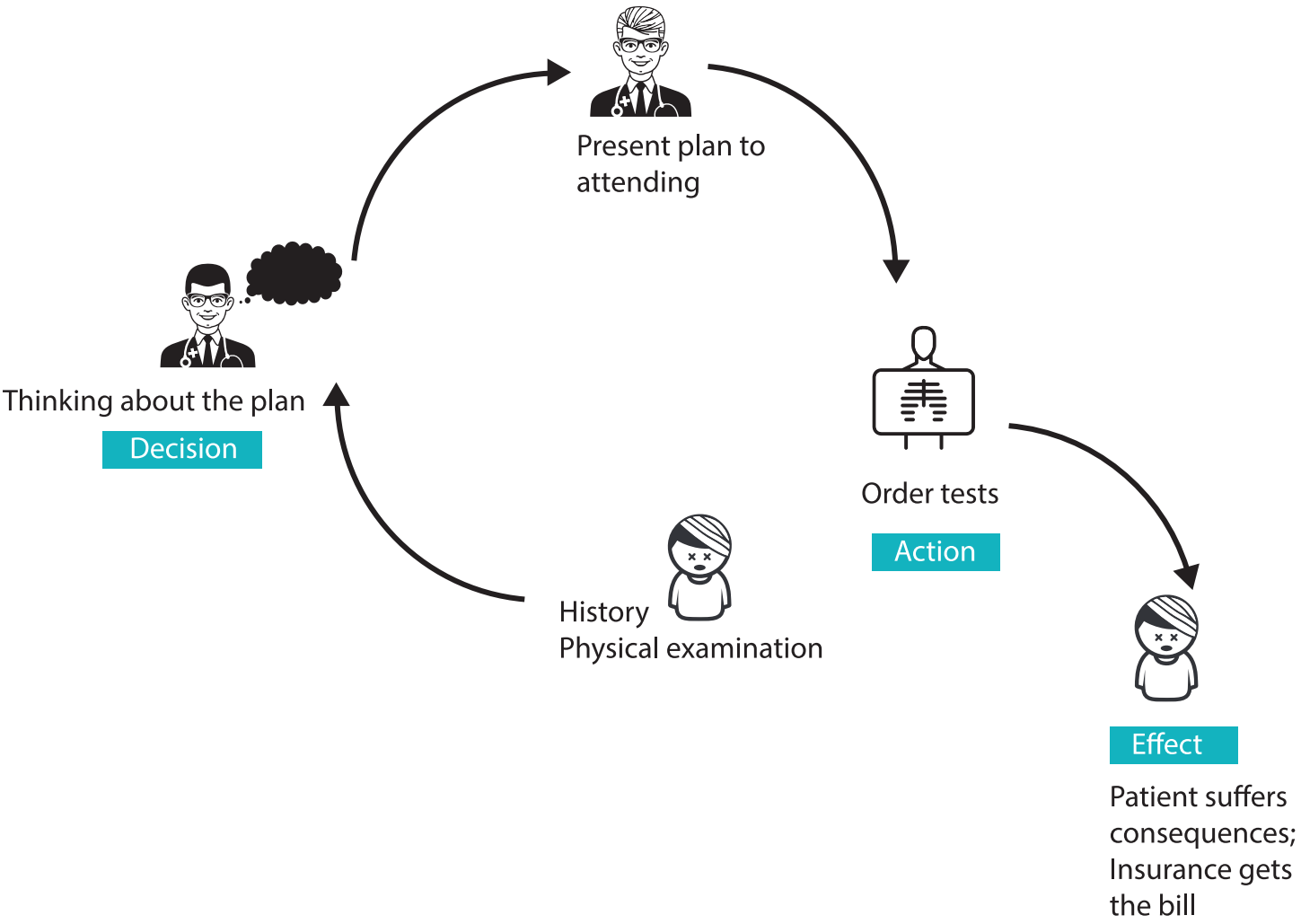
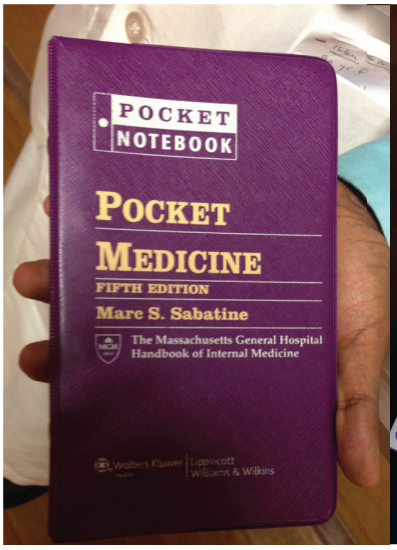
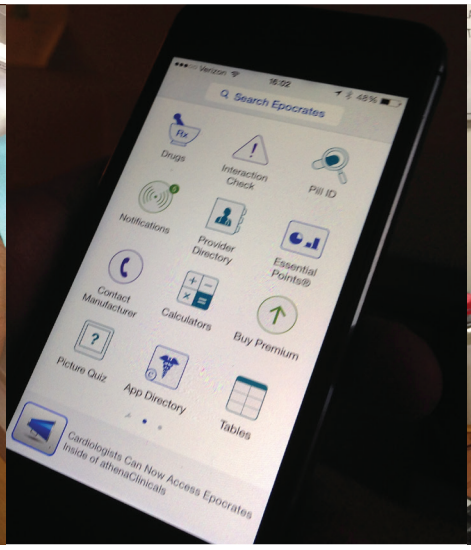


Fig 2.3 A diagram showing the broken feedback loop





Existing tools

Spending two working days with the Internal Medicine team, I learnt that decisions are taken at two levels in the hospital:

1. When resident and intern make a plan for the patient:
For this, they use medical guideline tools — both books and apps in their phone to help them decide the plan. The most popular are Pocket Book of Medicine and Epocrates (a mobile app).

