

# AAHKS 2019 BUSINESS COURSE: Practical DIGITAL Solutions to Practical ANALOG Problems

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## Conflicts of Interest

- [Cloudmedx.com](https://www.cloudmedx.com)
- [InSilicoTrials.com](https://www.insilicotrials.com)
- Stryker

**PROBLEM**

**DIGITAL  
SOLUTION**





# Pain Points

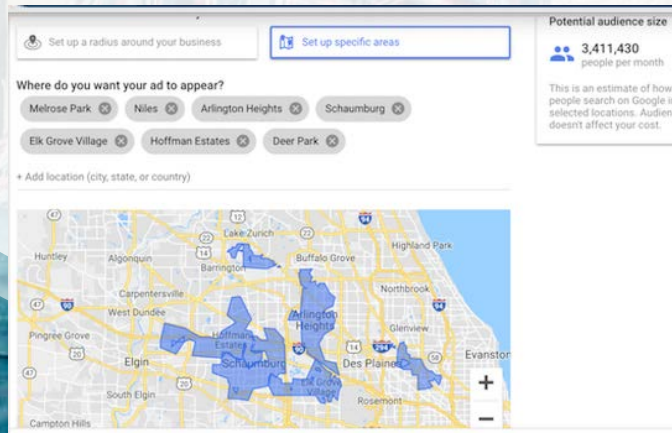
- Marketing and outreach
- Referral Management
- Space Utilization
- EMR data entry
- Surgical Scheduling
- Patient Communication
- Bundles and Virtual PT
- PROM capture
- OR Block Optimization
- Billing
- Managing Risk in a bundle
- Robotic Surgery
- Continuing Education



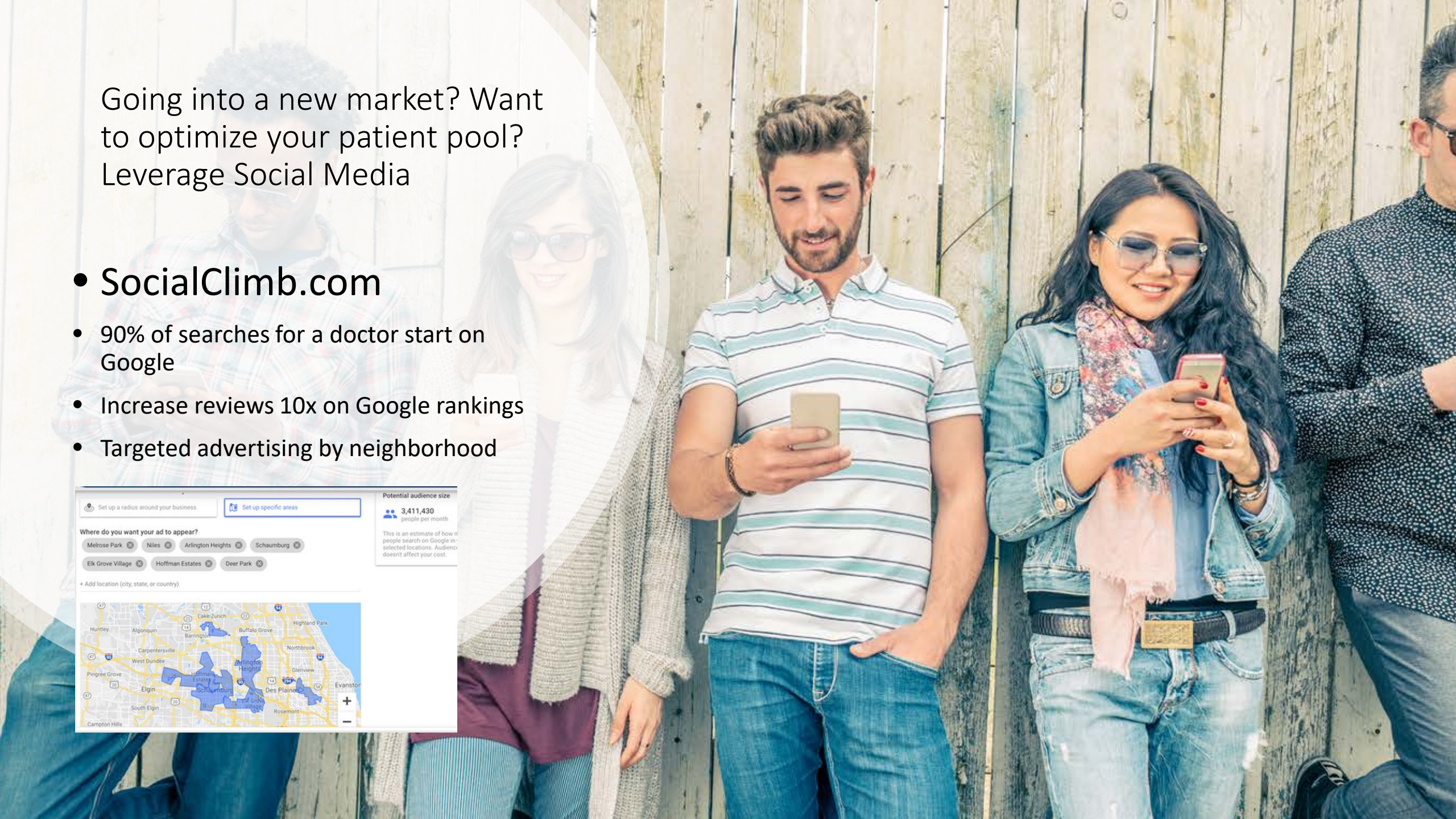
Going into a new market? Want to optimize your patient pool? Leverage Social Media

- **SocialClimb.com**

- 90% of searches for a doctor start on Google
- Increase reviews 10x on Google rankings
- Targeted advertising by neighborhood



The screenshot shows the targeting interface on SocialClimb.com. At the top, there are two options: "Set up a radius around your business" and "Set up specific areas". Below this, a section titled "Where do you want your ad to appear?" lists several neighborhoods: Melrose Park, Niles, Arlington Heights, Schaumburg, Elk Grove Village, Hoffman Estates, and Deer Park. A map below shows these neighborhoods highlighted in blue. To the right, a box displays "Potential audience size" as 3,411,430 people per month, with a note: "This is an estimate of how many people search on Google in selected locations. Audience doesn't affect your cost."



