

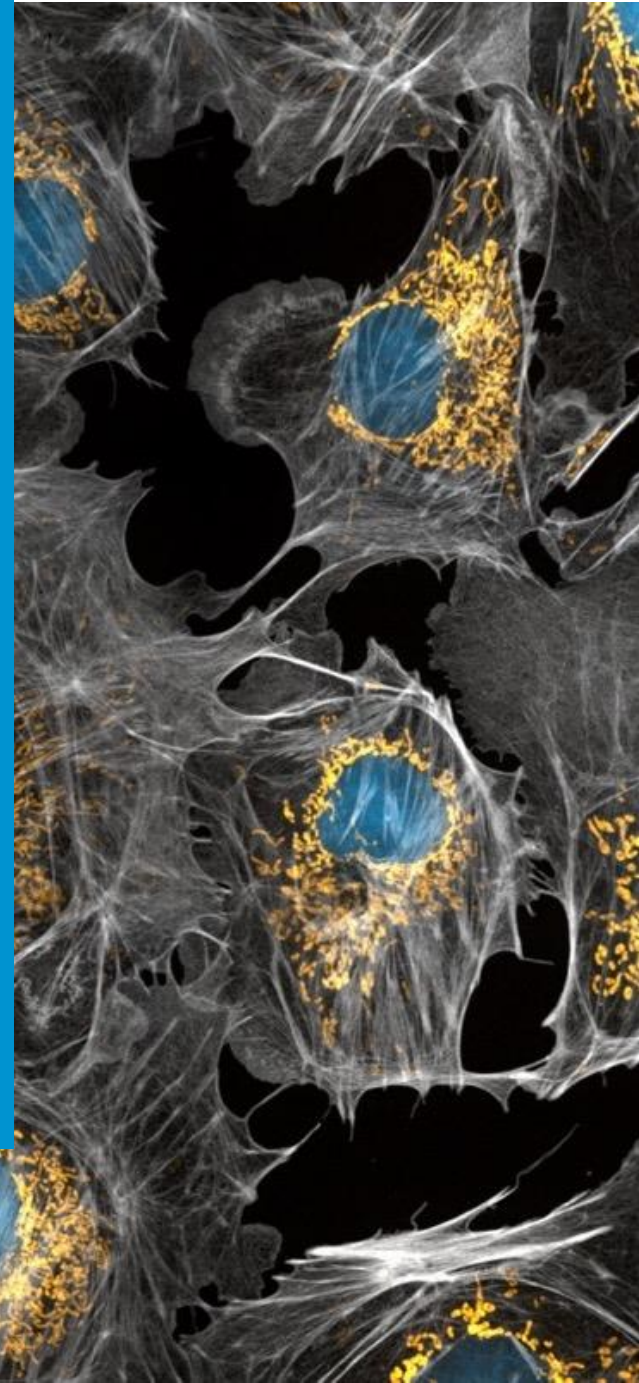


University of California  
San Francisco

# Digital Tools to Aid your Practice

PRO Collection, Patient Navigation, Online reputation

Derek Ward, MD  
Associate Professor of Orthopaedic Surgery  
Division of Adult Reconstruction  
UCSF



# Disclosures

- Consulting – Depuy
- UCSF Contracts with Certain Digital Partners (no personal relationship)

## Digital Orthopaedics: A Glimpse Into the Future in the Midst of a Pandemic

Stefano A. Bini, MD <sup>a,\*</sup>, Peter L. Schilling, MD, MSc <sup>a</sup>, Shaun P. Patel, MD <sup>b</sup>,  
Niraj V. Kalore, MD <sup>c</sup>, Michael P. Ast, MD <sup>d</sup>, Joseph D. Maratt, MD <sup>e</sup>,  
Dustin J. Schuett, DO <sup>f</sup>, Charles M. Lawrie, MD <sup>g</sup>, Christopher C. Chung, BS <sup>h</sup>,  
G. Daxton Steele, MD, PharmD <sup>i</sup>

# Outline

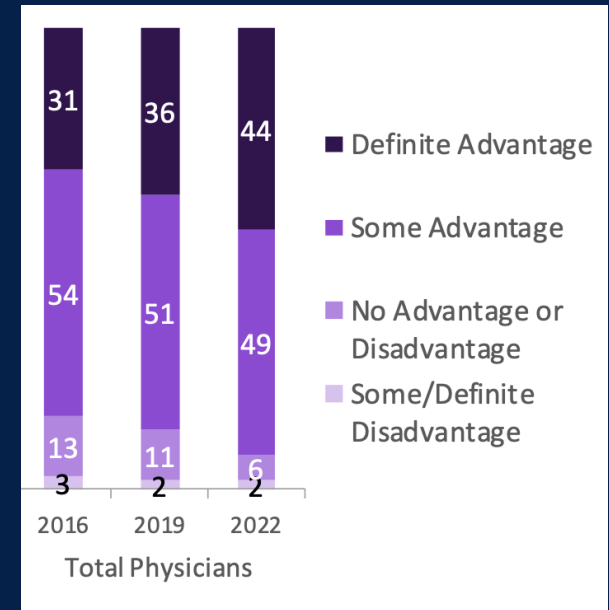
- Digital Adoption and Enthusiasm
- Whirlwind tour of Types Digital Tools
- Framework for Adoption



# Digital Adoption

## AMA Survey

- Conducted in 2016, 2019, 2022
- 1300 physicians, 50% specialists
- Percentage of physicians who felt digital tools offer an advantage for patients care from 85% to 93%
- Average number of digital tools used in practice grew from 2.2 to 3.8



# Summary of Digital Health Trends from 2019 to 2022

01



## There has been an increase in the number of physicians that see a definite advantage in digital tools

- There has been growth in those that see an advantage especially among those 51+ years old.
- Those that see no advantage are trending downwards and are concentrated in the Specialist and age 51+ segments.

02



## Adoption of digital tools has grown significantly among all physicians regardless of gender, specialty or age

- Use of all seven tools has increased significantly.
- Improved clinical outcomes and work efficiency are key drivers.
- Coverage by standard malpractice insurance continues to be the most common requirement and data privacy concerns have increased.