2. When the resident presents this plan to the attending and the team decides.
For this, they use communication tools such as progress notes and diaries to help remember what they learnt about the patient.

Overall, residents tend to use a lot of mobile apps because they feel “It doesn’t add to the already heavy white coat”.

> “I use the Pocket book when a patient has coded— because in that crucial moment, I sometimes freeze.”

Use mobile phone during breaks

Residents take a number of small coffee or smoking breaks in between work. This is when they use the phone for leisure purpose— for e.g. social media, games, news etc.

IDENTIFY UNMET NEEDS

These observations and learnings helped me narrow down my findings into key unmet needs, which were:

Discomfort with Uncertainty

Feel: unconfident about their clinical diagnosis.
Need: to feel assured about their diagnosis and decisions.

Time Pressure

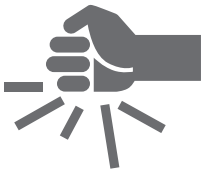
Feel: overloaded with work as they juggle through multiple tasks in a day. This makes them feel impatient and therefore, rush through every task.
Need: a way to be more time efficient, so that they focus on one task at a time.

Disconnect between actions and consequences

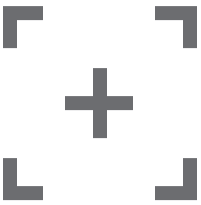
Insight: There is a gap between being taught about cost sensitivity and translating it into action
Need: a way to receive feedback that links behavior of ordering tests to costs of those decisions.

Hypothesis

The unmet needs led me to three hypothesis which were:



If physicians feel confident about their decisions, they will order less tests.



If residents focus on one single task at a time, it will save them time.

Residents will be motivated to be cost efficient if they can see the effect of ordering on bills.

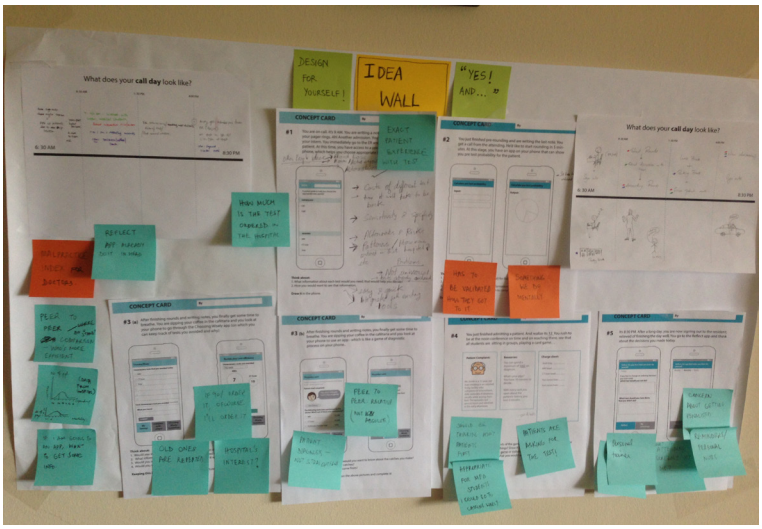
TEST HYPOTHESIS

My next step was to test my hypothesis that

Residents will be motivated to be cost efficient if they can see the effect of ordering on bills.

I conducted a co-design session with residents, to identify where and when information about cost can be incoporated in their routine.

I gave them a situation, a concept framework for tool and asked them to fill in information that could be useful. They all participated enthusiastically and at the end of the workshop, we had many different concepts. For e.g. a conversational tool to talk to patients about costs, a diagnostic test guide to help know the costs and patient experience of each test etc. We then role played some of those to know how a tool could be used in some situations.



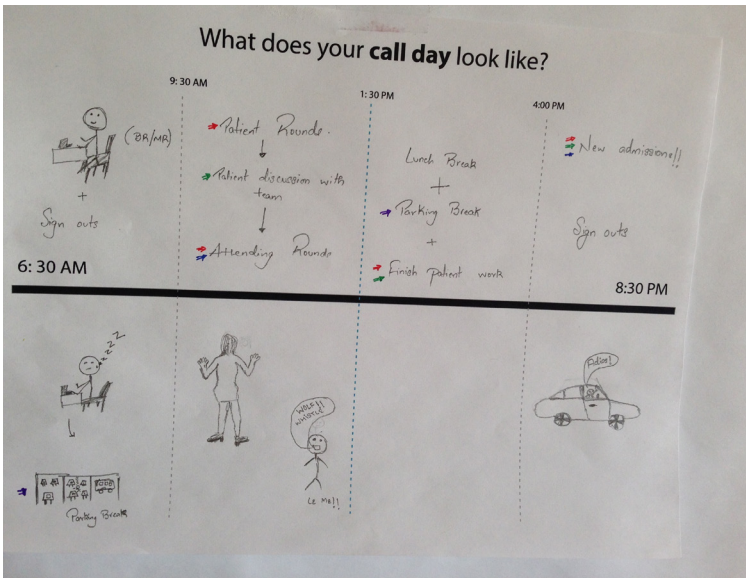
My biggest take away from this workshop was:

Lack of Motivation

Only incorporating costs in their routine will not change their behavior because presently, there is no motivation for them to take up costs as a responsibility. It is only an additional burden and adds to time stress.