# REFERRAL MANAGEMENT TECHNOLOGY

Invented in 1865

popularized  
1980s



COMMUNICATION  
TECHNOLOGY  
invented in the  
1849

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# Referral Management

- LUMA Health
- 90% of referrals are faxed
- 35% are booked
- Call center outreach
  - A ton of work!
- Automate it!

Since implementation, the UCSF Ortho Department has seen the percentage of unfilled availabilities **decrease by 20%**





# Increased clinical volume

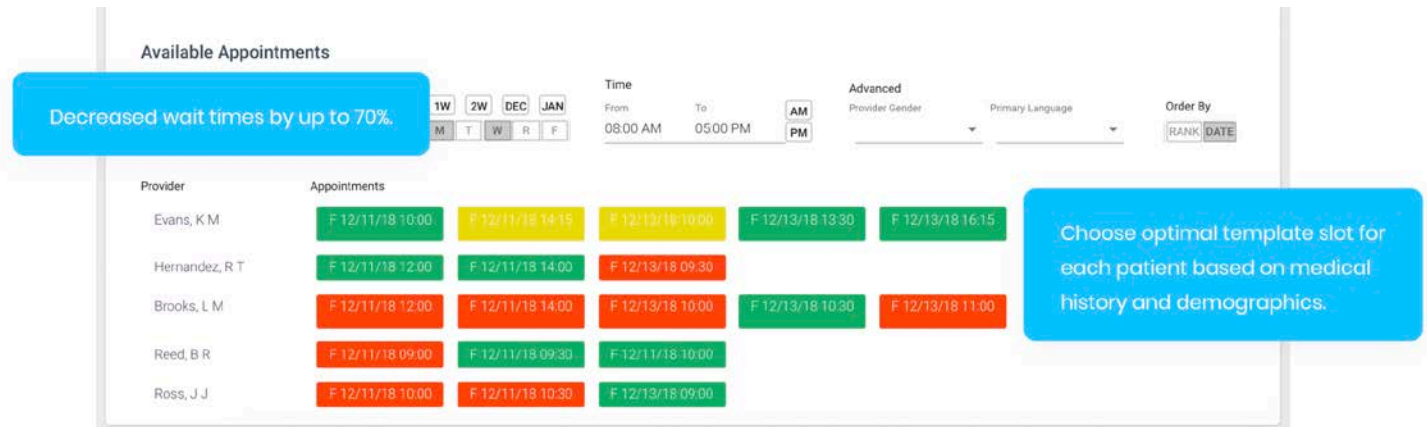
Compared to Q2 2018, the UCSF Ortho Department confirmed 840 more appointments in Q2 2019, a **16% increase** from baseline

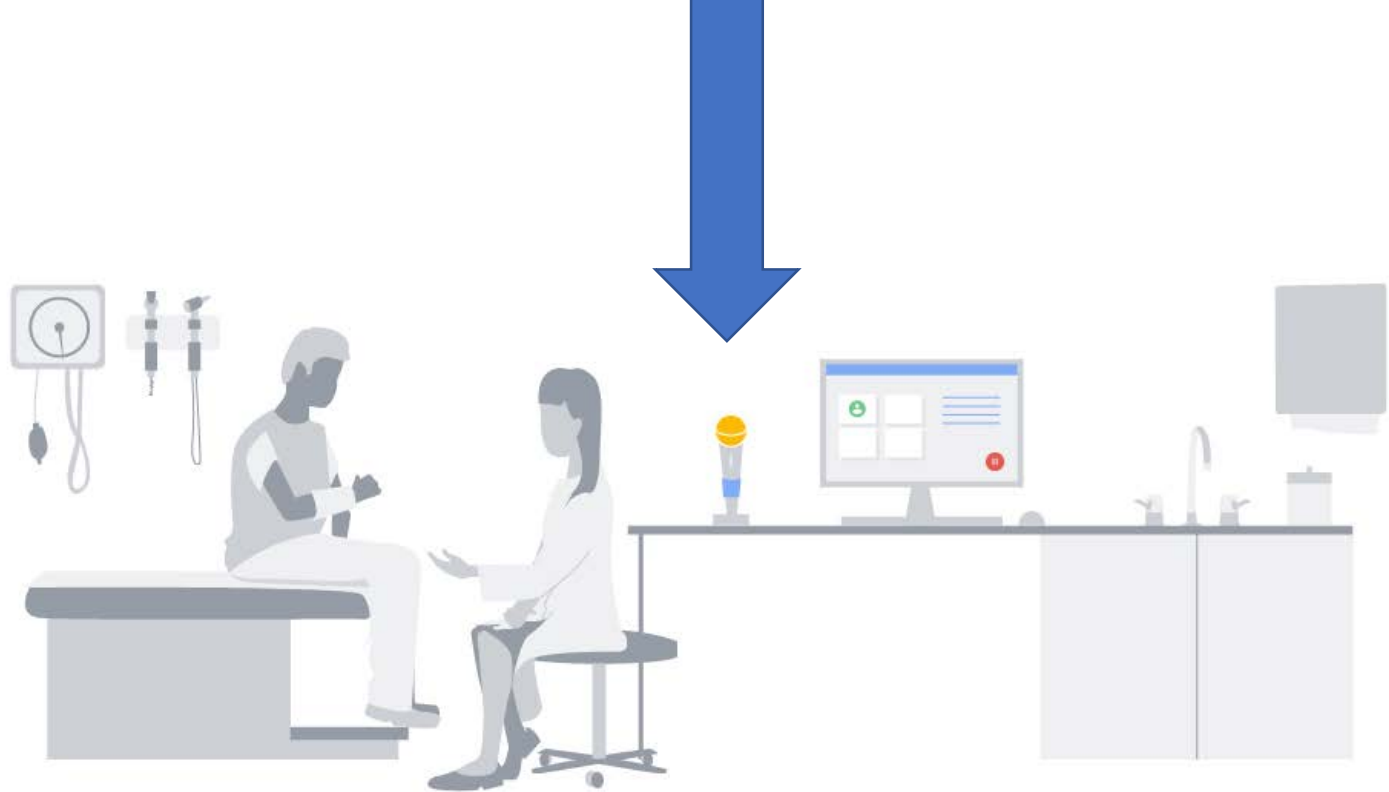


Growing too fast? Need more space? Long wait times? Use AI and RFIDs to track use.

