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CHAMPIONS OF HEALTH UNITE

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To Buy or to Build – How Best to Leverage Technology to get your project off the ground

Session 204, February 14, 2019

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Disclosures

Neha Patel, MD MS

Has no conflicts of interest to report.

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Agenda

- An approach to “test” new tech in a healthcare system
- Factors to consider for Build vs Buy
- Case examples and outcomes:
 - Case Study 1: Secured Messaging (Buy)
 - Case Study 2: Interdisciplinary task management (Build)

Learning Objectives

- Explain the strengths and weaknesses in implementing a vendor based technology solution
- Recognize the strengths and weaknesses in developing a homegrown technology solution
- Explain how healthcare systems should test, sustain, and finance technology solutions that optimize clinician workflows

Getting to know you...



**Clinicians? Healthcare administrators? Informatics?
Healthcare environment ...**

- **supportive of new technology, besides EHR?**
- **with mobile strategy, including BYOD policy in place?**
- **with mobile apps in daily clinical use?**



The ideal...

- Seamless integration of technology into (and while enhancing) clinical workflow
- Clinician are empowered to focus on patient – not technology
- More time spent at bedside than desktop
- Relevant information about the patient flows seamlessly to all members of the care team
- Real-time clinical decision support
- Regulations, requirements flow naturally out of clinical work

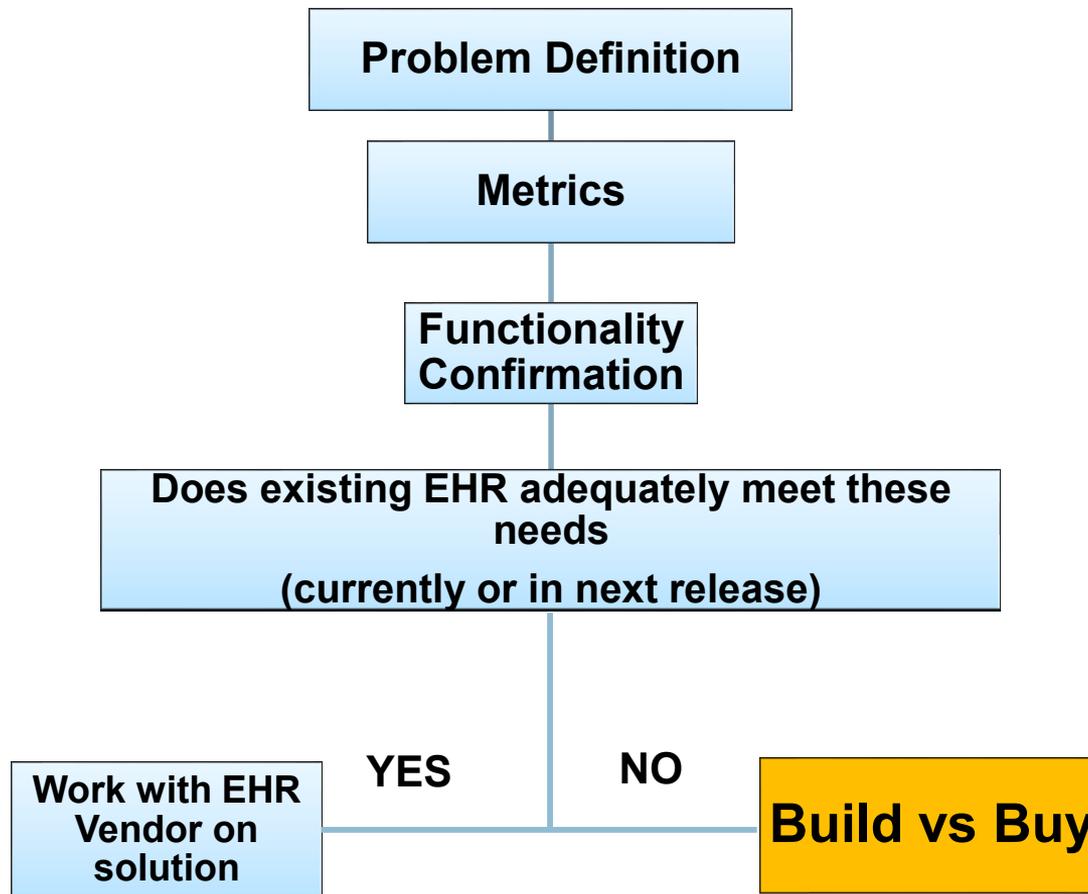


The reality...

- Promised benefits of EHRs remain elusive
- Lack of flexibility with EHR development functionality and timelines
- Poor EHR usability leads to inefficient workflows and contributing to clinician burnout
- Limited mobile functionality in EHR solutions
- *EHR connected applications being used to improve workflows & fill gaps in EHR functionality*



User Centered, Problem Based Approach



To Build or To Buy

...an approach to consider...

- In the last 6 months, how many of you have implemented a vendor solution?
- In the last 6 months, how many of you have developed a home-grown solution?

Build vs Buy Considerations

- Organizational culture
 - Buy when possible? Build when possible?
- Availability of vendor based solution
- Internal timeline
 - Is there a hard stop for when solution is needed?
- Security and legal issues
- Infrastructure
 - Device availability, Wi-Fi, MDM etc



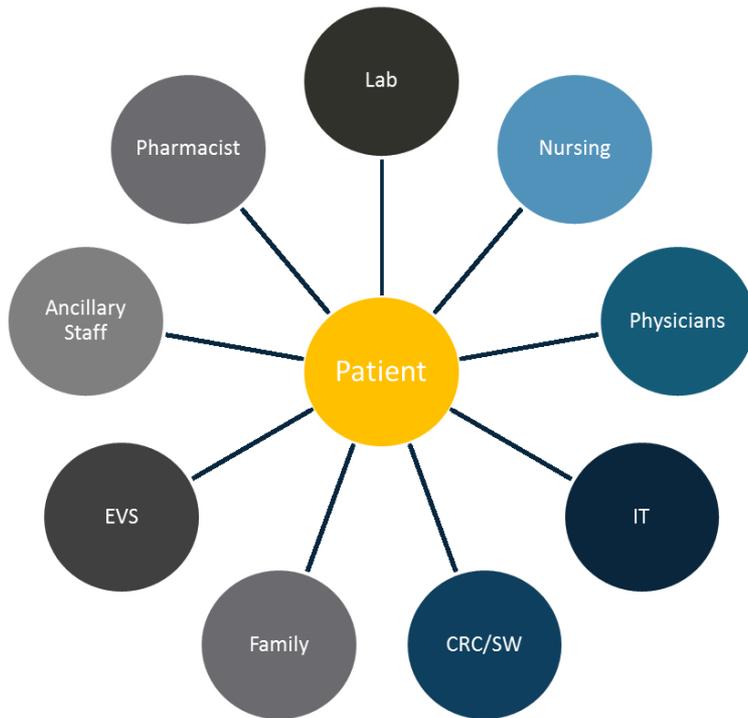
Build vs Buy Considerations

- Development resource availability
 - Engineers, content expertise
- Implementation
 - Staff readiness/buy-in
 - Training, implementation resources & support
 - Scalability of workflow and software
- Desired outcomes
 - How will success be defined?