This led me to the question:

How can residents feel motivated to take ownership of costs?



UNDERSTANDING MOTIVATIONS

How they think

Through this process of making, I started seeing patterns in the way they think and act.

Bandwagon effect

An attitude that if their peers are doing something, then it must be right.

Competition

Being highly academic and toppers all their lives, they value the the spirit of competition— to bring out the best in them. And they are motivated by recognition among peers

Objectivity= Clarity

Being taught about evidence based medicine, and talking the language of guidelines and protocols, doctors trust objective information and data. Subjectivity is fuzzy and abstract for them and therefore, they do not trust it.

Behavior Change Model

I studied the Behavior Change Model by BJ Fogg to analyze the behavior of residents of ordering unnecessary tests . I broke down down the existing behavior and target behavior (of ordering only appropriate tests) down to Trigger, Motivation and Ability.

My biggest learning from this model was that creating new behavior requires helping users do what they want to do, easily.

So my focus expanded from “unnecessary tests” to helping residents improve as doctors.

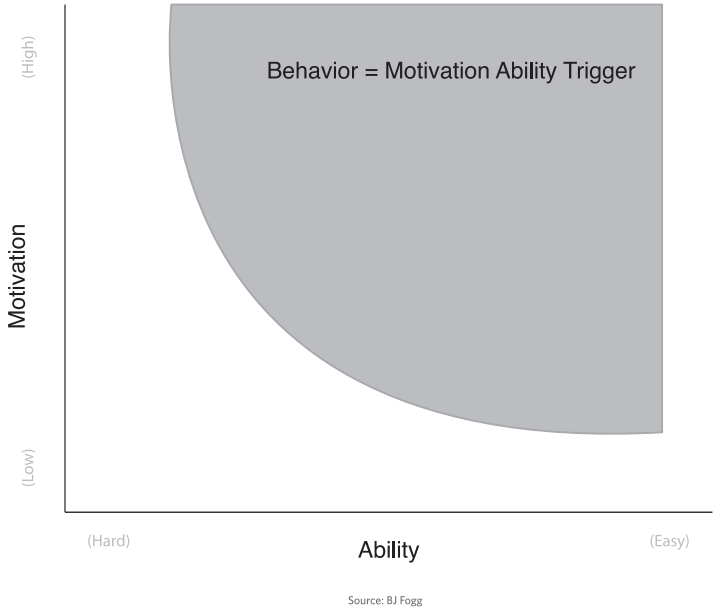


Fig 2.4 Behavior Change Model by BJ Fogg

DEFINE: CONNECTING THE DOTS

Developing Framework: Drivers of overtesting

My hypothesis was that overtesting happens because of a combination of factors— unconscious drivers, conscious rationale and context in which decisions are taken.

Unconscious Drivers: Emotions
Discomfort with uncertainty leads to ordering of tests just to be “safe”.

Conscious Drivers: Lack of transparency
Lack of transparency in the system leads to a feeling of indifference towards cost, and therefore an behavior inclined towards over-testing.

Context:Time Pressure
Hurried and rushed environment in the hospital leads to doctors taking the faster route, which is to order tests rather than spending time talking to the patient.

These factors were flipped to define the design goals such that they would create conditions for minimizing unnecessary test orders.