- **ApprenticeHealth.com**

- RFID tags on everyone and receivers in every room
- Track patterns of use
- Let AI identify the best options
- Decrease wait times 70%, increase throughput 10-30%





# Physician Burnout? Here come the Digital Scribes

## ROBIN.com

- Voice recognition and Machine learning
  - 65% automated transcription
- Decrease clinical documentation load
- Cheaper and more accessible than a scribe
  
- < documentation time by 90'



robin



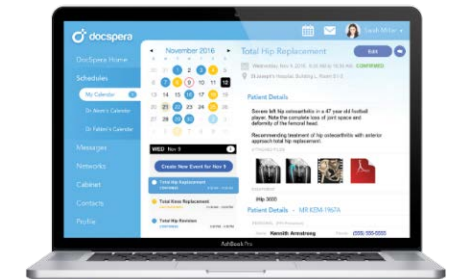
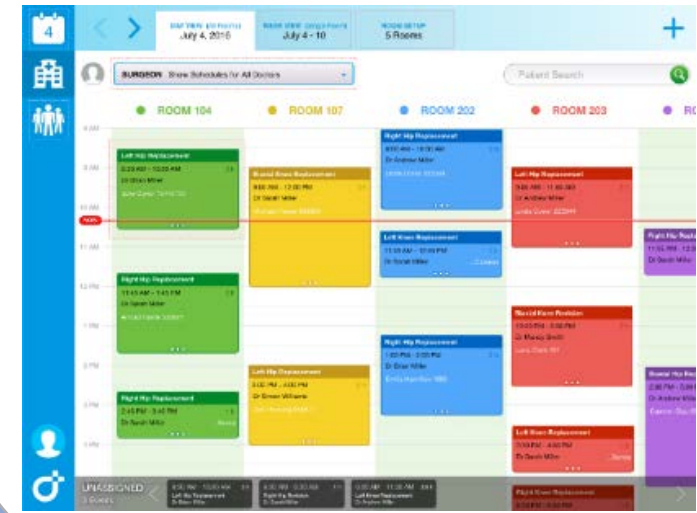
# Surgical Scheduling

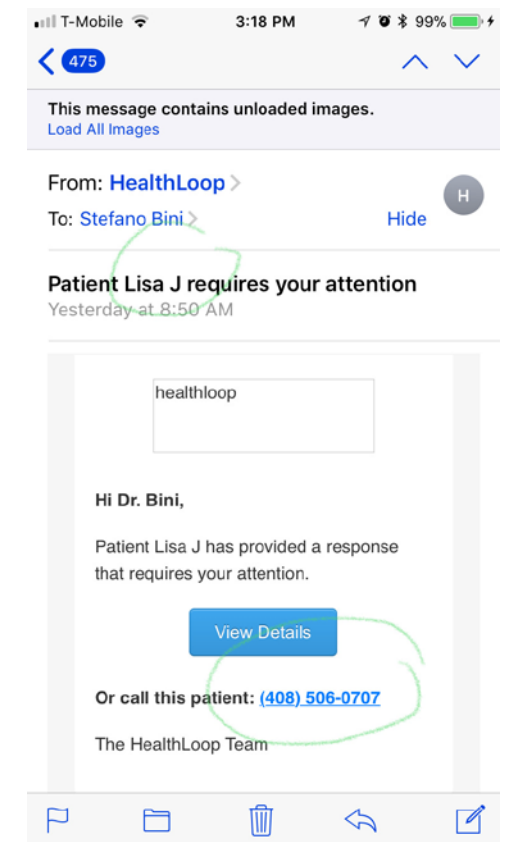
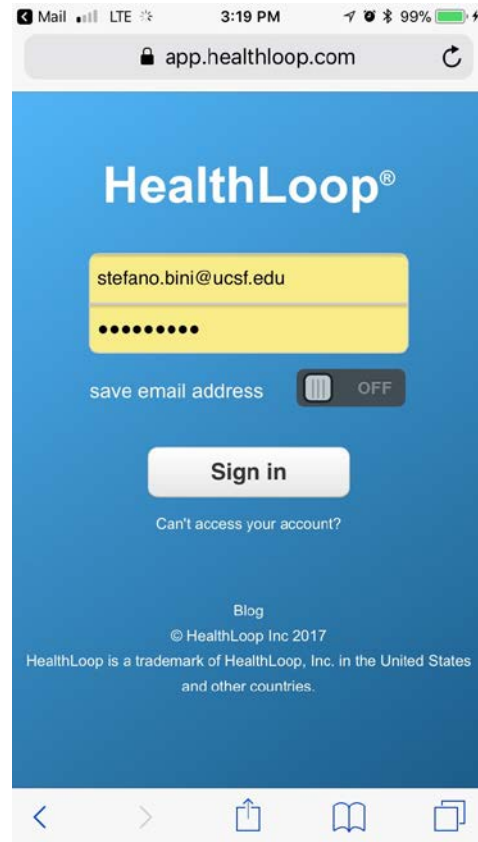
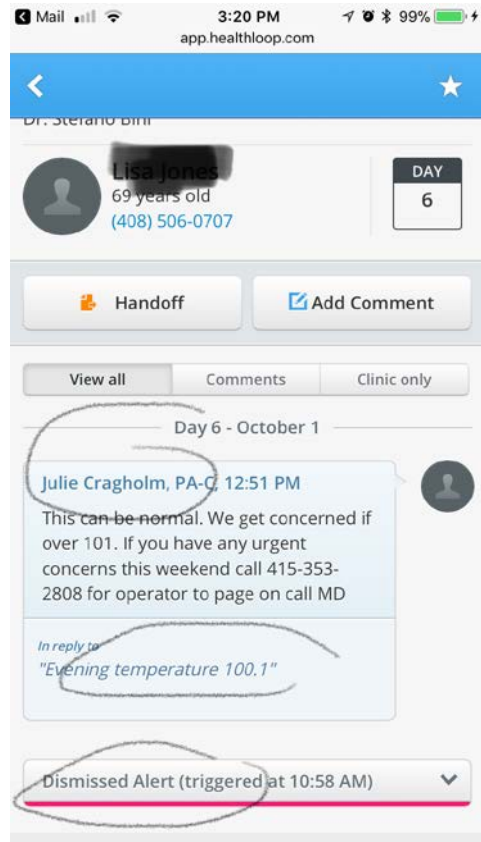
- Cant search this
- Cant access it from your smart phone
- It does not talk to your EMR
- It cant be seen by anyone else
- It does not communicate with vendors
- Does not do block utilization reports