Case Study 1

Secured Messaging

Current technology enabling silos...



Desktop (EHR)(40%)*

- Pagers
- Smartphones
- Landlines
- In-person

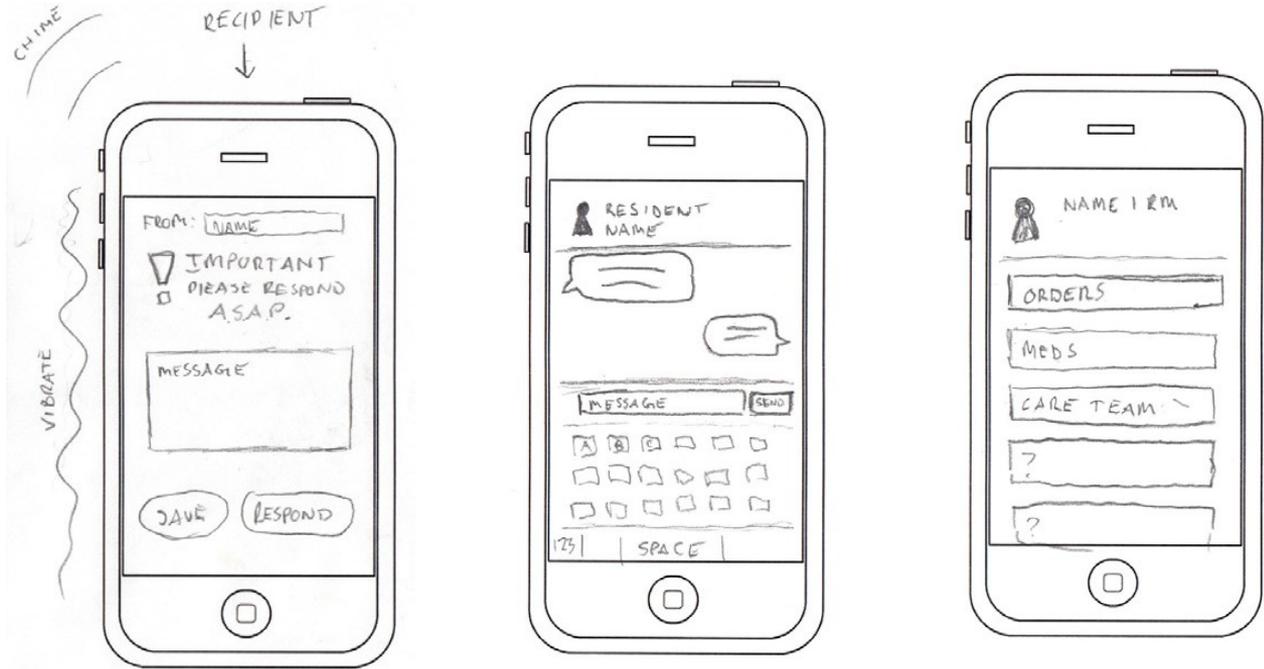
*Block L, Habicht R, Wu AW, Desai SV, Wang K, et al. In the wake of the 2003 and 2011 duty hours regulations, how do internal medicine interns spend their time? *J Gen Intern Med.* 2013; 28(8):1042-7.
 Sinsky C, Colligan L, Li L, Prgomet M, Reynolds S, Goeders L, et al. Allocation of Physician Time in Ambulatory Practice: A Time and Motion Study in 4 Specialties. *Ann Intern Med.* 2016; 165:753–760.

Problem definition and measurement

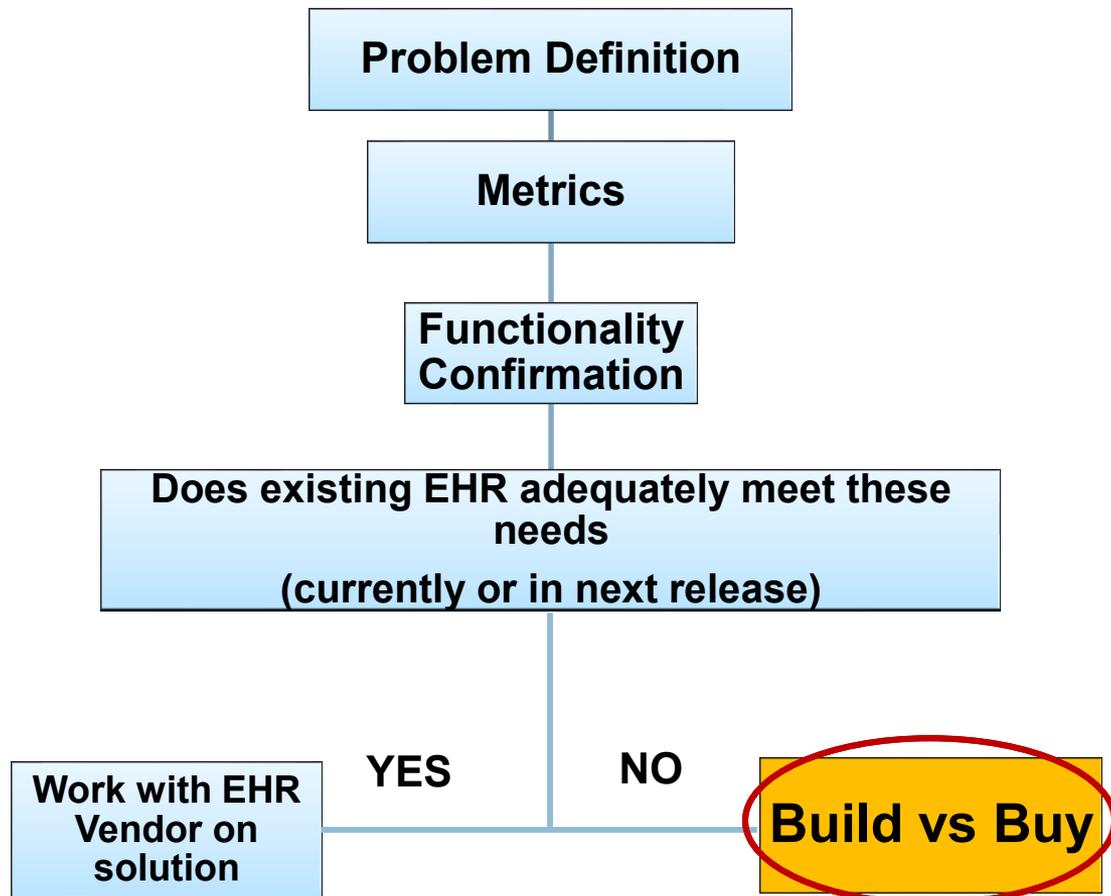
- Observations of local workflow
- Contextual interviews of all stakeholders
- Identify metrics of success
 - Satisfaction of users (Surveys)
 - Operational metrics (LOS, Readmission, Time saved)
 - Quality and safety metrics patient care (Safety events)
- Create prototypes and get feedback; cyclical process