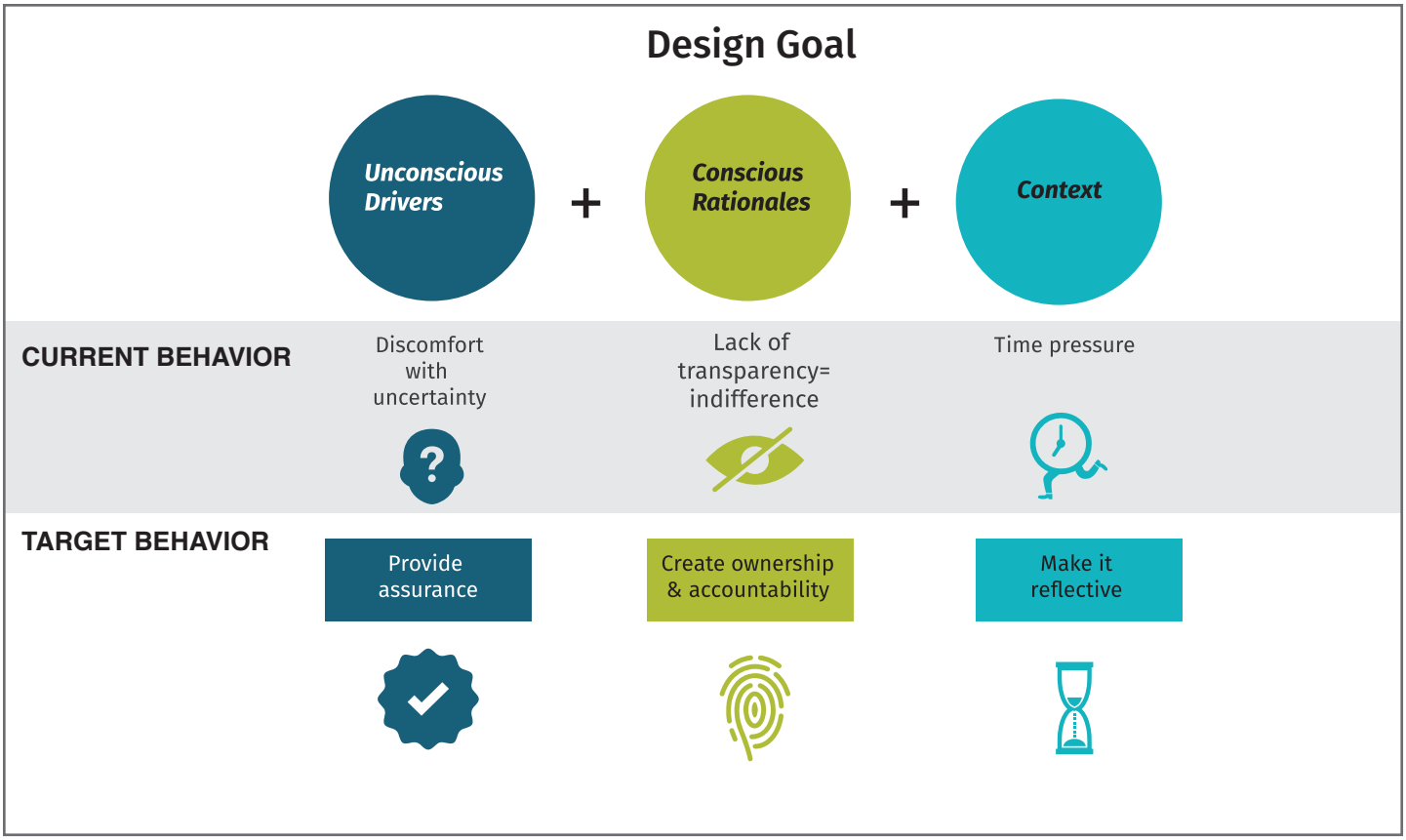


Fig 2.5 Hypothesis Framework

Translating behavior into design principles

The observed idiosyncracies were translated into design principles.

Bandwagon effect

Assurance

Providing assurance by giving information about how peers are behaving.

Competition

Self- satisfaction

Increase self-satisfaction by improving own practice

Objectivity= Clarity

Objective data

Using the language of objective data to give information.

Design Guidelines

These principles were then connected with the design goal framework

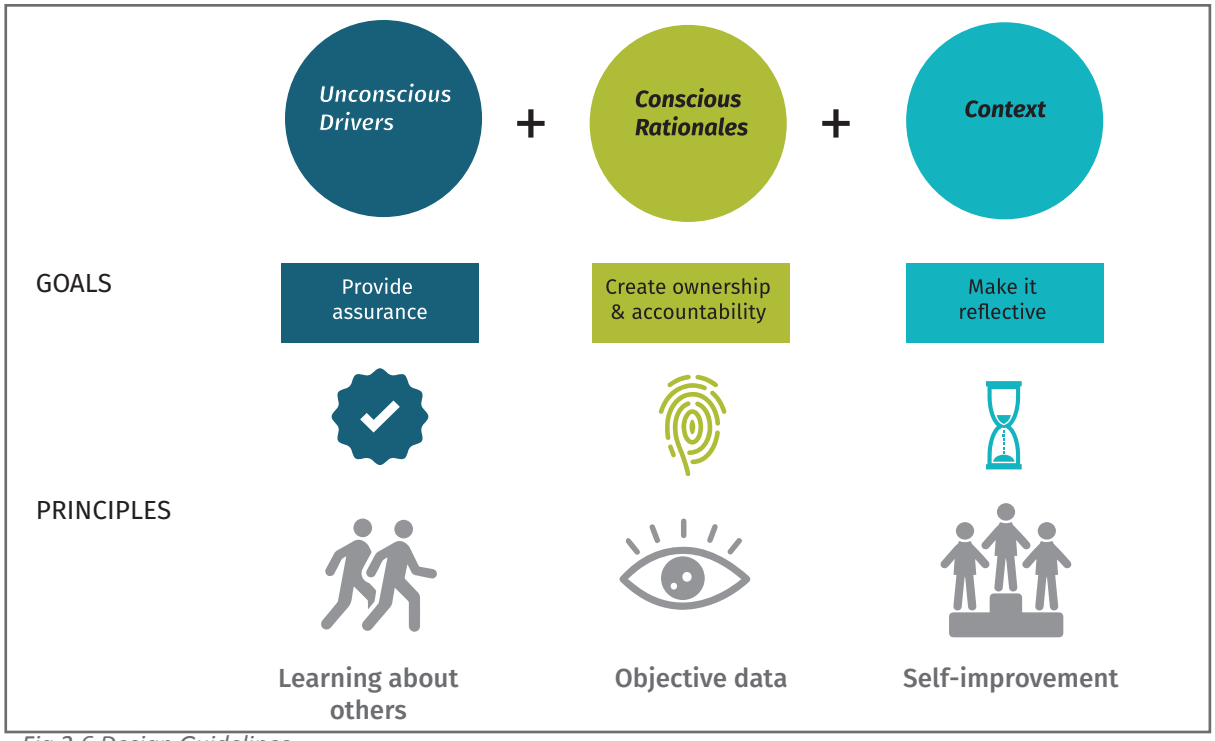
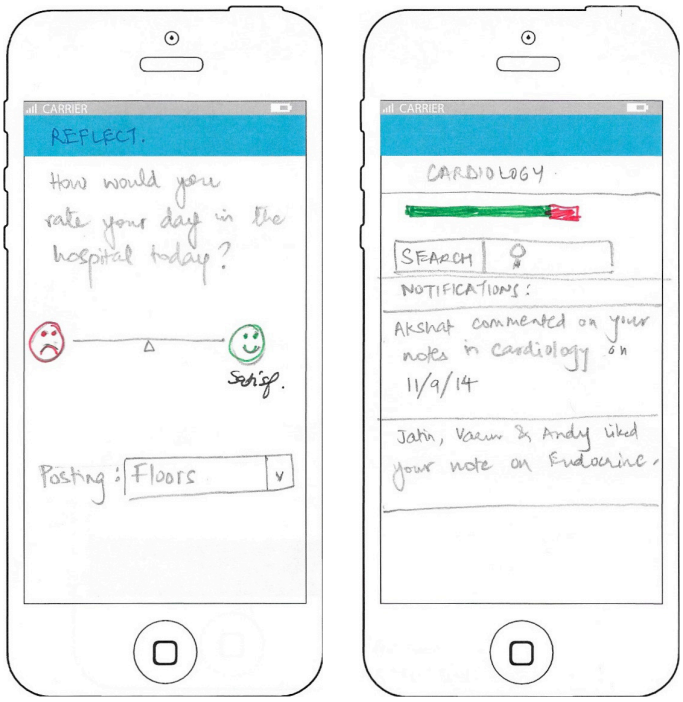