# Surgical Scheduling platforms: DOCSPERA

- Surgical Scheduling
  - Search for *open time slots*
  - Automates and customizes *case scheduling*
  - Track *patient preparedness* with smart checklists
  - Quantify *backlogs*, volumes, block utilization
  - Cross scheduler *access*
  - Communication with *vendors*
- Cancellation management
  - NLP to *search* for patients who are ready, available, right case length, right surgeon
- Surgeon App
  - Links to Google *Calendar*, Outlook, etc
  - Access to Imaging
  - Billing





## Patient Communication: Patient Engagement Platforms:

## Background

- Higher levels of patient engagement lead to more efficient and effective healthcare<sup>1</sup>
- Patients with higher levels of engagement are more likely to report a positive care experience<sup>2</sup>
- Online patient engagement platforms (PEP) provide **asynchronous digital communication** between surgeons and patients using mobile applications
  - PEP are web-based mobile communication platforms
  - Can be accessed via computer or mobile device (phone or tablet)
- PEPs support care management and can collect patient-reported outcomes (PROs)
  - They have also been shown to facilitate smoking cessation, improve diabetes management, increase appointment attendance, reduce postoperative ED visits<sup>3</sup>
- Little is known about the impact PEPs have on clinic workflows**
- Purpose:** to describe the impact of patient care of a PEP at an academic arthroplasty practice

## Methods

- Data prospectively collected for all consecutive **arthroplasty patients** at a single academic institution from January 1, 2016 through December 31, 2016
- January 2016: UCSF division of arthroplasty introduced a PEP called HealthLoop (Mountain View, CA)
  - HIPAA-compliant, secure platform which can be accessed via mobile and desktop devices
  - Guides patients through standardized perioperative pathways with daily messages, check-ins and two-way communication**
- PEP were also used to collect patient-reported outcomes (PROs)
- Variables examined for the purpose of this study include:
  - Check-ins sent by PEP
  - Number of patient logins
  - Patient messages generated
  - Timing of patient messages
  - Mean staff response time
  - Number of staff and surgeon logins

## Results

- 561 patients: enrolled in the PEP (HealthLoop)
  - Average age: 62.4
  - Female: 329 (58%)
  - THA: 305 (54.4%)
- 502 patients (89.5%) activated their PEP account
  - Similar activation rates for THA (90.2%) and TKA (88.7%) (p = 0.56)
  - Similar activations rates based on gender (p = 0.91)
- 13,903 check-ins generated (throughout study period)
- 18,916 logins (time avg: 11 minutes)
- 5,319 messages generated
  - 1,343 (25.4%) generated in the first postoperative week
  - Messaging peak: Monday, tapering to Friday/Weekend.
- Average staff response time: 1.9 business hours (SD = 3.1)
- 4,975 team logins
  - 6% of all logins were by surgeons
  - The rest were by nurse navigators and Pas
  - Response rates varied by surgical team (A: 23%, B: 54%, C: 64%) but "Very Satisfied" rates did not vary (A: 69%, B: 63%, C: 64%)
- 366/502 (72.9%) of all patients completed PEP evaluations
  - 92.3% were very or somewhat satisfied

	Total	Average ± SD (per patient)
Check-ins	13093	26.1 ± 4.3
Patient logins	18916	38.8 ± 23.4
Messages generated	5319	14.2 ± 12.4
Team logins	4975	415 (per month)

	Total
Preoperative	
1 week postop	25%
1 week – 3 month postop	
3 month – 6 month postop	

	Surgeon	PA	Nurse navigator	Total
% Logins	6%	40%	54%	100%

## Discussion

- High patient participation rate using this PEP**
- Each patient averaged 39 PEP logins & 14 messages sent
  - >30% messaging rate than similar study on spine patients with a different app (Force)<sup>5</sup>, suggesting that variations in how PEPs are designed or implemented may impact patient utilization rates.
- Surgeons accounted for 6% of staff logins and there was variation in response rates between surgical teams.**
- Satisfaction rate were vary high but had no relationship with surgeon app utilization, possibly because patients could reach surgeon through other channels.

## Conclusions

- Nearly 90% of patients chose to participate in the PEP and remained active throughout postop period with a very high satisfaction rate.
- The workload generated is not insignificant
- The PEP allowed for rapid response time and high patient satisfaction
- Bulk of the work falls on support staff and needs to be accounted for (limiting patient access to other communication platforms (Phone, email) may mitigate impact

## References

- Greene, J. et al. When patient activation levels change, health outcomes and costs change, too. *Health Aff (Millwood)*. 34, 431–437 (2015).
- Mosen, D. M. et al. Is patient activation associated with outcomes of care for adults with chronic conditions? *J. Ambul. Care Manage* 30, 21–29 (2007).
- Perez, F. et al. Evaluation of a mobile health system for supporting postoperative patients following day surgery. *J. Telemed Telecare* 12 Suppl 1, 41–43 (2006).
- Davidovitch, R. et al. Home health services are not required following total hip arthroplasty. *J. Arthroplasty*. In press.
- Bell, K., et al. "Patient Adoption and Utilization of a Web-Based and Mobile-Based Portal for Collecting Outcomes After Elective Orthopedic Surgery." *American journal of medical quality: the official journal of the American College of Medical Quality* (2018)





