Office of the National Coordinator for Health Information Technology

Insights into API Use to Enable Data Sharing between EHRs and Apps

05/03/2023

Welcome

Background

- Today's presentations showcase results from several studies that examine data sharing between electronic health records (EHRs) and apps from different perspectives.
  - We consider health care provider, app developer, and patient experiences to understand the how, what, and why about data sharing between EHRs and apps.

- Although each study isn't directly comparable to the other, we weave an interesting picture where a common story does unfold.

- The current state is shaped by a lot of factors:
  - Decade old efforts through the JASON Task Force and Argonaut Project to enable EHR and third-party app data sharing through standards-based APIs
  - HHS Cures Act rulemaking that set the standards for API-based data sharing
  - COVID-19 pandemic that accelerated demands for virtual care and digital access

- Three years since ONC finalized Cures Act rulemaking and a decade after JASON, we look at how things have changed and consider what is to come.

Today's presentations

- Hospital use of APIs to enable data sharing between EHRs and apps
  - Catherine Strawley, Public Health Analyst , Data Analysis Branch, ONC
- Patient access to electronic health information
  - Chelsea Richwine, Ph.D., Economist , Data Analysis Branch, ONC
- Digital health company experiences with EHR APIs
  - Natalya Maisel, Ph.D., Associate Director, Center for Clinical Informatics and Improvement Research, University of California San Francisco
- Changes in the App Marketplace, 2019-2022
  - Wesley Barker, Branch Chief, Data Analysis Branch, ONC
- Wrapping up
  - Jordan Everson, Ph.D., Public Health Analyst, Data Analysis Branch, ONC

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Hospital Use of APIs to Enable Data Sharing Between EHRs and Apps

AHA Health IT Supplement Results on Apps/APIs

Catherine Strawley, Public Health Analyst
Data Analysis Branch, Office of Technology, ONC

Data and Methods

- Data are from the American Hospital Association (AHA) Information Technology (IT) Supplement to the AHA Annual Survey for the years 2020 and 2022.
  - Each U.S. hospital CEO was invited to participate, and the person most knowledgeable about the hospital's health IT (typically the CIO) was asked to answer supplement questions.
  - Due to the COVID-19 pandemic, the 2020 survey was fielded in 2021.
- Response rate for non-federal acute care hospitals
  - 2020 survey (N = 2,359) – 54%
  - 2022 survey, fielded July to December 2022 (N = 2,541) – 59%
- We assessed hospital use of clinician and patient APIs to enable apps to read EHR and non-EHR data, and write data to the EHR, as well as use of APIs to enable patient access and patient generated data submission.
  - We also compared across years and characteristics of hospitals and health IT.
  - Missing responses were removed from the sample for all weighted averages.

API-Enabled App Functionalities

- Write to EHR: Integration of data from a third-party software into a hospital's EHR, i.e. third-party software is capable of writing data to the EHR.
- Read EHR data: Providing data from a hospital's EHR to third-party applications used by clinicians in the same hospital/health system, i.e. third-party applications are capable of reading data from the EHR.
- Read Non-EHR data: Providing data from sources other than the EHR to third-party applications used by clinicians at a hospital or health system.

Question Text	Response Options
Write to EHR	
27a*. Does your hospital integrate data into your EHR from third-party software (e.g., patient monitoring devices, telehealth)?	Yes | No | Do not know
Read EHR Data	
27c*. Does your hospital provide data from your EHR to third-party applications used by clinicians at your hospital/health system?	Yes | No | Do not know
Read Non-EHR Data	
27e*. Does your hospital provide data from sources other than your EHR to third-party applications used by clinicians at your hospital/health system?	Yes | No | Do not know