03



## Adoption of remote care tools such as tele-visits and remote monitoring had the most movement

- Use of tele-visits/virtual visits has nearly tripled since 2019 and remote monitoring for efficiency has nearly doubled.
- Providing remote care to patients has increased significantly as a motivator of adoption of digital tools.
- Reducing stress/burnout has also gained importance as a driver of digital tool adoption

04



## Growth in enthusiasm has largely been concentrated in tele-visits

- Enthusiasm for virtual visits has increased significantly from 2019, while enthusiasm for most other digital solutions is largely stagnant
- Enthusiasm for consumer access to clinical data has shifted down since last wave

05



## Plans for adoption of most emerging technologies is high but current usage low

- Nearly 1 in 5 are currently using augmented intelligence for practice efficiencies and 2 in 5 plan to adopt in the next year.
- Nearly 3 in 5 physicians believe technology can most help key areas such as chronic disease patients and preventative care

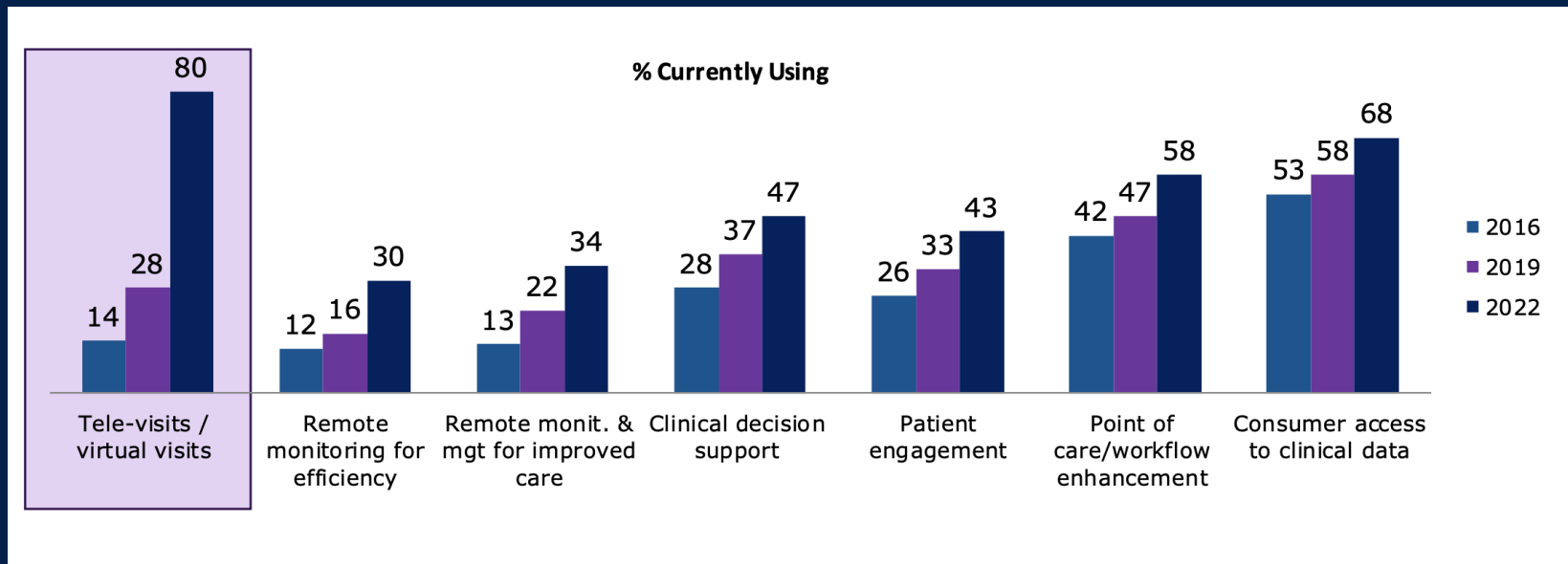
© 2022 American Medical Association. All rights reserved.



Physicians' powerful ally in patient care

# Growth

- Largest growth is in remote care
  - Telehealth grew from 14% to 80%

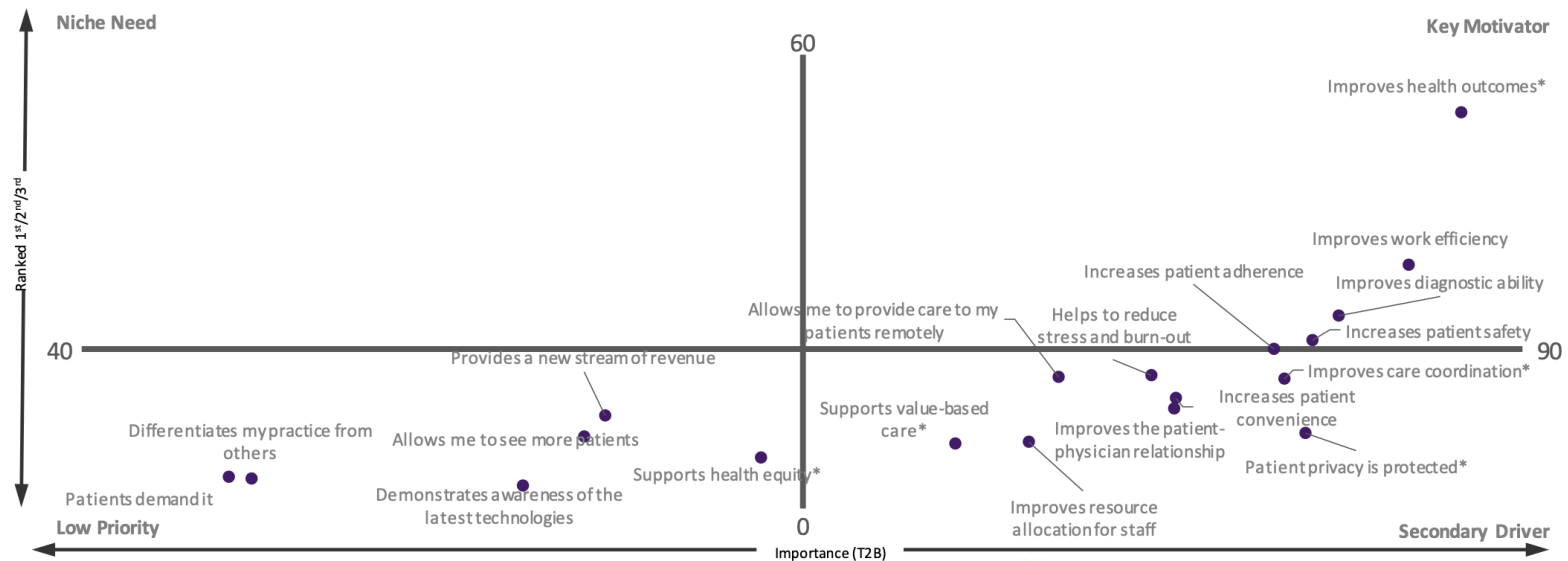


# Drivers

Drivers of Adoption

## Improved health outcomes stands out as the largest driver of new technology adoption

Improved work efficiency, diagnostic ability, patient safety and adherence have remained key motivators from 2019. Reducing stress/burnout and improving care coordination have moved into the key motivators group from secondary drivers.