Our prototypes...based on our user needs...not theory



User Centered, Problem Based Approach



Build vs Buy Considerations

- **Availability of solution:**
 - Numerous start-ups in secured texting space.
 - Existing features matched what our providers identified as needed in our prototypes, not “wish list” features
- **Timeline:**
 - Internal funding was available for pilot so there was leadership buy-in
 - Vendor solution was ready to “turn on”
- **Development resources:**
 - Minimum internally
 - Required no integration with our digital assets
- **Content expertise:**

Prototypes identified features that worked in our workflow



Build vs Buy Considerations

- **Implementation considerations:**
 - Staff readiness was high and the effort was low (texting was part of everyday life and the tool we chose did not require training)
- **Security considerations:**
 - Approved and encouraged by our Security and Privacy leadership
- **Goals:**
 - Clear metrics on utilization, satisfaction and operational effects were measured pre-post to help with decision on scale or not
- **Device considerations and policies:**
 - Became a secondary goal of the pilot
- **DID NOT address, since we were in “testing” phase:**
 - Maintenance resources
 - Scalability



Pilot results

- **Setting: 3 general medicine units and 1 surgical unit**
- **96 iPhones, 13 *iTouches***
- **Participants: Housestaff, Hospitalists, Nurses, Pharmacy, Social workers, Discharge Planning Nurses, Physical Therapists**

721,820

Total Messages Sent



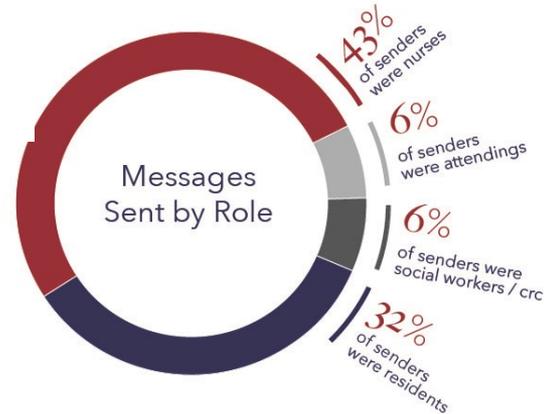
588,589

Individual to Individual Messages Sent

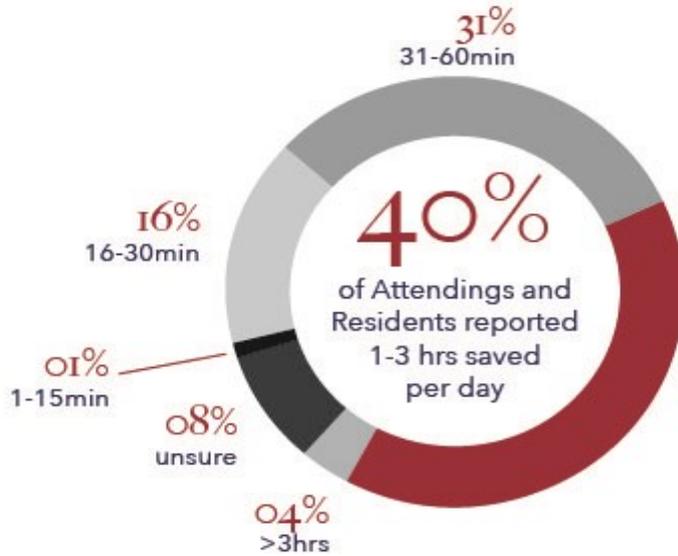


133,231

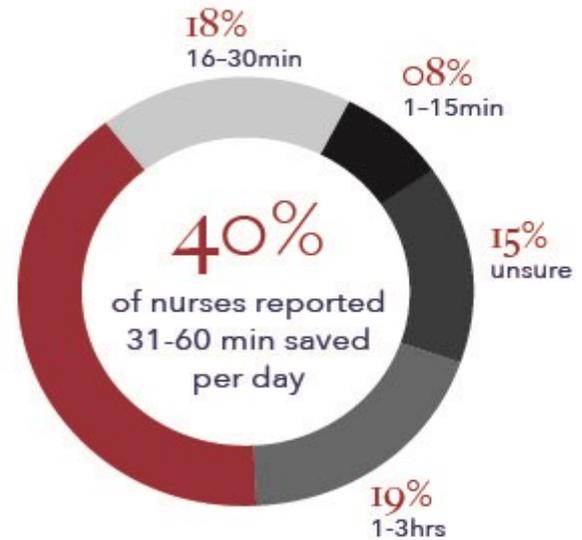
Individual to Group Messages Sent



Time savings impact...

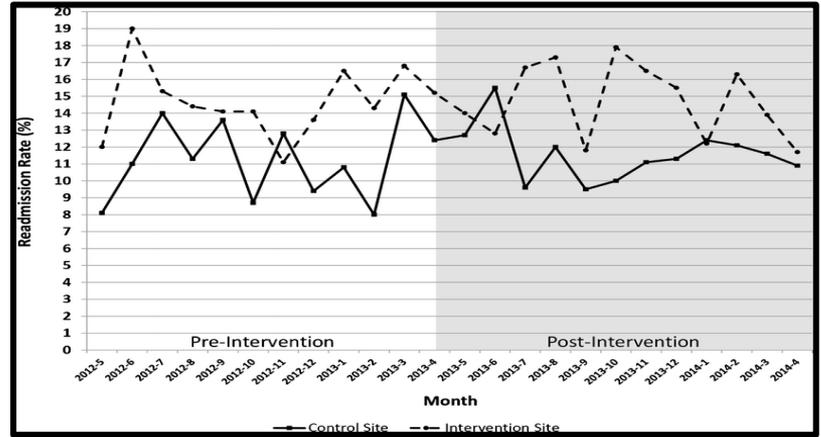
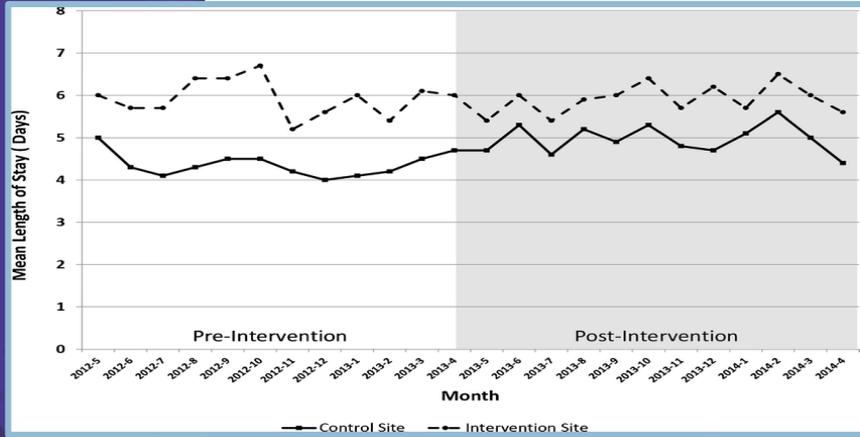


Attending and Resident Time Saved



Nurse Time Saved

Outcome metrics



- In adjusted analyses, there was a significant decrease in length of stay for the intervention site relative to the control site during the post-intervention period compared to the pre-intervention period (-0.77 days ; 95 % CI, -1.14, -0.40; P < 0.001).
- There was no significant difference in the odds of readmission (OR, 0.97; 95 % CI: 0.81, 1.17; P = 0.77).