# Overloaded call center: Chat Bots

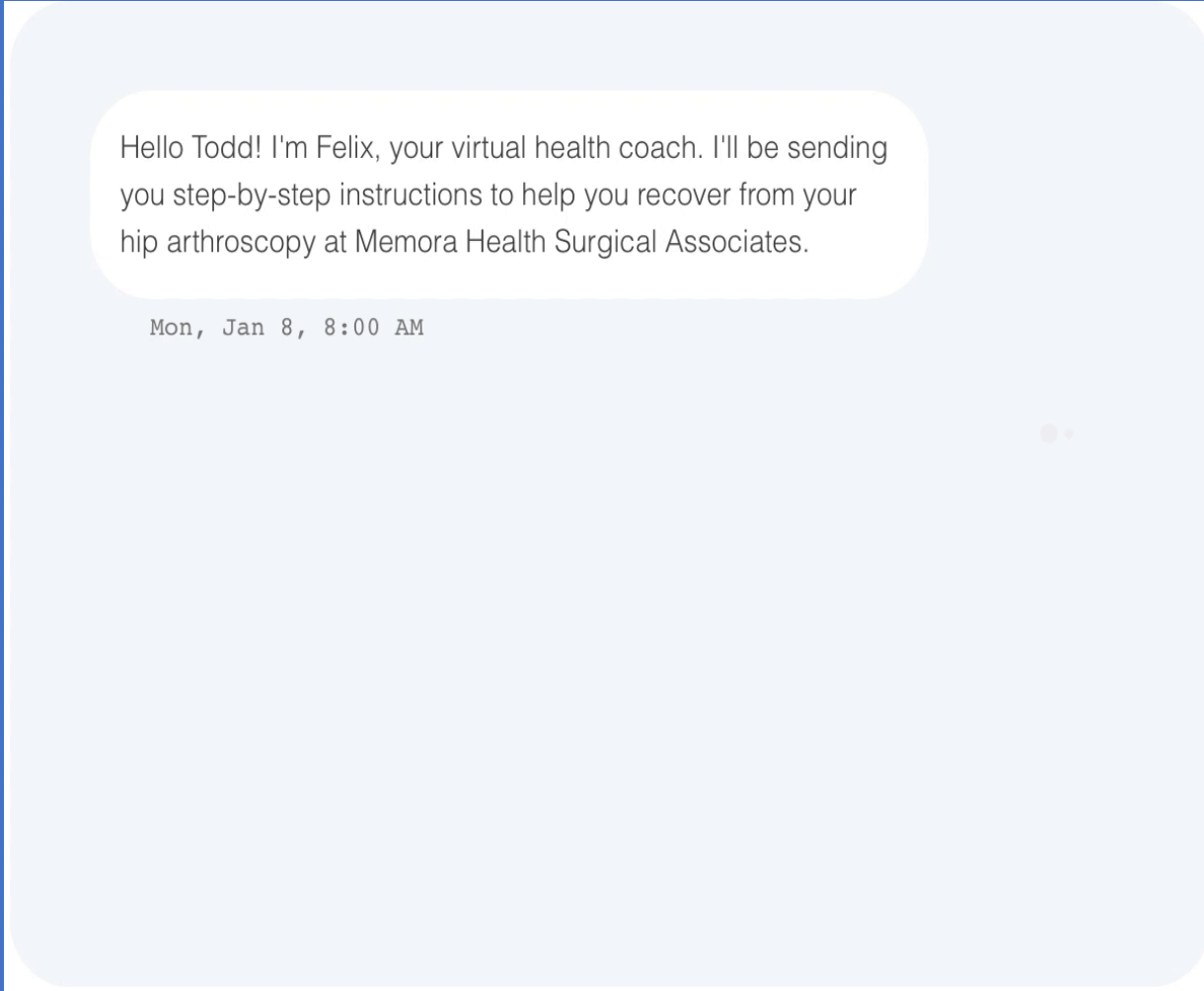
MEMORA HEALTH  
SMS + AI

97% find SMS easy to understand

98% of SMS messages are read

Results:

- 21,000 patients
- 35 hospitals
- **79% of all patient questions and concerns answered automatically by the system**



Hello Todd! I'm Felix, your virtual health coach. I'll be sending you step-by-step instructions to help you recover from your hip arthroscopy at Memora Health Surgical Associates.

Mon, Jan 8, 8:00 AM

“Alexa, tell my doctor my blood pressure is 125/66.”



## HIPAA Compliant Virtual Digital Assistants

- Amazon Alexa
  - 6 healthcare organizations
- “Hey Alexa” can :
  - Contact your physician
  - Schedule an appointment
  - Read and interpret your lab results
  - Reorder medication
  - Access your hospital discharge instructions

# Cost of PT in a bundle environment? (P)Rehabilitation Platform

**FORCE THERAPEUTICS** [Store](#) | [Contact Us](#)

Transforming the delivery of **Injury Rehabilitation**  
Improved Outcomes

- Physical Therapists
- Physicians
- Patients

## The Force Platform

A comprehensive platform that engages patients via digital and video connections, extending your reach into the home



Virtual Rehab



Digital Navigation



PRO Collection



Data & Analytics



Registry Integration



Smart Tasks

# REHAB and PREHAB



HOME

ABOUT

PROVIDERS

EMPLOYERS

CONTACT

SIGN IN

PT (PROFESSIONAL USER) - V1.1

Shawn Rankin System Administrator

Navigation: Dashboard, Exercise Programs, Create New, Saved, Pre-Designed, Prescribed, Rehab Protocols, Patterns, Telehealth, Referral Network, Resources, Support Tools

SEARCH OR USE THE FILTERS BELOW TO FIND EXERCISES... THEN ADD EXERCISES HERE TO CREATE YOUR PROGRAM.