© 2022 American Medical Association. All rights reserved.  
 Vertical axis: % of respondents that ranked the item in top 3 most important.  
 Horizontal axis: % of respondents that rated the item a 4 or 5 out of a 5-point scale.  
 \*New attributes added to the 2022 wave

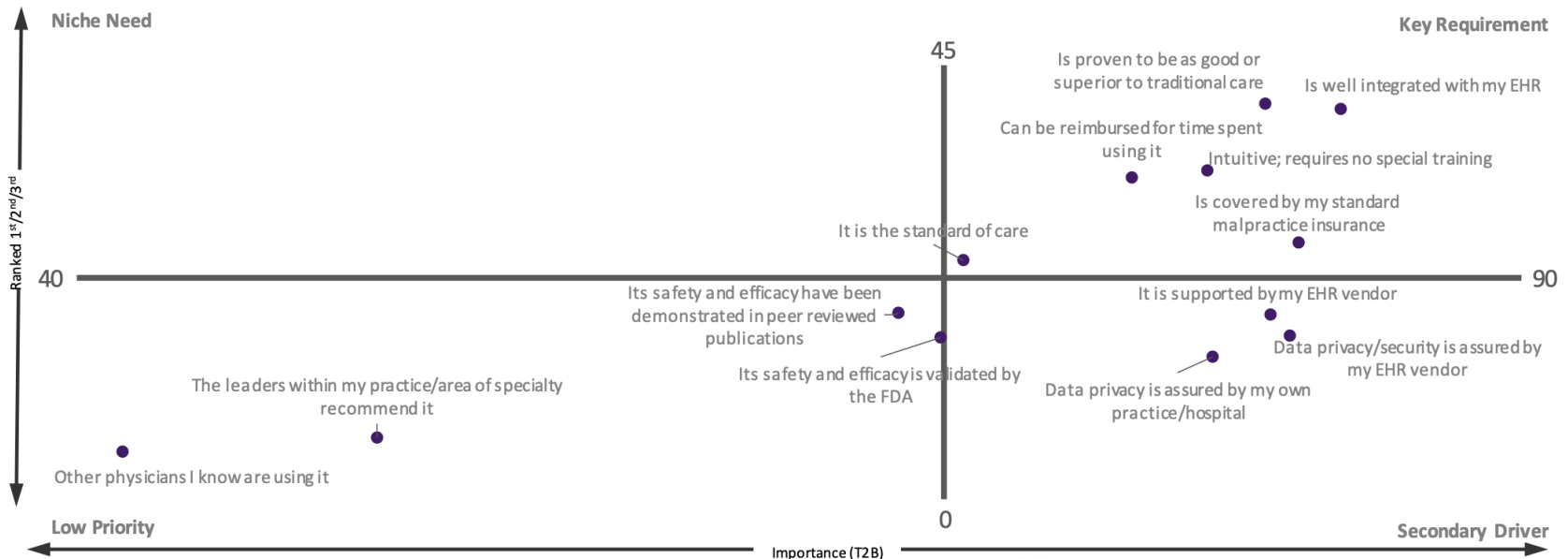


Physicians' powerful ally in patient care

# Requirements

## Requirements for adoption have largely remained unchanged since 2019

EHR integration, benefits over traditional care, reimbursement, ease of use, and insurance coverage are still the main requirements for adopting new technologies



© 2022 American Medical Association. All rights reserved. Vertical axis: % of respondents that ranked the item in top 3 most important.  
Horizontal axis: % of respondents that rated the item a 4 or 5 out of a 5-point scale.



Physicians' powerful ally in patient care



# Types of Digital Tools - Telehealth



Rapid Adoption due to  
Pandemic

Reimbursement barriers  
dropped – State dependent



High satisfaction from  
patients

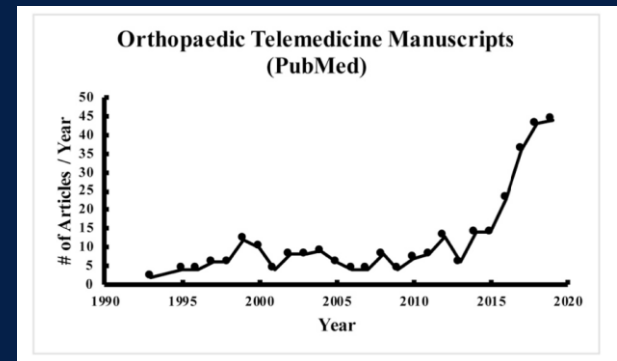
Now an expectation



Mixed Satisfaction from providers


# Telemedicine in Orthopaedics

- High interest and Adoption
  - High patient satisfaction
  - Cost effective to health system
  - Not inferior to standard care
    - Buvik, et al, 2019 RCT
- Challenges
  - Technology implementation and cost
    - Potential for negative financial implications
  - Inability to perform physical exams
  - Inability to quickly get new xrays
  - Medicolegal exposure