Pilot → Enterprise level

- Pilot data and adoption among frontline staff helped get buy-in to do this at an enterprise level
- Secured messaging implementation requires a roadmap with the following stages:
 - Infrastructure
 - Functionality of Secured Messaging Applications
 - Security/Financial Implications
 - Communication etiquette
 - Custom notifications
- **Vendor testing/implementation requires infrastructure for success...**



Penn Medicine's New technology review committee-NTRC

- **Mission Statement:**
 - To ensure innovative technology initiatives meet Penn Medicine's goals and objectives.
- **Purpose:**
 - Multi-disciplinary group dedicated to accelerating innovation throughout Penn Medicine in an organized and compliant manner.
- **Composition:**
 - Various institutional perspectives are represented on the committee. These perspectives include:
 - The Office of Audit, Compliance and Privacy
 - The Office of the Chief Administration Officer
 - The Office of the Chief Information Officer
 - The Office of the Chief Medical Officer
 - The Office of the General Counsel
 - The Office of the Chief Information Officer
 - The Office of the Chief Operations Officer



Highlights of NTRC

◆ Project Intake:

- Sponsor completes intake document providing vendor details and project goals
- Vendor completes security and privacy impact assessment documentation

◆ Pre Pilot:

- Execute Legal Agreement
- Complete Security and Privacy Impact Assessment
- Conduct Technical Setup

◆ Pilot:

- Pilot the technology, gathering success metrics data

◆ NTRC Post Pilot Assessment

- Sponsor returns to NTRC to deliver pilot outcomes data
 - Did the technology solve the problem it proposed to solve?
 - Did use of the technology complicate clinical or operational workflows?
 - Should Penn Medicine continue to use this technology?

◆ Final Determination

- Use of technology approved to continue at Penn Medicine
- Use of technology discontinued



Summary of Vendor Considerations

- **If “buying” solution, figure out if you “test” or “implement”**
- **Measurement identification of what success is important to help with buy-in and future investment**
- **Organizational culture and governance is necessary**
- **Major considerations of testing solution**
 - Available vendors & functionalities
 - Timeline
 - Development resources (integrate or no)
 - Content expertise
 - Implementation resources
 - Security considerations
 - Goals/Outcomes
- **Additional major considerations of implementing vendor solutions:**
 - Maintenance resources
 - Device considerations and policies
 - Scalability



Case Study 2

Mobile, Interdisciplinary Handoff



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440,000

3rd leading cause of death in the United States

70% of errors are related to
communication failures

James JT. A new, evidence-based estimate of patient harms associated with hospital care. *JPS*. 2013;9(3):122-

128. 28

CRICO Strategies. Malpractice risk in communication failures; 2015 Annual Benchmarking Report. Boston, Massachusetts: The Risk Management Foundation of the Harvard Medical Institutions, Inc.