Show 100 Select a Category Select a Body Region Filter by Enter keywords here... Search

Pelvic Tilts	Pelvic Tilt with Glut Squeeze	Supine Curl Up (Level I)	Supine Curl Up (Level II)	Supine Curl Up (Level III)
Supine Curl Up (Level IV)	McGill Crunch	Level I Abdominals	Level II Abdominals	Level III Abdominals
Level IV Abdominals	Supine Modified Bicycle Abs	Supine Abdominal Scissors	Straight Arm Crunch	Cross Arm Crunch

THOUSANDS OF ANIMATED EXERCISES SUPPORT OUR DIGITAL SOLUTION... VIEW EXAMPLES BELOW.

QUADRUPED ALTERNATE HIP EXTENSION

Mirror (L/R)



# PRO CAPTURE and REPORTING WOES? Automate it.

UCSF:

75% collection rate  
at 3 months

Expanding across all 5 UC  
Campuses

Virtual registry

CODE TECHNOLOGY

[Our Platform](#) [About Us](#) [Resource Center](#) [Blog](#)

[Request A Demo](#)

We collect, report, and benchmark orthopedic patient-reported outcome data as a service.

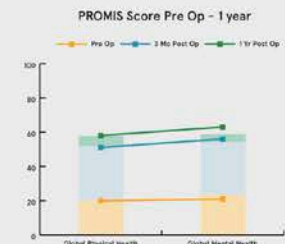
[See How it Works](#)

[Request a Demo](#)

## WE BELIEVE

Our sole mission is to collect PROs.  
We believe outcome data will  
change medicine.

[Meet CODE](#)



# Transforming Healthcare Operations with **Data Science** and **Machine Learning**

NEED TO  
INCREASE  
YOUR  
REVENUE?  
Try an ML  
application



## 80+ Leading Hospitals Rely on iQueue for Operating Rooms to Improve OR Utilization

- UCHealth increased OR utilization by 4%, adding over \$10M in revenue
- MultiCare increased available OR minutes by 300%.
- OhioHealth repurposes 12 blocks per month using *Collect*.
- NewYork-Presbyterian Brooklyn Methodist Hospital increased their cases per day by 13%

[Learn More](#)



140+ Cancer Centers Rely on iQueue  
Infusion Centers to Improve Opera

# CODING AND BILLING? use AI and NLP

Using NLP to "read" charts  
Check documentation for optimal coding  
Decrease workload on coders

The screenshot shows the CloudMedx website. At the top left is the CloudMedx logo, which consists of a red square with a white ECG line and the text 'CLOUDMEDX®'. To the right of the logo is a navigation menu with the following items: Home, Solutions, About Us, Press, Demo, and Contact. Below the navigation menu is a large blue graphic with a network-like background. The graphic features a central title 'ARTIFICIAL INTELLIGENCE FOR CARE DELIVERY' in white. Below the title is a visual equation: five square boxes containing icons for 'Medical Notes' (a brain with neural connections), 'Clinical History' (a magnifying glass over a pulse line), 'Demographics' (three stylized human figures), and 'Medical Procedures' (a surgical table), followed by an equals sign and a final box for 'Clinical Insights' (a circular gauge with a needle pointing to the 'High' section). Below this graphic is a paragraph of text: 'Data driven models to improve clinical insights, revenue cycle management, and patient care. We are automating this entire process for improved operations and outcomes.' At the bottom center of the graphic is a red button with the text 'How it Works'.

# Need to manage risk? Use Big Data and Analytics

Clarify Health: Patient profiles with 200+ risk factors, including social determinants

Patient Insights

**Aaftiok, Eldridge**  
DOB: Dec 31, 1950 | Birth Gender: Male | Home: BRONX, NY  
Age: 67 | MRN: | Marital Status: unknown | Ethnicity: White

Timeline | History | Episodes | Journey | Profile | Ratings

**Ratings**

Disposition	Initial Rating	Current Rating	
Complete regular check-ins	N/A	N/A	Details

**Outcomes**

Outcomes	Initial Rating	Current Rating	
<b>Quality</b>			
Risk of Post Acute Admission	⚠️ 12.9%	🚨 50.1%	Details

**Billing and Cost**

Likelihood of PAC	⚠️ 19.1%	🚨 44.1%	Details
Episode cost estimate	⚠️ \$19,393	🚨 \$51,714	Details

**Factors** Cohorts Timeline

**Clinical**

Admit from SNF: True	No
Aids HIV: True	No
Alcohol Abuse: True	No
Blood Loss Anemia: True	No
Cardiac Arrhythmias: True	No
Chronic Pulmonary Disease: True	No
Coagulopathy: True	Yes
Congestive Heart Failure: True	No
Deficiency Anemia: True	No
Depression: True	No
Diabetes Complicated: True	Yes
Diabetes Uncomplicated: True	No
Drug Abuse: True	No
Fluid And Electrolyte Disorders: True	No
Hip Fracture: True	No
Hypertension Complicated: True	Yes
Hypertension Uncomplicated: True	No
Lithium: True	Yes