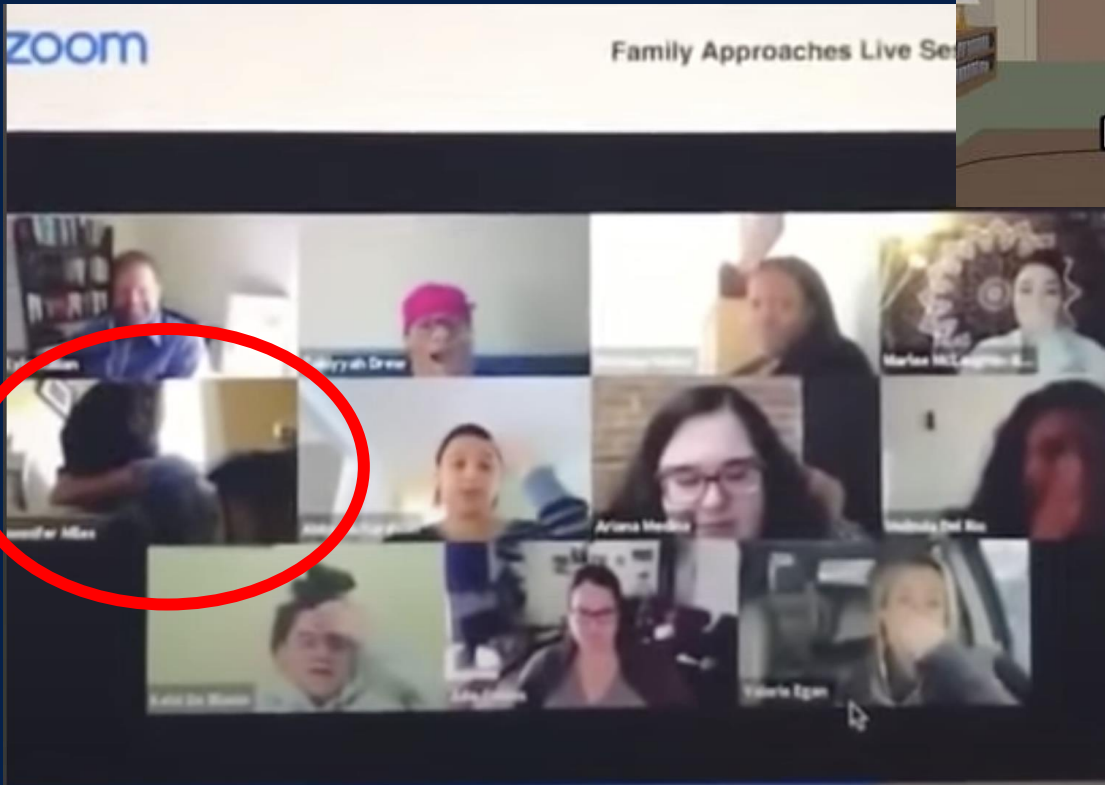
# Reimbursement

**TABLE I Useful Resources\***

Coverage	Useful Resources
State laws and reimbursement policies	<a href="https://www.cchpca.org/telehealth-policy/current-state-laws-and-reimbursement-policies#">https://www.cchpca.org/telehealth-policy/current-state-laws-and-reimbursement-policies#</a>
Medicare	<a href="https://www.medicare.gov/coverage/telehealth">https://www.medicare.gov/coverage/telehealth</a> <a href="https://www.cms.gov/newsroom/fact-sheets/medicare-telemedicine-health-care-provider-fact-sheet">https://www.cms.gov/newsroom/fact-sheets/medicare-telemedicine-health-care-provider-fact-sheet</a>
Medicaid	<a href="https://www.medicaid.gov/medicaid/benefits/telemedicine/index.html">https://www.medicaid.gov/medicaid/benefits/telemedicine/index.html</a>
AAOS CPT code guide	<a href="https://www.aaos.org/globalassets/about/covid-19/aaos-coding-guide_covid19.pdf">https://www.aaos.org/globalassets/about/covid-19/aaos-coding-guide_covid19.pdf</a>
AAOS startup checklist for practice management	<a href="https://www.aaos.org/quality/practice-management/telemedicine/">https://www.aaos.org/quality/practice-management/telemedicine/</a> 
<p>*Orthopaedic surgeons should understand coverage and reimbursement guidelines on a national basis, along with variations across different states. We have included resources to these as well as links to resources from the American Academy of Orthopaedic Surgeons (AAOS) that assist with practical aspects of establishing telemedicine practice and the process of billing for telemedicine encounters. CPT = Current Procedural Terminology.</p>	

# Technology Challenges

## Zoom Fatigue



# Digital/Virtual Scribes

The screenshot shows the Epic EMR interface for a patient named Mary Smith. The main window displays a 'Post Partum Hemorrhage' event. A red box highlights the 'Code Start (Editing)' window, which includes fields for 'Time' (15:57:46) and 'Date' (2/8/2017). The interface also shows various tabs like 'Vitals', 'Respirations', 'BP', 'SpO2', and 'Temp', along with a list of medications and orders.



**The New York Times**

## Willy Wonka and the Medical Software Factory

The engineers at Epic Systems work on a campus full of childish whimsy but also sit in on open-heart surgery. Is this the indulgence of an oddball founder, or a better way to run an I.T. company?

[Share full article](#) [186](#)

The architecture at Epic's headquarters in Verona, Wis., is heavy with movie references, from Indiana Jones to Harry Potter. Nargan Mahon for The New York Times