RN

Attending

MD
#3

MD
#1



CNA

SW

MD
#4

MD
#2

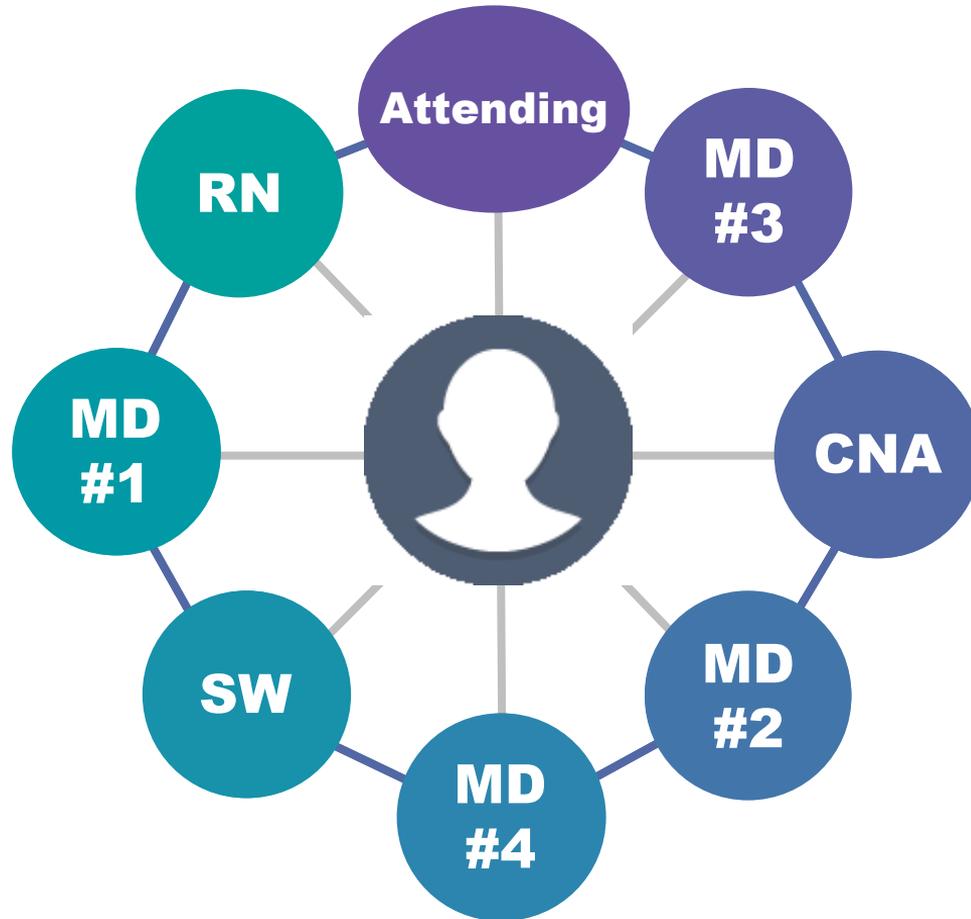


Pt Info	HPI	Prob List	MEDS	To Do	CrossCover
Smith, John Bob F14 1465A MR: 34520984 DOB: 11/3/38 DOA: 11/2/06 Allergies: NKDA Code: FULL Access: RIJ 3L (11/4) Cx: >101.4 Precautions: MRSA Contact: Wife Mary 215-777-7777	Age, Gender, CC (on DOA): short of breath CC (after dx): aspiration pneumonia Race, pertinent PMH, presentation to ED, HPI -relevant ROS -relevant ED issues (vitals, meds given) -relevant things done o/n -important events during hospitalization 11/20 - desat last night, improved after diuresis DATA: 11/3 CXR: LLL pneumonia 11/5 Chest CT: LLL consolidation	**Asp Pna - on cefepime, still borderline **ARF on CKD: Cr 0.8 → 2.5, likely 2/2 dehydration. Getting volume **CAD - EF 10%, on coumadin for low EF **DM - on insulin **HTN **Diarrhea - possibly CDiff, cx pending -Prostate ca - resected, cured ---PMH--- -hyperlipidemia -PTSD -chronic anemia	Cefepime 1gm IV q12 Colace 100mg po bid Docusate 5mg po daily Furosemide 20mg po daily Metoprolol 50mg po bid Metronidazole 500mg po bid Warfarin 5mg po qHS Diet: Cardiac, mech grnd, NS @ 150 ---Other Med Info--- Flagyl 500mg q12 11/2-4	---D/C Info--- PMD Dr. Jones 444-2244 <input type="checkbox"/> needs gi appt ---To Do --- <input type="checkbox"/> f/u xxx test <input type="checkbox"/> daily pulm note □ LLE 4/5 □ 2nd set enzymes □ recheck ECG □ start Tele	 □ f/u 7pm Na - increase IVF if Na < 130 -if looks bad, consider fungal coverage

142 | 110 | 22 < 210
 4.1 | 30 | 1.8 < 1.4

- better = slutz □ ? dk plan. may be houlders
 - ECG nl.
 - 1st set enzymes nl. → talk to SW. □
 AKI → ? Bray → □ IVF - recheck Cr





Paper is just not good enough...

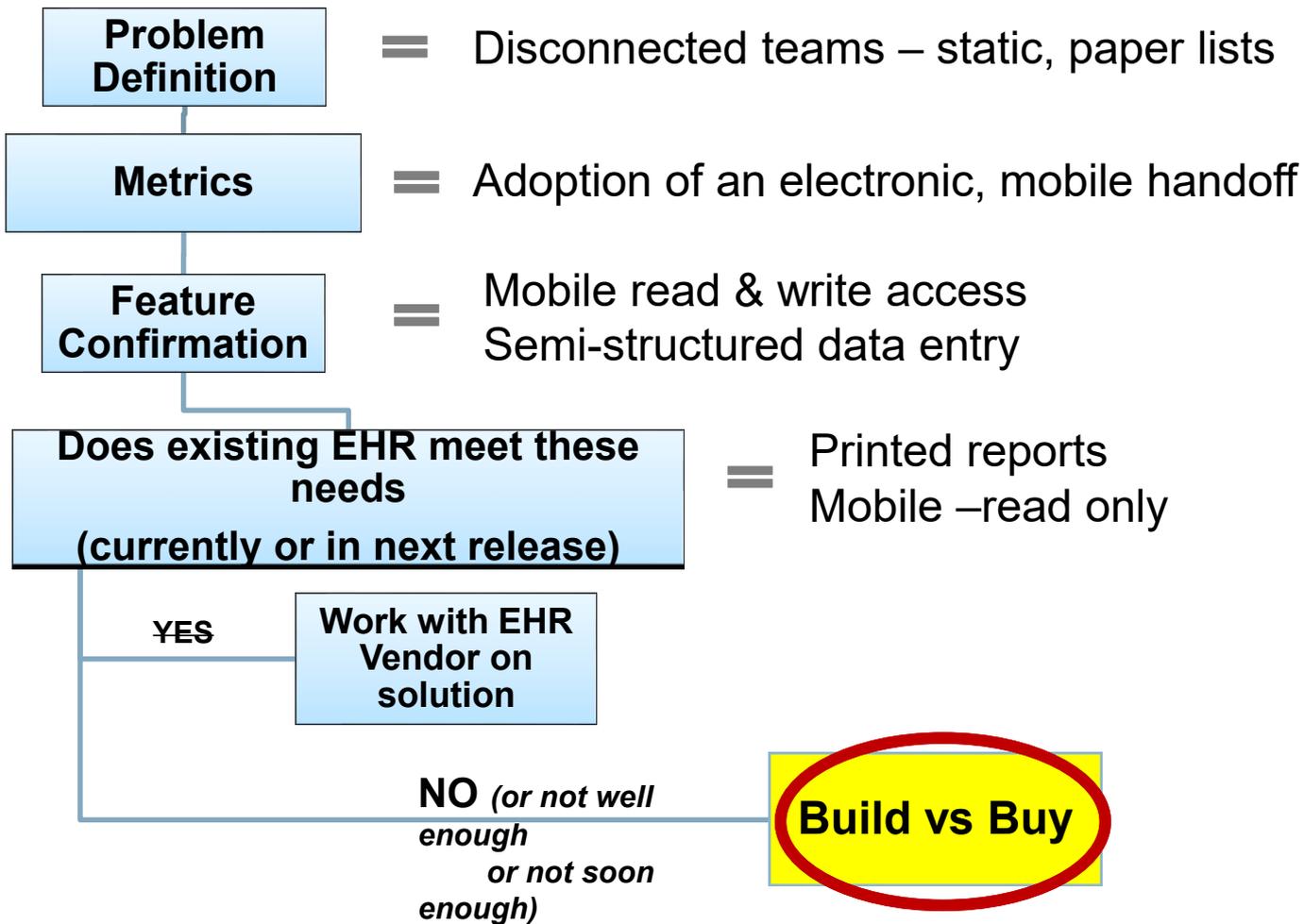
Average list in hands = 9-12 hours old
(3pm cross-sectional evaluation at UPenn)

Printed documents out of date within
3.3 hours (day shift), 6 hours (night shift)

Rosenbluth et al, BMJ Qual Saf 2015

Paper is not HIPAA compliant...





Build vs Buy – Next steps

Organizational priorities and resources

- Funds to pay for a vendor vs internal development

Evaluate vendor capabilities

- Limited mobile functionality (if any)
- Limited experience integrating with EHRs

Evaluate organizational resources

- Content expertise
- Development expertise & time
- Implementation resources
- Maintenance resources

Key Build Steps

- Timeline – are features needed by a certain date?
- Security
 - Start with the CISO
- Legal
 - Regulations? Limitations?
- Device/Hardware
 - Health system supplied vs BYOD
 - Policy for use of mobile devices
 - Wi-fi infrastructure
- Form factor: Smartphone vs Tablet vs Desktop
- Native vs. Responsive



Timeline

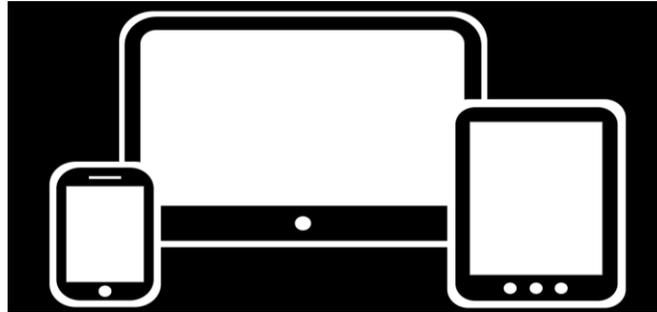
Are features needed by a certain date?