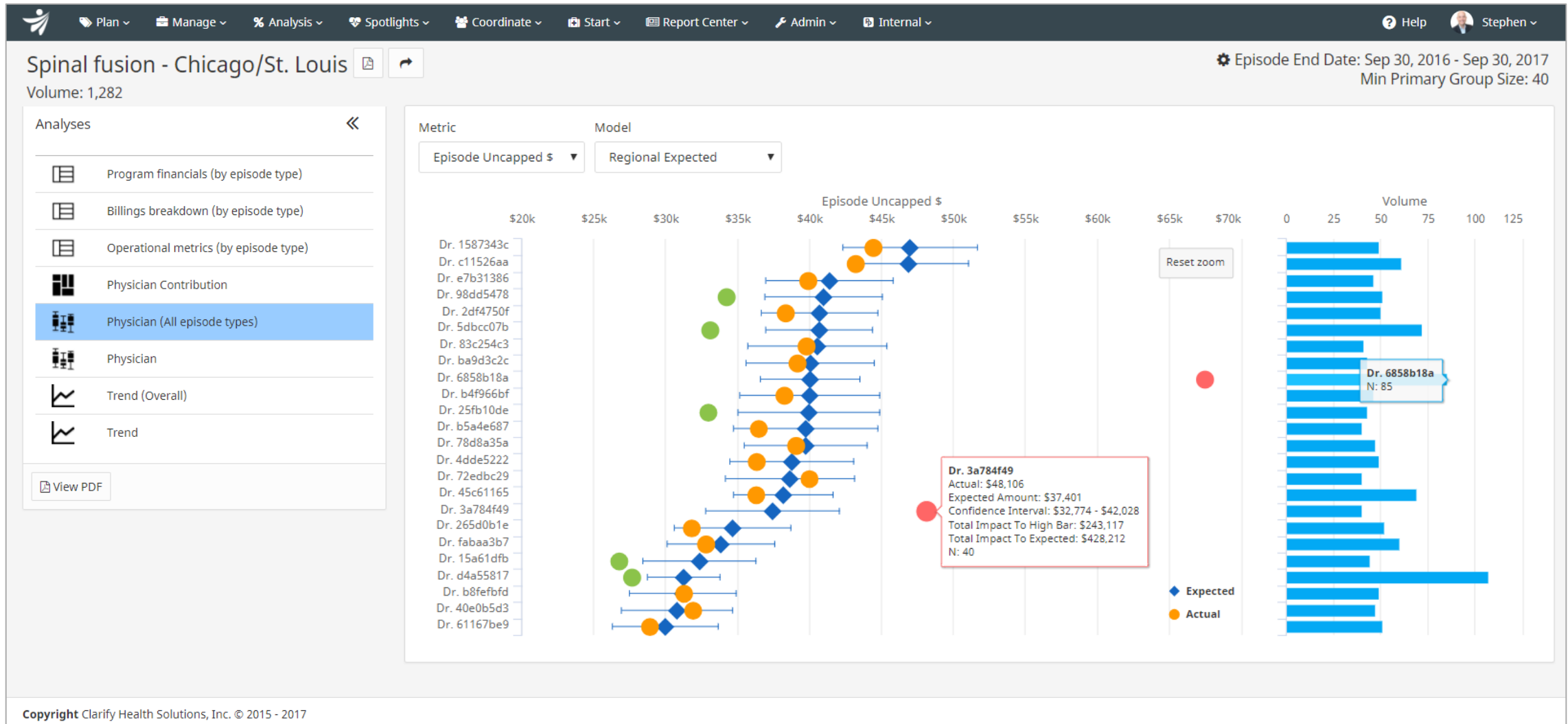
Stratify and track member risk in real-time for cost, quality, and outcomes

Comprehensive personal member profiles comprise 200+ risk factors— clinical, social, and demographic



# VARIATION IN COST OF CARE FOR SAME PROCEDURE?

Identify variations in care, episode cost, case-mix, etc.





“Danger, Danger Will  
Robinson!”

- Lost in Space

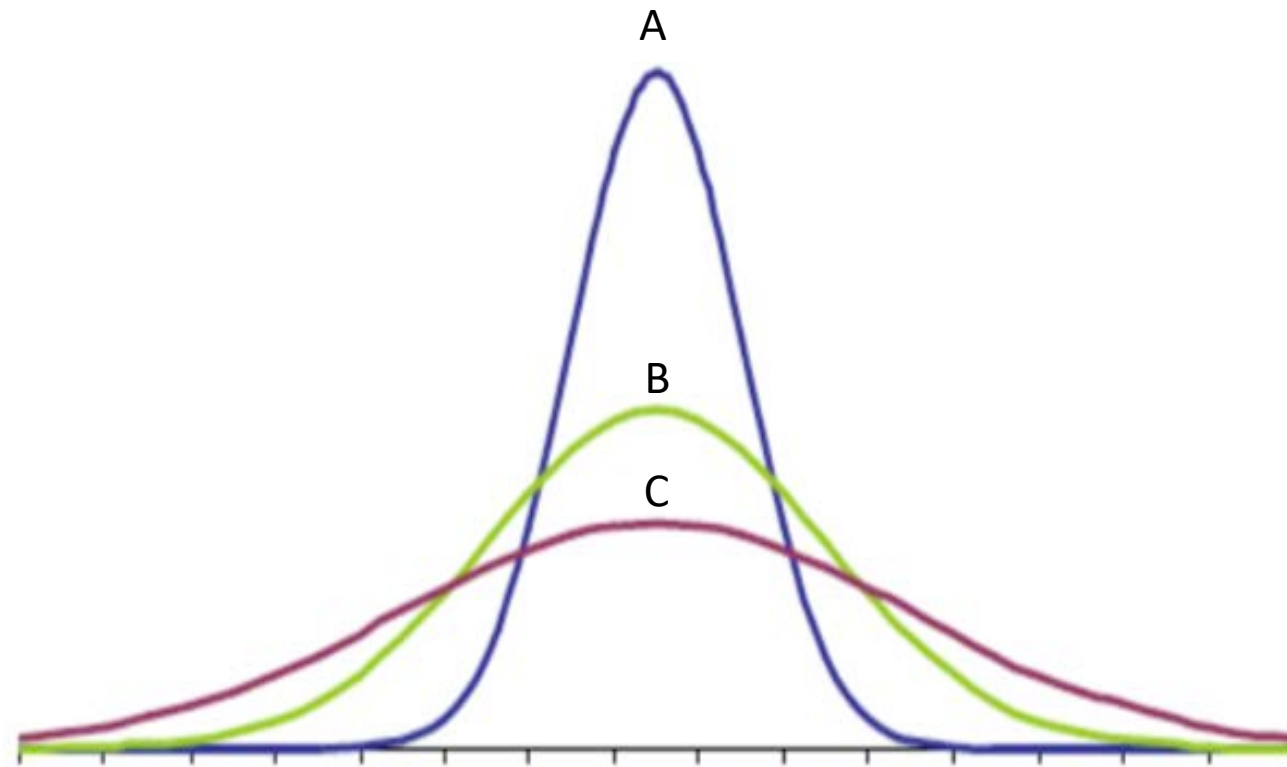
# Arthroplasty Robots

- Omni (Corin)
- Navio (S&N)
- Mako (Stryker)
- Rosa (Z/B)
- OrthoTaxi (Depuy/Synthes)