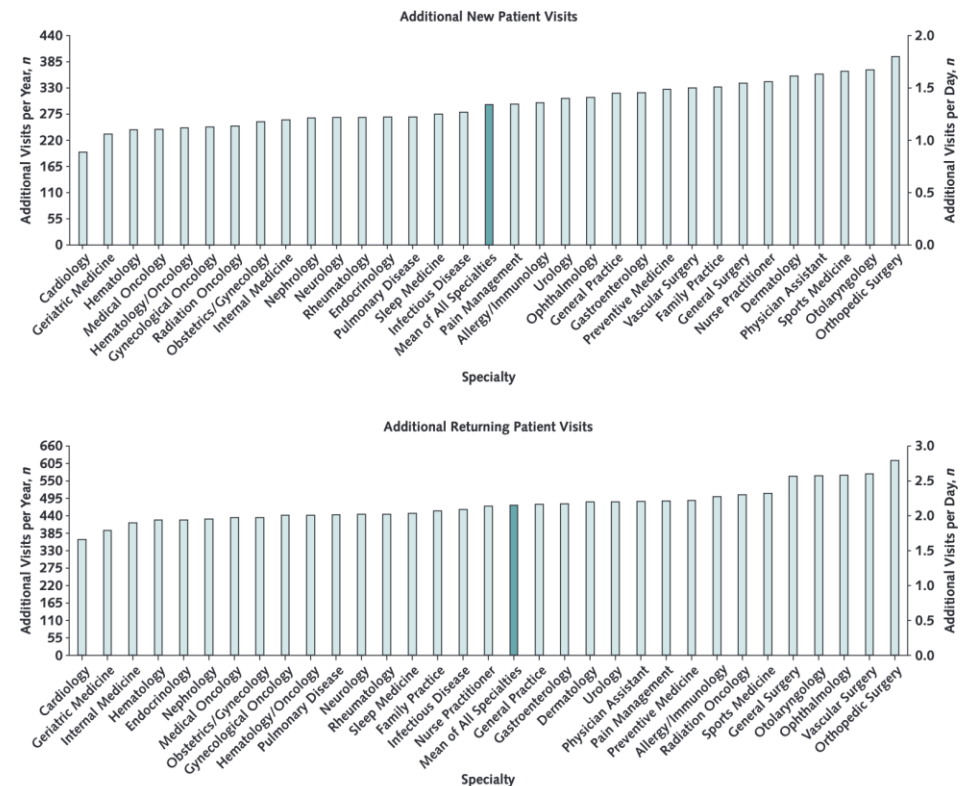
# Digital/Virtual Scribes

- Shift during Covid
- Many Companies
- Synchronous vs Asynchronous
- Probably the digital tool most ripe for advancement with AI and NLP

## The Productivity Requirements of Implementing a Medical Scribe Program

Tyler J. Miksanek, BA, BS; M. Reza Skandari, PhD; Sandra A. Ham, MS; Wei Wei Lee, MD, MPH; Valerie G. Press, MD, MPH; Marie T. Brown, MD; and Neda Laiteerapong, MD, MS

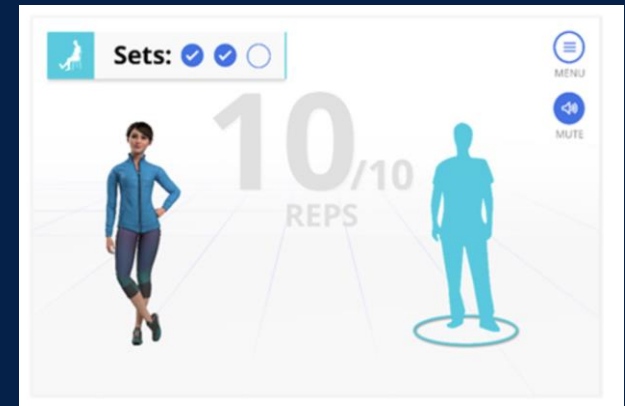
Figure 1. Additional number of patient visits to recover costs after implementation of medical scribes.



Reported values are the number of additional visits required to have 90% confidence that the costs of implementing a medical scribe program will be recovered at 1 y.

# Virtual Physical Therapy/Telerehabilitation

- Multiple studies showing feasibility and non-inferior outcomes
  - Caveat - self-selecting patients
- Can be cost effective but not all studies agree
- Pull again at the question of how necessary physical therapy is at all



## Effects of Virtual Exercise Rehabilitation In-Home Therapy Compared with Traditional Care After Total Knee Arthroplasty

VERITAS, a Randomized Controlled Trial

Janet Prvu Bettger, ScD, Cynthia L. Green, PhD, DaJuanicia N. Holmes, MS, Anang Chokshi, DPT, Richard C. Mather III, MD, MBA, Bryan T. Hoch, DPT, Arthur J. de Leon, MPT, Frank Aluisio, MD, Thorsten M. Seyler, MD, PhD, Daniel J. Del Gaizo, MD, John Chiavetta, MD, Laura Webb, BS, Vincent Miller, MMCI, Joseph M. Smith, MD, PhD, and Eric D. Peterson, MD, MPH

## 2018 John N. Insall Award: Recovery of Knee Flexion With Unsupervised Home Exercise Is Not Inferior to Outpatient Physical Therapy After TKA: A Randomized Trial

Andrew N. Fleischman MD, Meredith P. Crizer BS, Majd Tarabichi MD, Shelby Smith BS, Richard H. Rothman MD, PhD, Jess H. Lonner MD, Antonia F. Chen MD, MBA

## Internet-Based Outpatient Telerehabilitation for Patients Following Total Knee Arthroplasty

A Randomized Controlled Trial

By Trevor G. Russell, PhD, Peter Buttrum, BPhy, Grad Cert (Health Management), Richard Wootton, DSc, PhD, and Gwendolen A. Jull, PhD

Investigation performed at the Queen Elizabeth II Jubilee Hospital, Brisbane, Australia

# Surgery/Clinic Scheduling Applications

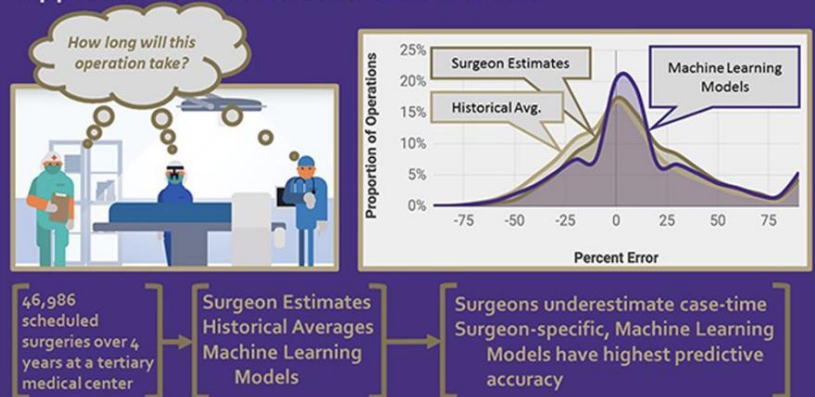
- Promise to help increase utilization and decrease cancellations
- Ease burden on staff
- Use data to drive scheduling
  - AI
  - Machine Learning

## Improving Operating Room Efficiency: Machine Learning Approach to Predict Case-Time Duration

Check for updates

Matthew A Bartek, MD, MPH, Rajeev C Saxena, MD, MBA, Stuart Solomon, MD, Christine T Fong, MS, Lakshmana D Behara, MS, Ravitheja Venigandla, MS, Kalyani Velagapudi, PhD, John D Lang, MD, Bala G Nair, PhD

## Improving Operating Room Efficiency: A Machine Learning Approach to Predict Case-time Duration





Re

- P
- Ir
- R
- N
- B

- Documentation and review barrier
- Global period

**VICON** APPLICATIONS SOFTWARE HARDWARE SUPPORT & DOWNLOADS ABOUT US RESOURCES BUILD MY SYSTEM

Pack of 2

**Blue Trident IMU (single)**

Vicon Blue Trident is a small, lightweight IMU (only 12g) containing dual-g sensors, capturing 12-axes of measurement. When you use Vicon IMUs with the Vicon Capture.U app (available FOC from the App Store) or IMU Step (\*paid subscription required\*), you can store high-fidelity data on the device or transmit the data via Bluetooth to your smartphone. Compatible with Nexus 2.10 onwards. Comes with: 1 x sensor, 1 x strap (medium) and 1 x cradle.