Security & Legal

- Security
 - Talk to the CISO
 - Mobile access?
 - Mobile device management
 - On vs Off Campus access
- Legal
 - Talk to institution's legal counsel
 - Legal record vs Not
 - Logging, storage requirements



Device Considerations



Smartphone

Less Cost

Less screen space

Easy with 1 hand (multi-task)

More readily fits in coat pocket

Need to use on screen keys

Tablet

High cost

More real estate

Usually requires 2 hands

Need mini to fit in pocket

Can get bluetooth keyboard

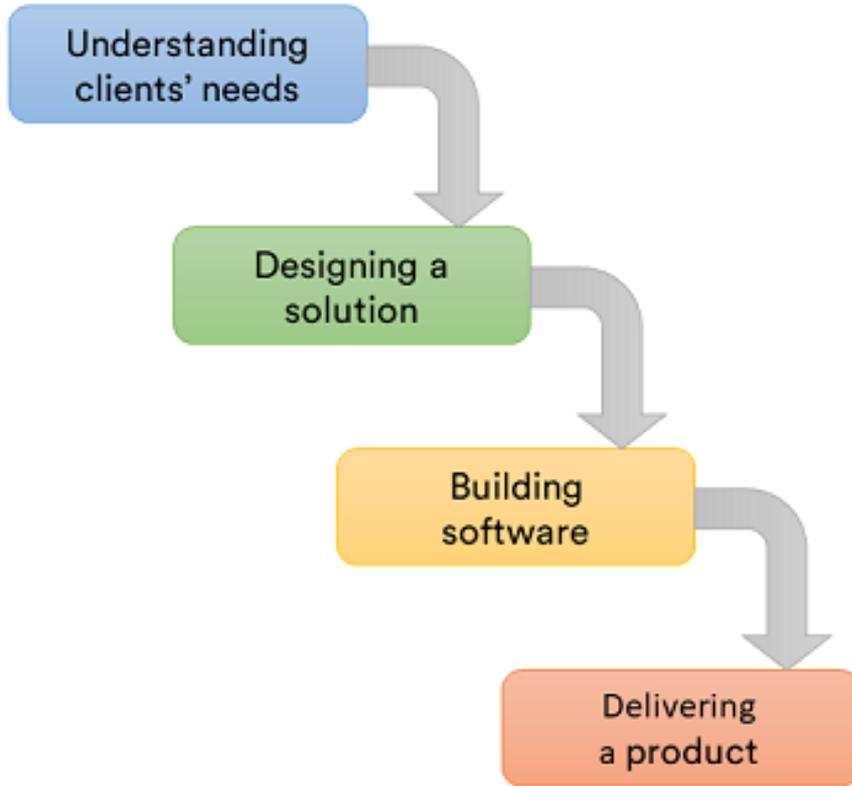
Native vs Responsive vs Hybrid



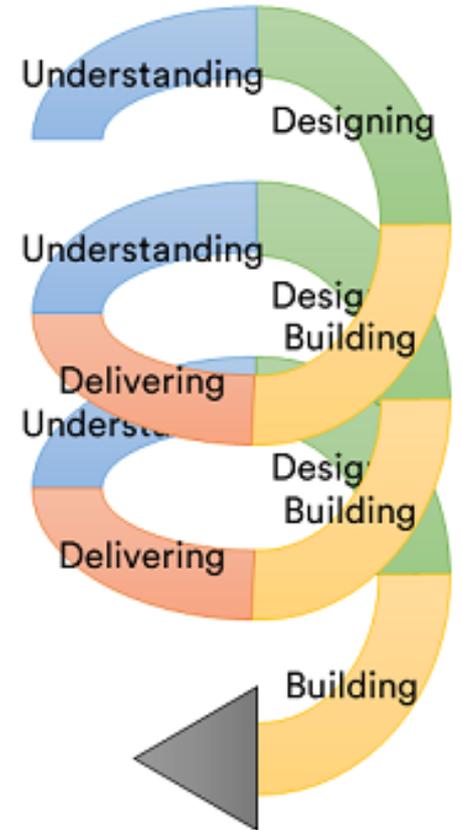
Image source: <https://medium.com/@AtukuriApps>

	Native	Mobile Web
	Device Specific	Cross platform
Development Time	Long	Short
Updates	Download required	Can be pushed
Utilize hardware	Yes	Somewhat
Programming Flexibility	More	Less