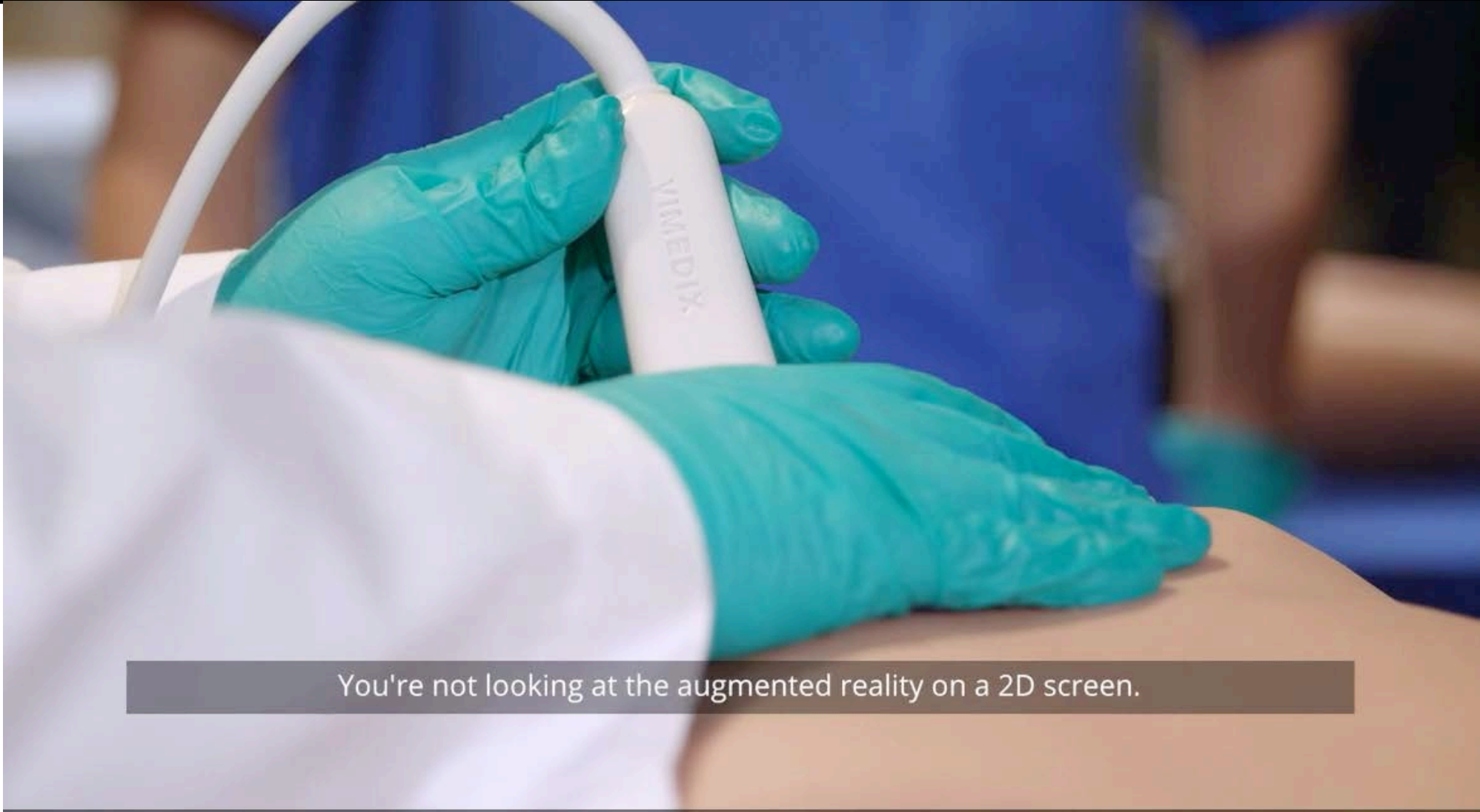


# Why Robots?





# Continuing Education? Augmented and Virtual Reality:



You're not looking at the augmented reality on a 2D screen.

# TEACHING TOOLS: OSSO VR, FUNDAMENTAL SURGERY



# Pain Points: Solved!

- ✓ Marketing and outreach (social climb)
- ✓ Referral Management (Luma Health)
- ✓ Space Utilization (Getwell loop)
- ✓ EMR data entry (Robin)
- ✓ Surgical Scheduling (Docspera)
- ✓ Patient Communication (Memora)
- ✓ Bundles and Virtual PT (Force)
- ✓ PROM capture (CODE Technologies)
- ✓ OR Block Optimization (LeenTaas)
- ✓ Billing (Cloudmedx)
- ✓ Managing Risk in a bundle (CalrifyHealth)
- ✓ Robotic Surgery
- ✓ Continuing Education (Osso VR)



CTO  
Dept of Orthopedics

- Role of the CTO
  - Help identify digital technology tools that will help THE GROUP enable it's growth strategy







 AUTHORS

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Professor, INSEAD



# Digital Doesn't Have to Be *Disruptive*

The best results can come from adaptation rather than reinvention.



PHOTOGRAPHER

**CHRISTOPH MORLINGHAUS**

**MYTH**  
Digital is about technology.

**REALITY**  
It's about the customer.

**MYTH**  
Digital requires radical disruption of the value proposition.

**REALITY**  
It usually means using digital tools to better serve the known customer need.

**MYTH**  
Digital will replace physical.

**REALITY**  
It's a "both/and."

**MYTH**  
Digital requires overhauling legacy systems.

**REALITY**  
It's more often about incremental bridging.

**DOCSF 2020**

**Bridging: Technology + Orthopaedics**

**Jan 11, 12 2020 San Francisco**

**TEAM pricing**

**UCSF Department of Orthopaedic Surgery**

[www.docsf.health](http://www.docsf.health)  
**#TheDOCSF**





A goldfish is captured mid-leap, jumping from a small, square-topped glass fishbowl on the left into a larger, rounded glass fishbowl on the right. The background is a light blue gradient. The text 'Take the leap!' is in the top left. The text 'Analog Orthopedics' is at the bottom of the small fishbowl. The text 'Digital Orthopaedics' is on the right side. A yellow box on the right contains social media information.

Take the leap!

Analog Orthopedics

Digital Orthopaedics

Interested? follow me:

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