**\$1,600.00 + TAX**

ADD TO CART

**Blue Trident IMU (2 pack)**

Vicon Blue Trident is a small, lightweight IMU (only 12g) containing dual-g sensors, capturing 12-axes of measurement. When you use Vicon IMUs with the Vicon Capture.U app (available FOC from the App Store) or IMU Step (\*paid subscription required\*), you can store high-fidelity data on the devices or transmit the data via Bluetooth to your smartphone. Compatible with Nexus 2.10 onwards. Comes with: 2 x sensors, 2 x straps (medium) and 2 x cradles.

**\$3,200.00 + TAX**

ADD TO CART

## Working with Wearable Sensors Following

Yeung<sup>3</sup>, Sebastian Weaver<sup>3</sup>, Astrid Cantamessa<sup>4</sup>, Jacob T. Munro<sup>1,2</sup>, Justin W. Fernandez<sup>3,5</sup>, Thor F. Besier<sup>3,5</sup>



(Vicon Blue Trident sensor) strapped to the ankle of the patient for home monitoring after outpatient rehabilitation clinics. An additional sensor was strapped to the distal thigh pre-operatively and at Post-Op Week 4.

### 4. Discussion

We present a scalable RPM workflow system to quantitatively assess post-operative function in patients' recovery after knee arthroplasty. This novel platform combines traditional PROMs collection with wearable IMU sensors. It has been designed to easily incorporate into the routine clinical pathway in a low-maintenance and low-cost manner that is acceptable to patients. The simple use of an ankle bracelet system reliably captures

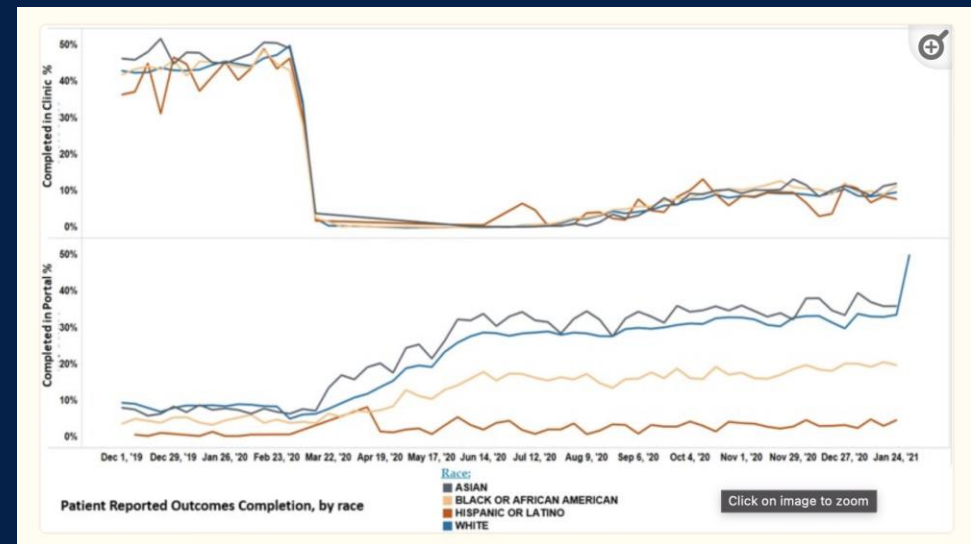
# PROM Collection

- Many companies in the space
- Challenges connecting to EMR
- With mandates will become the standard of practice
- Highlights current digital disparities

## Case Report

### Digital disparities: lessons learned from a patient reported outcomes program during the COVID-19 pandemic

Rachel C. Sisodia,<sup>1,2</sup> Jorge A. Rodriguez ,<sup>3</sup> and Thomas D. Sequist<sup>2,3</sup>



*Journal of the American Medical Informatics Association*, 28(10), 2021, 2265–2268

# Online Reputation Management

Word of Mouth and Online Reviews Are More Influential Than Social Media for Patients When Selecting a Sports Medicine Physician



Dylan N. Greif, M.D., Harsh A. Shah, M.D., Dylan Luxenburg, B.S., Blake H. Hodgens, B.S., Anabel L. Epstein, B.A., Lee D. Kaplan, M.D., Julianne Munoz, M.D., Michael Letter, Ph.D., P.A.-C., and Michael G. Baraga, M.D.

- Ratings and Reviews
  - Google, Yelp, Vitals, RateMD, Healthgrades
  - Google My Business Listing
- Social Media
- Search Engine Optimization
  - Search engine suppression
- Growing area for companies

# Review Websites

- Popular with patients
- Often provide inaccurate information (affiliated hospitals, etc...)
- Questionable validity of reviews
- Require monitoring to manage
- Onus is entirely on the physicians
  - The websites basically take no legal responsibility for what is posted



# Online Reputation

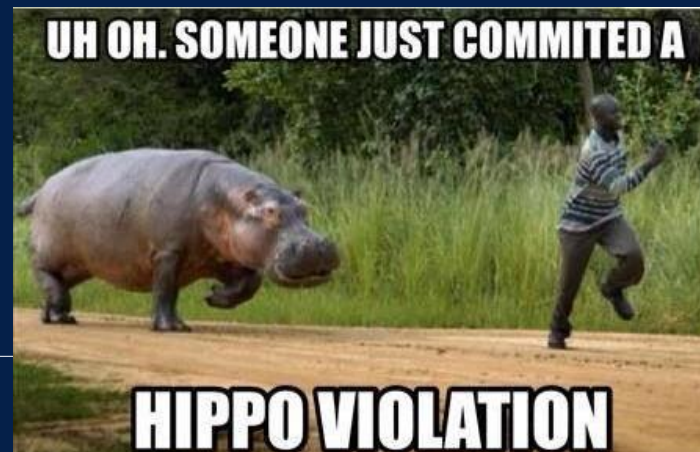
- Hire a company to help you manage
- Use a patient engagement platform to generate positive reviews
- Removing libelous/defamatory reviews
  - Time and effort
- HIPAA!!!!!!!