'Waterfall' process



'Agile' process



Our Proposed Solution

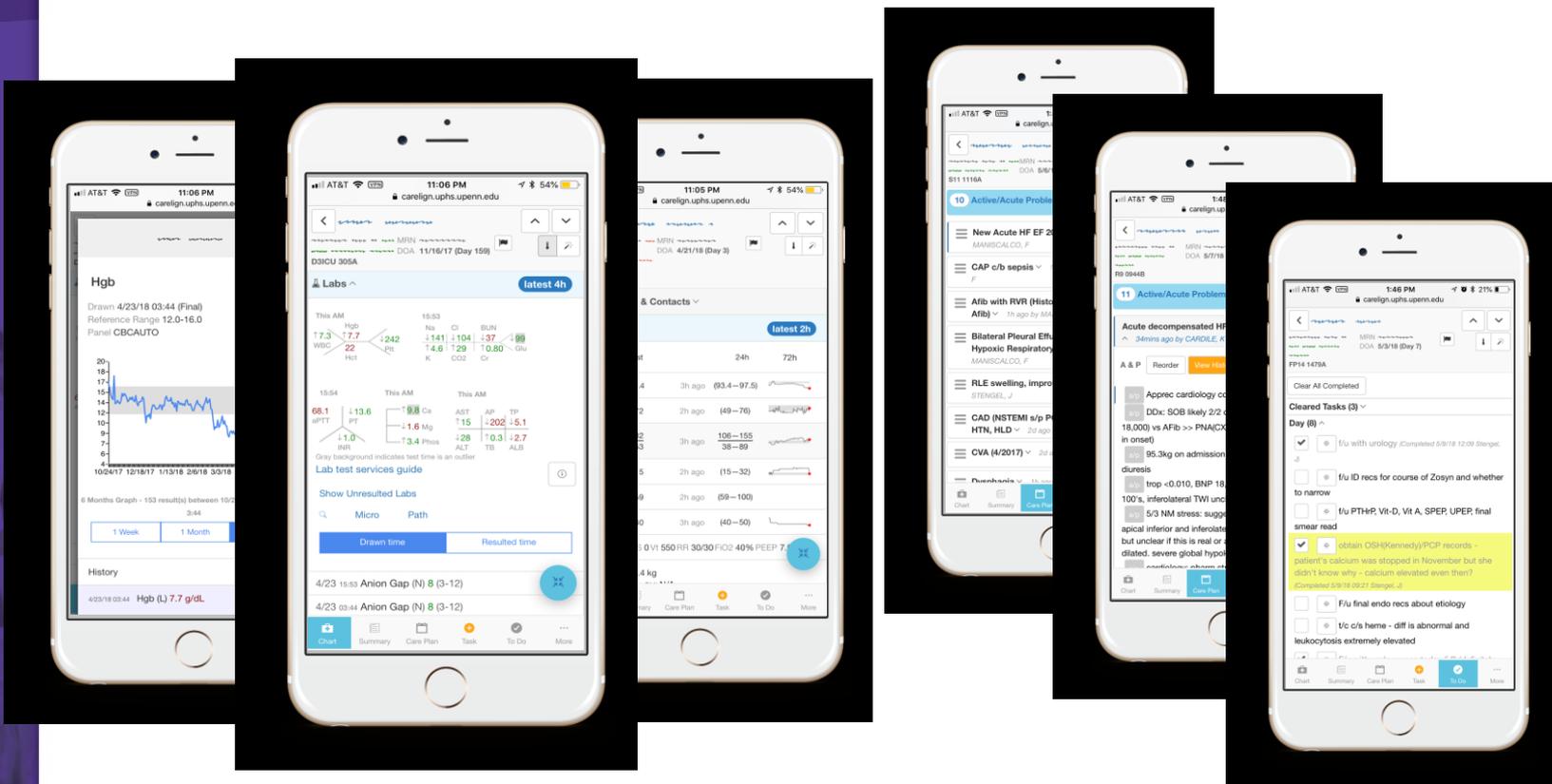
- Design for the *Clinical User*
- Electronic with fully functional mobile interface
- Integrate with ecosystem of clinical IS systems
 - Real-time data feeds
 - Module within EHR for seamless workflow
- Leverage technology while still supporting paper
 - Easy to access
 - Semi-structured elements
 - Keyword, tag, filter, workflow based views
 - Simple print options for transition



Our Proposed Solution

- Patient-centered
 - Every one sees same content
 - Primary, consultants etc.
- Interdisciplinary
 - Physicians
 - Advanced practitioners
 - Nurses
 - Students
 - Pharmacists
 - Therapists
 - Social workers





Care Team & Contacts ▾

Vitals ^
latest 18mins

	Latest	24h	72h
Temp	99.7	1h ago (97.2–99.9)	
HR	95	18mins ago (67–101)	
BP	121/70	18mins ago (116–157/46–92)	
RR	24	18mins ago (12–37)	
Pox	99	18mins ago (85–100)	RA

Last 24hr: I/O: 5,382/450 (4,932)
I/O Output: Total Urine: 450ml, Urine Incontinence Count: 4

Weight 81.65 kg
Height 1.96 m BMI 21.34

Summary
Care Plan
To Do
Action

Assessment Statement ("one-liner") [Click to see HPI](#)
55 y/o male presenting to ED with xxx symptoms found to have yyyy being treated with zzzz now complicated by abc and def.

Sort: Problem System Consult view: View Consult

2 Active/Acute Problems ^

New **Problem 1** ^ 0mins ago by AIRAN-JAVIA, S

Assessment & Plan
View History
+ Bundle

- ≡ a/p Assessment of problem 1
- ≡ a/p Differential ddx of problem 1
- ≡ a/p Supporting data, thought processes of problem 1
- ≡ a/p Plan of problem 1
- ≡ a/p fyi Anticipatory guidance related to problem 1 for covering physician
- ≡ a/p 🏠 Important info that affects discharge planning for problem 1

Click to add info

Tasks
Clear
View Cleared

- ≡ ⚙️ 09:00 Primary team day task 1 problem 1 #0900
- ≡ ⚙️ Primary team day task 2 problem 1
- ≡ 🕒 21:00 #2100 Overnight team task 2 problem 1
- ≡ 🕒 22:00 #2200 Overnight team night task 1 problem 1
- ≡ 📅 Task to do later, but not today for problem 1
- ≡ 🏠 Another task that is related to discharge planning for problem 1

Click to add task

Labs ^
latest 42mins

3/15/16		Last PM		3/14/16	
Hgb	↓13.1	Na	↓140	Cl	↓109
WBC	↓7.9	BUN	↓6	Glu	↓92
Hct	↑42	K	↓3.7	CO2	21
Pit	↓170	Cr	↓0.98		