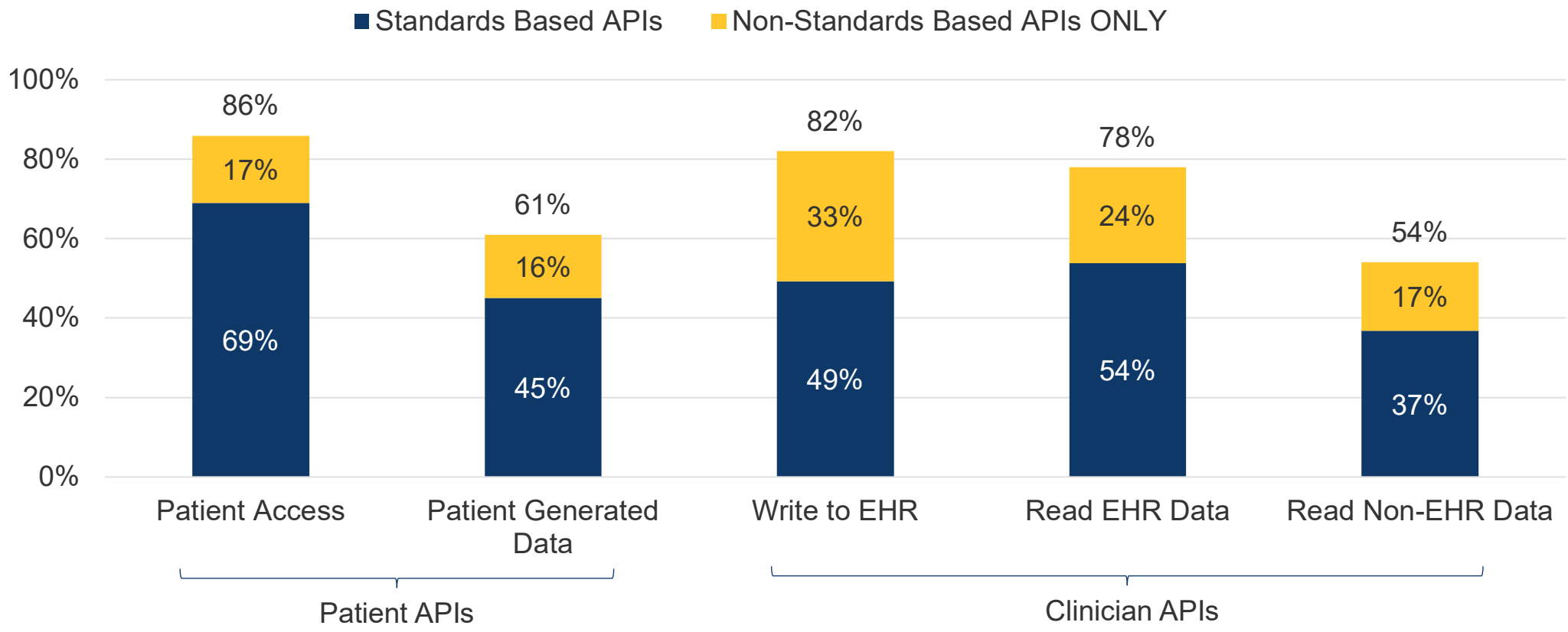
API-Enabled App Functionalities – Patient Access

Question Text	Response Options
Patient Access	
Are patients who receive care provided by your hospital or outpatient sites able to do the following: 2g*. Access their health/medical information using applications (apps) configured to meet the application programming interfaces (API) specifications in your EHR 2h*. Access their health/medical information using applications (apps) configured to meet Fast Healthcare Interoperability Resource (FHIR) specifications	Respondents were prompted to select all that apply among the following options: 1. Yes, at some or all inpatient sites 2. Yes, at some or all outpatient sites 3. Not across outpatient or inpatient site(s) 4. Do not know

Patient Generated Data Submission

Question Text	Response Options
Patient Generated Data	
Are patients who receive care provided by your hospital or outpatient sites able to do the following: 2i.* Submit patient generated data (e.g., blood glucose, weight) 2j*. Submit patient generated data (e.g., blood glucose, weight) through apps configured to meet FHIR specifications	Respondents were prompted to select all that apply among the following options: 1. Yes, at some of all inpatient sites 2. Yes, at some or all outpatient sites 3. Not across outpatient or inpatient site(s) 4. Do not know