Fig 2.6 Design Guidelines

EXPLORING CONCEPTS

Three concepts were explored and shown to three residents for feedback. Most were mobile apps because previous research suggested that residents prefer apps over other tools because they already carry a lot in their pockets.



Reflection:

A mobile app that enables residents to reflect on their decisions.

Performance Tracker:

A mobile app that allows residents to know where they stand compared with others.

Conversation Tool:

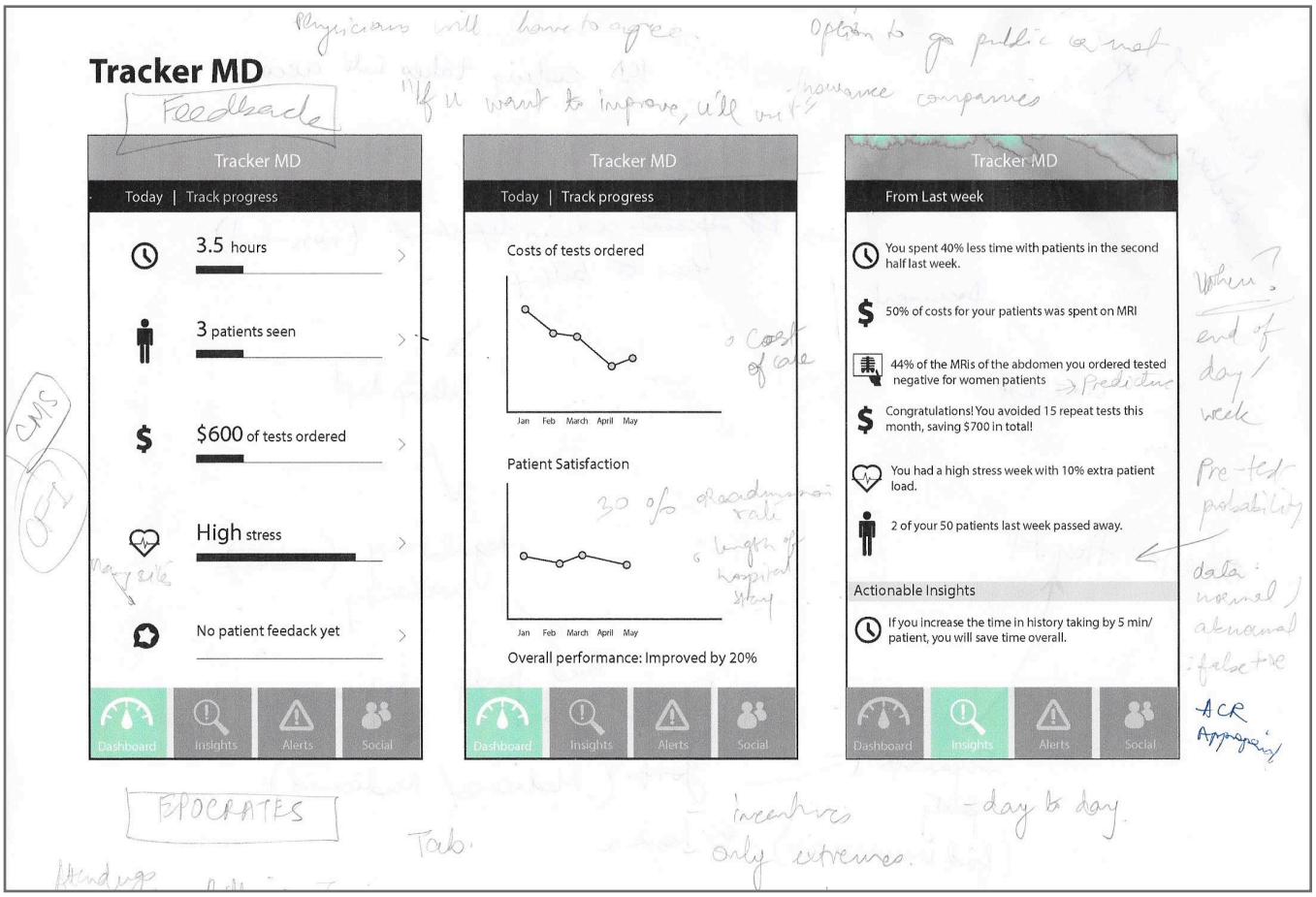
A probe that helps doctors talk about costs with patients, because usually they hesitate to talk to patients about it.