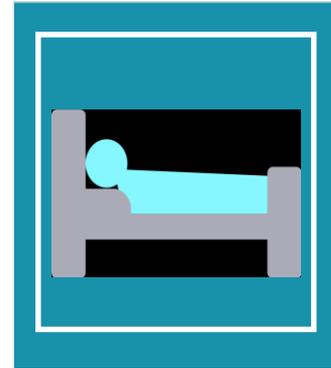
Results - Usage



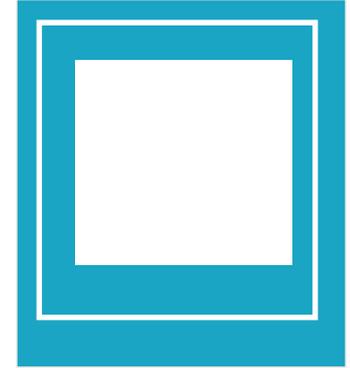
Four Hospitals
>130 Services



~5000 Users
150k Sessions



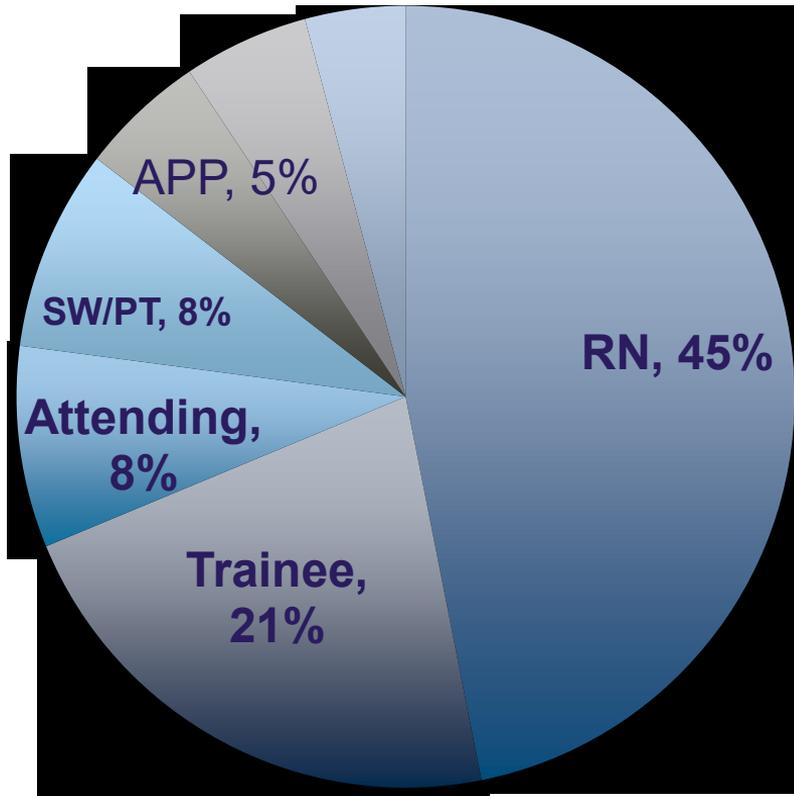
>500,000
Patient views



3.5M actions in
platform

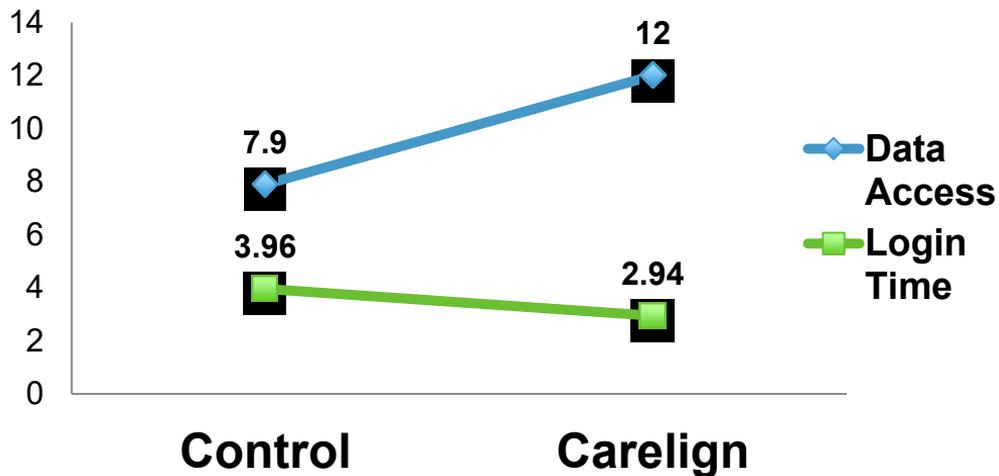


Results - Interdisciplinary



34% MDs & APPs
(Attendings + Trainees + APPs)
45% Nurses

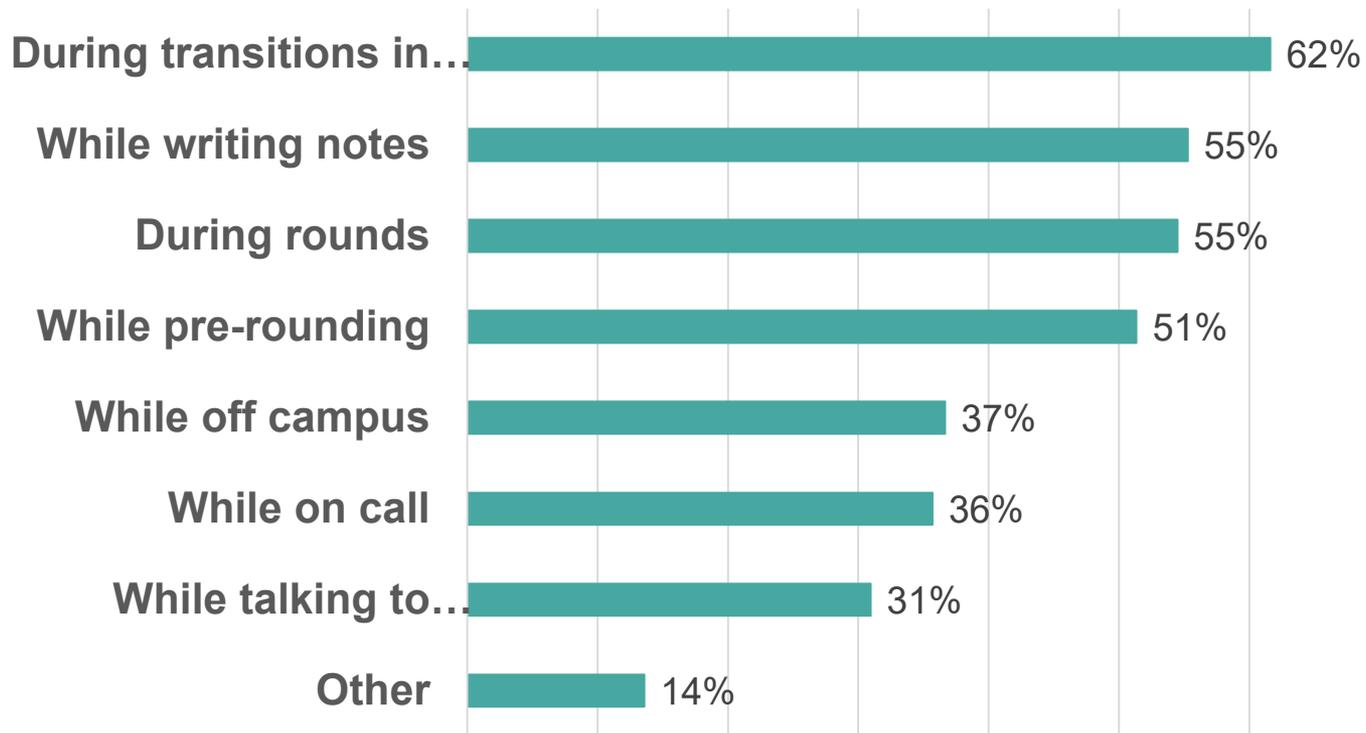
Results – Easy to Access



**Initial Pilot:
Teams using
Carealign vs Not**

Mobile login (touch ID, browser open) = ~2-10 s
Desktop login = 39 s – 2 min

Results - When is it used



Survey responses: 633 48

Key Challenges

- Time necessary to build
- Limited resources
- Process of scaling support to system level
- Ongoing maintenance needs

Keys Factors of Success

- Interdisciplinary development team
 - Users + *clinical informatician* + developers
- User centered design
- Agile development
 - Get Minimum Viable Product (MVP) into users hands frequently and iterate
- Solicit feedback frequently



Vendor vs Home grown - Summary

- Start with problem definition and desired outcomes
- Identify top priority factors & rate limiting steps to decide on build vs buy
 - Features
 - Timeline
 - Resources

Thank you!

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Please complete the online evaluation!