## Responding to Online Patient Reviews

<https://www.ama-assn.org/system/files/regulatory-myths-online-reviews.pdf>

- Don't disclose any information about the patient—don't even acknowledge the person is a patient in your office. Even if a patient has disclosed their information in an online review, remember that HIPAA prevents a physician from disclosing any information about a patient without the patient's permission. A patient's own disclosure is not permission for the doctor to disclose anything.



# Social Media

- LinkedIn
- Facebook
- Instagram
- X (Twitter)
- TikTok
- .....HIPAA



## Who should you be following? The top 100 social media influencers in orthopaedic surgery

Nathan H Varady, Akash A Chandawarkar, Willem A Kernkamp, Itai Gans

Rank	Twitter Handle	Name	Occupation
1	briancolemd	Brian Cole	Orthopaedic Surgery
2	hjluku	Howard Luks	Orthopaedic Surgery
3	myorthodoc	Steve A. Mora	Orthopaedic Surgery
4	drdavidgeier	David Geier	Orthopaedic Surgery
5	thekneedoc	Robert LaPrade	Orthopaedic Surgery
6	the_jockdoc	Andrew Blecher	Family Medicine Sports Medicine
7	milletmd	Peter Millett	Orthopaedic Surgery
8	cmichaelgibson	C. Michael Gibson	Interventional Cardiology
9	afranklynmiller	Andy Franklyn-Miller	Primary Care Sports Medicine
10	kburnsmd	Katherine Burns	Orthopaedic Surgery

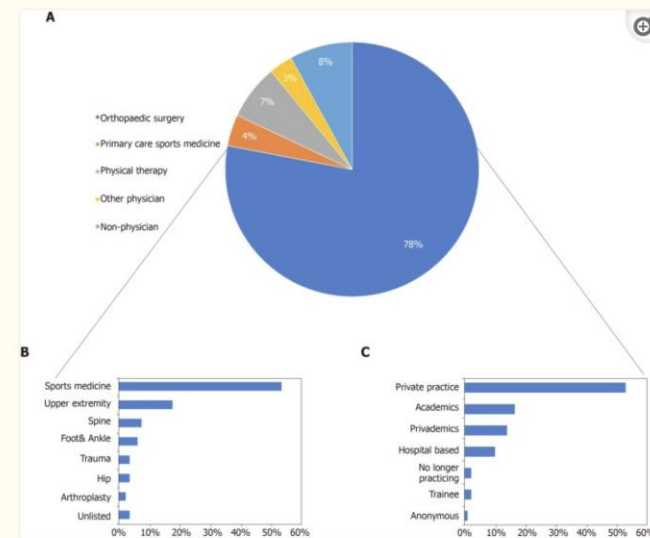


Figure 1

Occupations of the top 100 social media influencers in orthopaedic surgery. A: Occupation of the top 100 influencers; B: Subspecialties of the 78 orthopaedic surgeon influencers; C: Practice setting of the 78 orthopaedic surgeon influencers. Primary care sports medicine refers to internal medicine, family practice, or pediatric doctors who undergo additional fellowship training in sports medicine. Physical therapy refers to those practicing physical therapy/physiotherapy.

# Artificial I

D

How will artificial intelligence change arthroplasty?



Artificial intelligence (AI) has the potential to significantly impact arthroplasty, which is a surgical procedure for joint replacement, typically in the hip or knee. Here are several ways AI is expected to change arthroplasty:



1. **Personalized Treatment Plans:** AI can analyze a patient's medical history, imaging data, and other relevant information to create personalized treatment plans. This can help surgeons determine the optimal implant size, type, and surgical approach for each patient, leading to better outcomes and reduced complications.
2. **Preoperative Planning:** AI algorithms can assist surgeons in preoperative planning by generating 3D models of the joint, allowing them to visualize the anatomy and plan the surgery more accurately. This can lead to more precise implant placement.
3. **Surgical Assistance:** During surgery, AI can provide real-time assistance to surgeons. For example, computer vision algorithms can help surgeons identify critical structures and avoid damaging them. Robotic-assisted systems can also enhance the precision of implant placement.
4. **Postoperative Monitoring:** AI can monitor patients post-surgery to detect complications or issues early on. This can involve analyzing patient-reported data, wearable devices, or even AI-powered imaging analysis to track recovery progress and ensure timely interventions if necessary.
5. **Predictive Analytics:** AI can analyze large datasets to predict which patients are at higher risk of complications or revisions. This can help surgeons identify high-risk patients and take precautionary measures.
6. **Patient Education:** AI-powered tools can provide patients with detailed information about the procedure, expected outcomes, and rehabilitation processes. This can improve patient understanding and compliance, leading to better postoperative results.
7. **Prosthetic Design:** AI can contribute to the design and optimization of prosthetic implants. By analyzing data on how different implant designs perform in different patients, AI can help develop implants that are more durable, comfortable, and suited to individual needs.
8. **Rehabilitation and Physical Therapy:** AI-driven rehabilitation programs can provide patients with personalized exercise routines and monitor their progress, helping them recover more effectively and reducing the risk of complications.
9. **Data Integration:** AI can facilitate the integration of data from various sources, including electronic health records, medical imaging, and patient monitoring, making it easier for healthcare providers to access and analyze relevant information.
10. **Cost Efficiency:** By optimizing treatment plans, reducing complications, and improving patient outcomes, AI has the potential to lower the overall cost of arthroplasty procedures.

It's important to note that while AI holds great promise in arthroplasty, its implementation should be done carefully, with a focus on patient safety, ethical considerations, and regulatory compliance. Additionally, the technology should complement the skills and expertise of surgeons rather than replacing them entirely. As AI continues to advance, it will likely play an increasingly significant role in improving the effectiveness and efficiency of arthroplasty procedures.



# A Framework for Assessing Digital Tools



Does it work?



Does it help  
my patients,  
help my staff,  
or help me?



Does this help  
the Practice  
Financially?



Will I be  
liable?



Will it work in  
my particular  
practice  
landscape?



How am I  
partnering with  
the company?