Feedback

The residents I spoke to had the following feedback:
They saw a lot of value in reflection. However, they lack time and motivation to do it. The performance tracker (which helped them know how they are performing over time) was highly appreciated by them and they saw great potential in it. Also, they were not motivated to use the conversational tool because they hesitate to talk to patients about costs because they feel that patients might misunderstand their concern.

Overall, they preffered having an app than a physical tool because of easy access at all times.

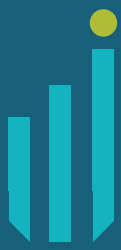
REFINING & DETAILING



I created low fidelity prototypes of the performance tracker to get some more feedback from attendings and residents on the kind of information and data that might be useful.

Learnings:

- The app needs to be flexible to incorporate the variation between inpatient and outpatient data.
- Making clusters like: Labs, Imaging (should include CT, MRI, ultrasound, Xray) , Stress test will be helpful
- Knowing patient outcomes will be useful in the long run. For e.g. no. of returning patients, Emergency Room visits of patients.
- Residents donot have the ultimate decision power. They do as much as attendings want them to do, so it will be useful to have attendings also as users.



WISE MD

A feedback tool for doctors
to enable cost-conscious,
quality care decisions.

ABOUT WISE MD

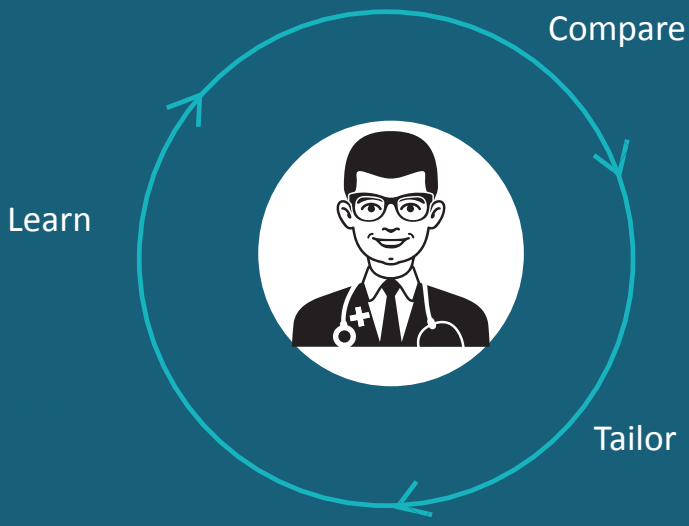
Wise MD is a fitbit like app for physicians to give them for the first time—Real Time, Automatic and Physician specific data. There are 3 main data components: Time efficiency, Cost effectiveness and Quality of Care

It enables users to

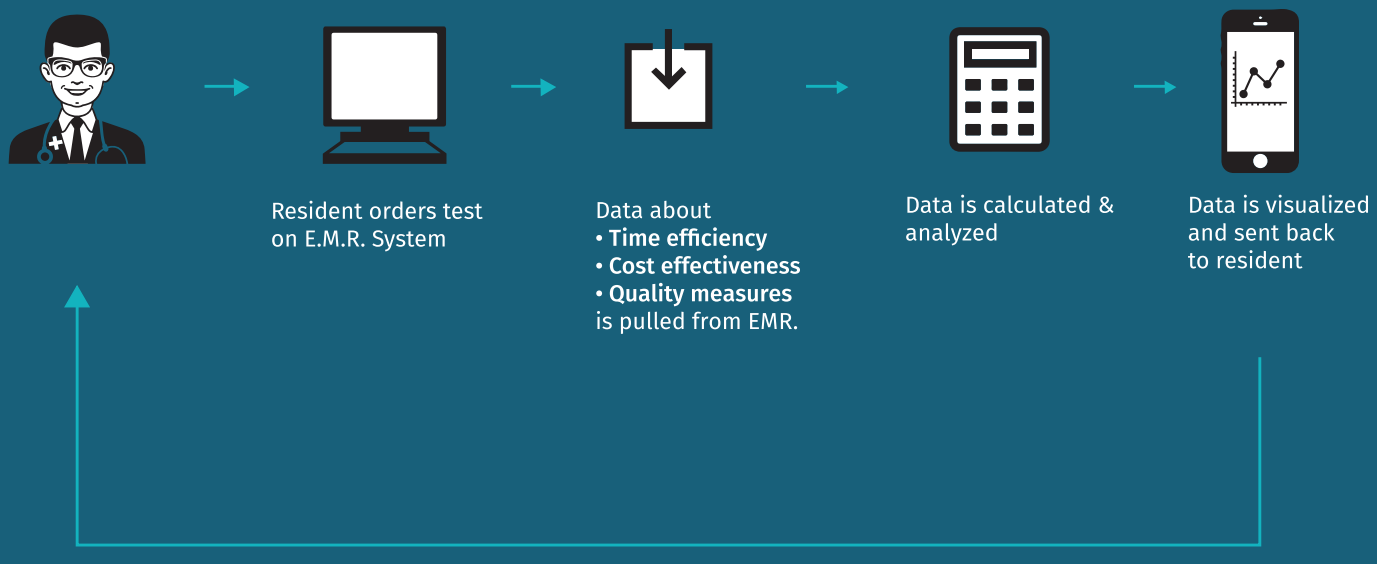
1. Learn about their own clinical habits
2. Compare themselves with their peers

So that, they can

3. Tailor their habits to perform better and deliver high value care.



How it works



VALUES AND CHARACTERISTICS

TRANSPARENCY

Leveraging the patient centered transparency movement for doctors

ALIGNED WITH INCENTIVES

With Obamacare, residents (when they become hospitalists) will be given bonuses and reimbursements based on provision of value care (minimum cost, maximum output). Wise MD gives residents a chance to learn early.

OWNERSHIP

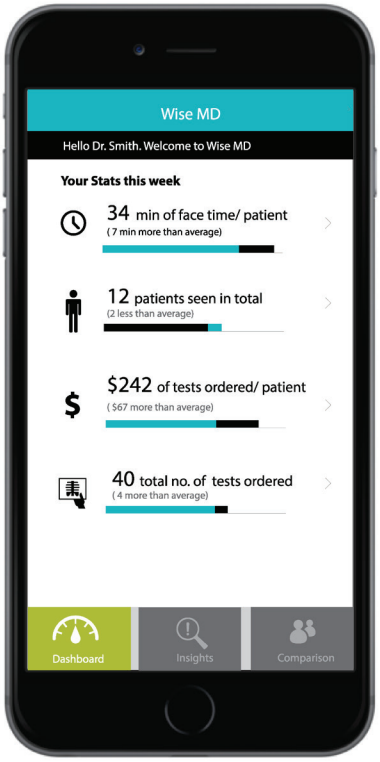
Transforming the attitude of indifference among doctors to ownership and responsibility for costs by giving physician centered data.

REFLECTIVE

Encouraging reflection on decisions by giving specific insights about one's own performance and compared with others.

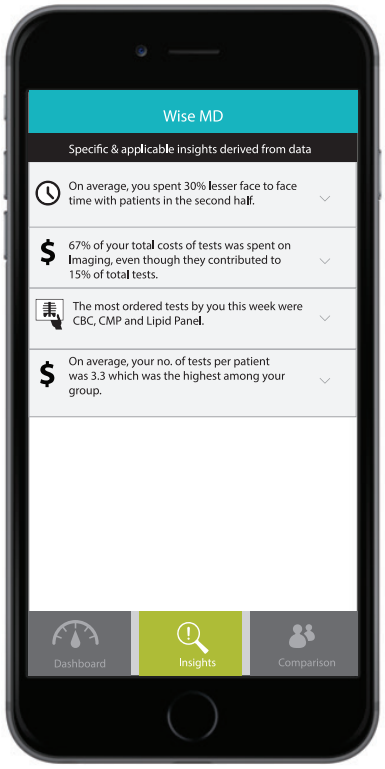
SELF EFFICACY

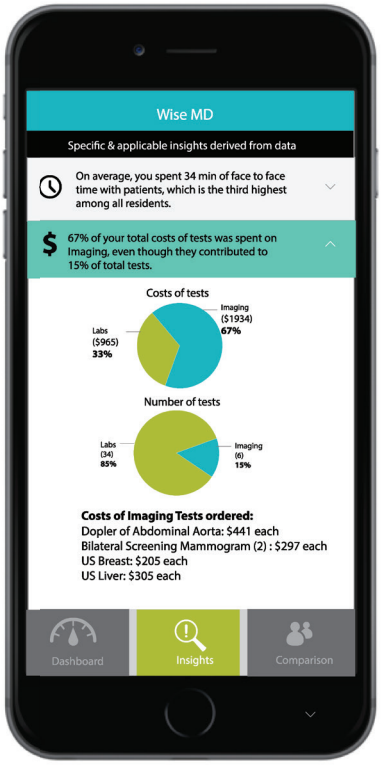
Encouraging residents to improve their performance by rewarding high value care (through recognition) and comparing performance over time.



Know at a glance

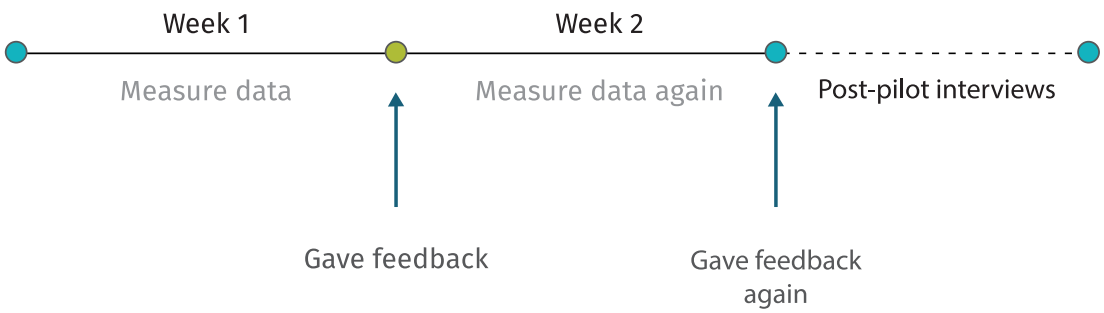
Compare with peers





Discover insights

THE PILOT



To test it out, I conducted a two week long pilot at an outpatient clinic setting in New Jersey.

First week:

The following data was collected for 10 residents by reviewing the Electronic Medical Records System (with IRB Approval):

Cost efficiency: No. of tests ordered for each patient

Quality measures: Average BMI of patient, Total no. of patients, No. of diabetic patients, No. of hypertensive patients

Time efficiency: I also requested the group of residents to submit time sheets (face to face time with patients). The costs of tests ordered were calculated by tallying each test with the Healthcare Blue Book (A website that gives fair prices for each test and medication).

This data was then visualized into the form of app screens through Flinto.And personalized data was given to each resident before the second week.