# Best Practices

Digital tools that  
integrate with  
each other

- i.e. A patient engagement platform that collects PROMs, directs satisfied patients to review website

Aligned interests  
with companies

- Co-development, Appropriate resources, Accountability

Long trial periods  
before full  
purchase



- Only way to see if things really work

PERSPECTIVE

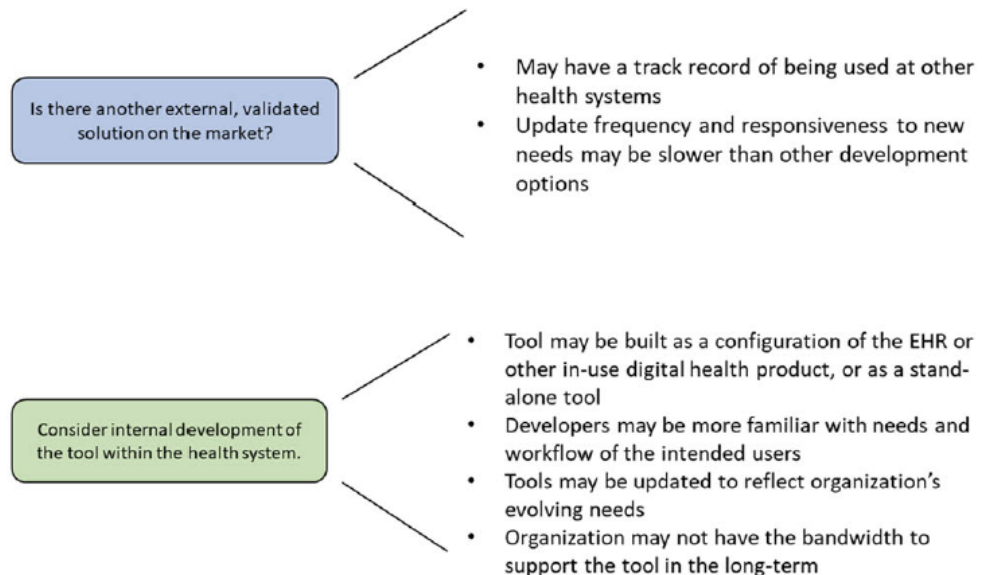
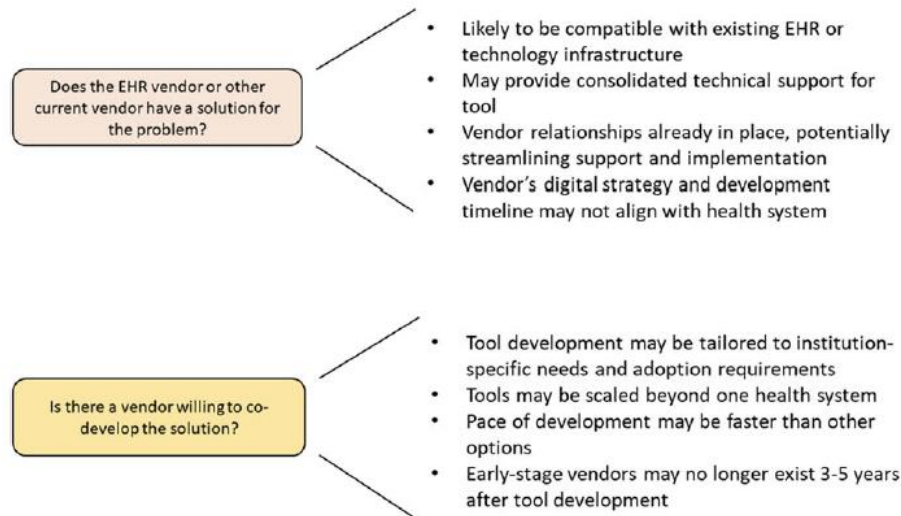
OPEN



## Deploying digital health tools within large, complex health systems: key considerations for adoption and implementation

Jayson S. Marwaha<sup>1,2</sup>, Adam B. Landman<sup>3</sup>, Gabriel A. Brat<sup>1,2</sup>, Todd Dunn<sup>4</sup> and William J. Gordon<sup>2,5</sup>

- Product Selection
- Financial Value
- Clinical Value
- Data Assets
- Internal Champion
- Executive Sponsor
- Institutional Priorities
- Implementation
- Long term operational home



**Fig. 1 Approaches to digital health tool selection.** Various digital health-product-selection approaches, and important considerations for each approach. We recommend investigating the viability of all four possibilities in parallel; the optimal approach will depend on the type of problem being addressed and characteristics of the health system.

### Box 1. Return on investment (ROI) frameworks

Common frameworks by which digital health tools can demonstrate financial return on investment (ROI).

Framework	Details
Fee-for-service	<ul style="list-style-type: none"><li>• Does the tool increase procedural volume?</li><li>• Does it enable providers to see more patients?</li></ul>
Value-based care	<ul style="list-style-type: none"><li>• Does the tool reduce the cost of care for certain conditions or populations?</li><li>• Does it reduce total medical expenses for certain populations?</li><li>• Does it improve a specific clinical outcome?</li></ul>
Regulatory compliance	<ul style="list-style-type: none"><li>• Does the tool help the health system comply with regulations that are tied to financial incentives or penalties?</li></ul>

### Box 2. Identifying resources for implementation

Important considerations when identifying what resources are required for digital health tool implementation.

Domain	Considerations
Training	<ul style="list-style-type: none"><li>• Through what medium should the training be delivered?</li><li>• What types of training materials must be prepared?</li></ul>
IT integration	<ul style="list-style-type: none"><li>• What are the specific integration requirements for the product itself?</li><li>• What permissions are required to integrate the tool into the health system's existing IT infrastructure?</li></ul>
Information security	<ul style="list-style-type: none"><li>• What are the organization's standards for information security, and does the tool meet these standards?</li><li>• Are there any security or privacy issues that need to be mitigated prior to implementation?</li></ul>
Human-capital investment	<ul style="list-style-type: none"><li>• What are the personnel and technical expertise requirements for training, integration, and information-security activities?</li></ul>
Adapting existing real-world and EHR workflows	<ul style="list-style-type: none"><li>• How will provider and staff responsibilities change after deploying the tool?</li><li>• What components of the EHR interface need to be changed to adapt to this new tool?</li></ul>

# Conclusion

- Digital health is rapidly expanding
- With market competition will come increased usability and value
- Use caution when selecting products
- Develop a framework for assessment and re-assessment of your digital tools

**Get a bright, responsive  
A.I. Doctor without  
having to join  
a dating site.**





# Thank you!