Second Week:

The data was collected again for the same set of residents. The two weeks were then compared with each other.

Comparitive data

At the end of two weeks, data from the two weeks were compared and the impact was huge.

Costs of tests per patient

↓ 21%

on average

No. of tests per patient

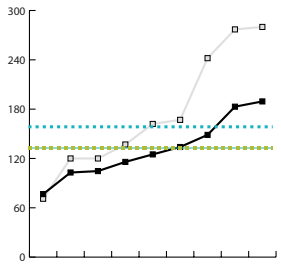
↓ 22%

on average

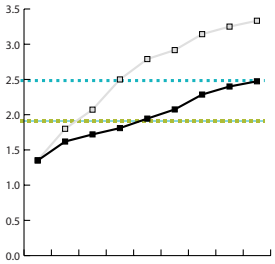
No. of patients

↑ 50%

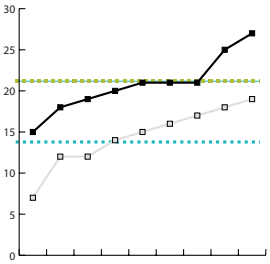
on average



Average Week 1= $165/patient
Average Week 2= $131/patient



Average Week 1= 2.5 /patient
Average Week 2= 1.9 tests /patient



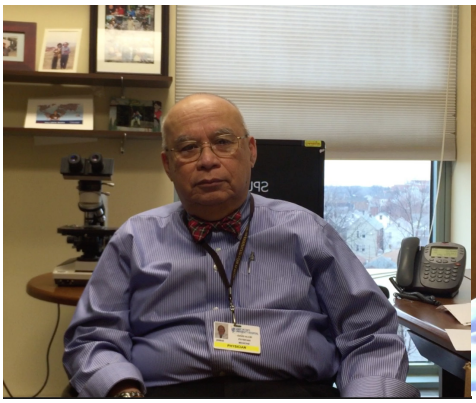
Average Week 1= 14 patients
Average Week 2= 21 patients

Week 2
Week 1

Average week 2
Average week 1

Charts 3.1 Comparitive data between first and second weeks.

INTERVIEWS



"It's a simple tool that can help doctors improve care and decrease costs"

- Dr. David Alcid,

Head of Infectious Disease, SPUH

"In residency you want to improve because when you go for a job, you have to see more patients and be more cost efficient. Why not start working on it now?"

- Dr. Ovais Khan, Resident Physician

"It tells me where do I have to improve. And if I am working on something, I know how well I am doing. I would love to continue with this"

- Dr. Alfredo Puing Vera, Resident Physician

First Reactions

The first reactions I got after they got their feedback was full of excitement, surprise and realization.

For e.g. some of the first reactions were:
" Oh wow! A bilateral mammography is for $297! That is insane"
" I spent the maximum face time with patients. I should be faster."
"I ordered the maximum imaging tests, will try to cut down on it"
"I spent the least time with patients. I hope I am not missing out on something"
"This would be more valuable if I could see this over time"

From indifference to ownership

The pilot was then followed up with interviews with the ten participant residents, and an attending to understand:
- Their experience of getting feedback
- Their Interest
- Concerns
- If it affected their behavior and how.

They had learnt a lot about themselves. While some residents learnt that they were spending too short a time with patients, others learnt that a "Sleep study" was quite expensive. All ten residents who participated wanted to continue with it. Also, those learnings were reflected in the data of the second week. And most importantly,

NEXT STEPS

After a successful pilot with both quantitative and qualitative impact on the behavior of residents, my confidence about the tool has become stronger. This tool has the potential to scale not just to every residency program, but also to every physician.

My next steps are to:

• Conduct a eight week long pilot with two more hospitals in Cincinnati and Bethlehem.

• Simultaneously, collaborate with developers and electronic medical record coders for creating an algorithm for this application.

• Apply for grant with Center for Medicare and Medicaid Innovation

I am passionate and excited about taking this to the next step, because it can have a big impact not just on reducing wastage, but also on creating a culture of cost efficient, high value care.

If we cut down even 1% of unnecessary tests, it can save us 62 Million Dollars and 3700 patient lives per year.

LEARNING

Human Lens

Initially, my hypothesis was that lack of transparency is the reason for indifference towards cost. However, through my prototypes I learnt that the real reason for that was lack of motivation. This process of thesis has taught me to look at every problem with a human lens.

Empathy over understanding

My process was highly driven by immersing immersing myself in their environment and culture of residents. This helped me to look at the problem of unnecessary tests from their point of view.

Role of Design

Personally for me, the role of design has evolved from designing tangible products to designing behavior. The impact of this work of social innovation is much more meaningful, but also much more sensitive. As designers of change, we need to be responsible towards our actions, because one small

Passion

Healthcare as a field has been close to my heart ever since I was a kid. And it is this passion that made me run this thesis marathon for a year. And going through this has made me believe that design has the potential to revolutionalize healthcare.

Trust the process

During this year long thesis process, there were times when I did intensive research on subjects that were only distantly related to my thesis. However, in the end, bits and pieces of most of those came together to connect the dots and create a holistic point of view towards the problem.

Don’t forget to zoom out.

Being involved deeply in my topic, it was difficult to zoom out and see how the little pieces are affecting the big picture. But it was critical to do this from time to time, to decide the next steps.

Bravery

This rigorous process has made me braver. It has given me the confidence to figure out steps in solving any problem I am thrown into. While I still do struggle with some parts, I feel personally and professionally I have grown enormously. I have learnt to balance my analytical strengths with creativity.

WISE MD