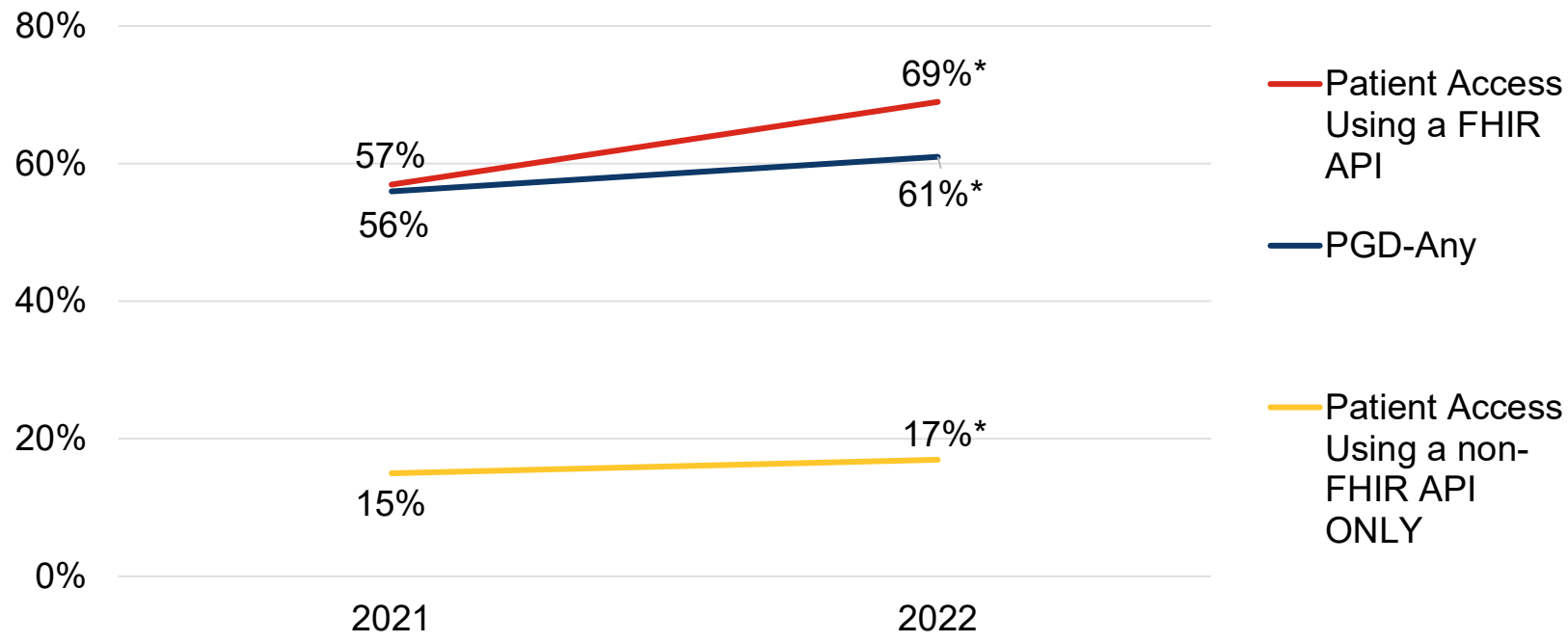
Hospital use of APIs to share data with apps



Source: 2022 AHA Annual Survey Information Technology Supplement.

Notes: Percentages are calculated among non-federal acute care hospitals with inpatient or outpatient sites. See the definition section of this brief for further clarification regarding clinician API capabilities highlighted in this figure (Write to EHR, Read EHR Data, and Read Non-EHR Data) and standards-based APIs.

Hospital use of APIs to enable patient access and submit patient-generated data to apps, 2021-2022



Source: AHA Annual Survey Information Technology Supplement.
Notes: The percentages in this figure are calculated among non-federal acute care hospitals with both inpatient and outpatient sites. The percentages reflected in this figure account for hospitals who indicated that patients were able to submit patient generated data in 2021, and hospitals that indicated that their patients were able to submit patient generated data generally or through apps configured to meet FHIR specifications in 2022. *Year over year change is statistically significant ($p<0.05$)..

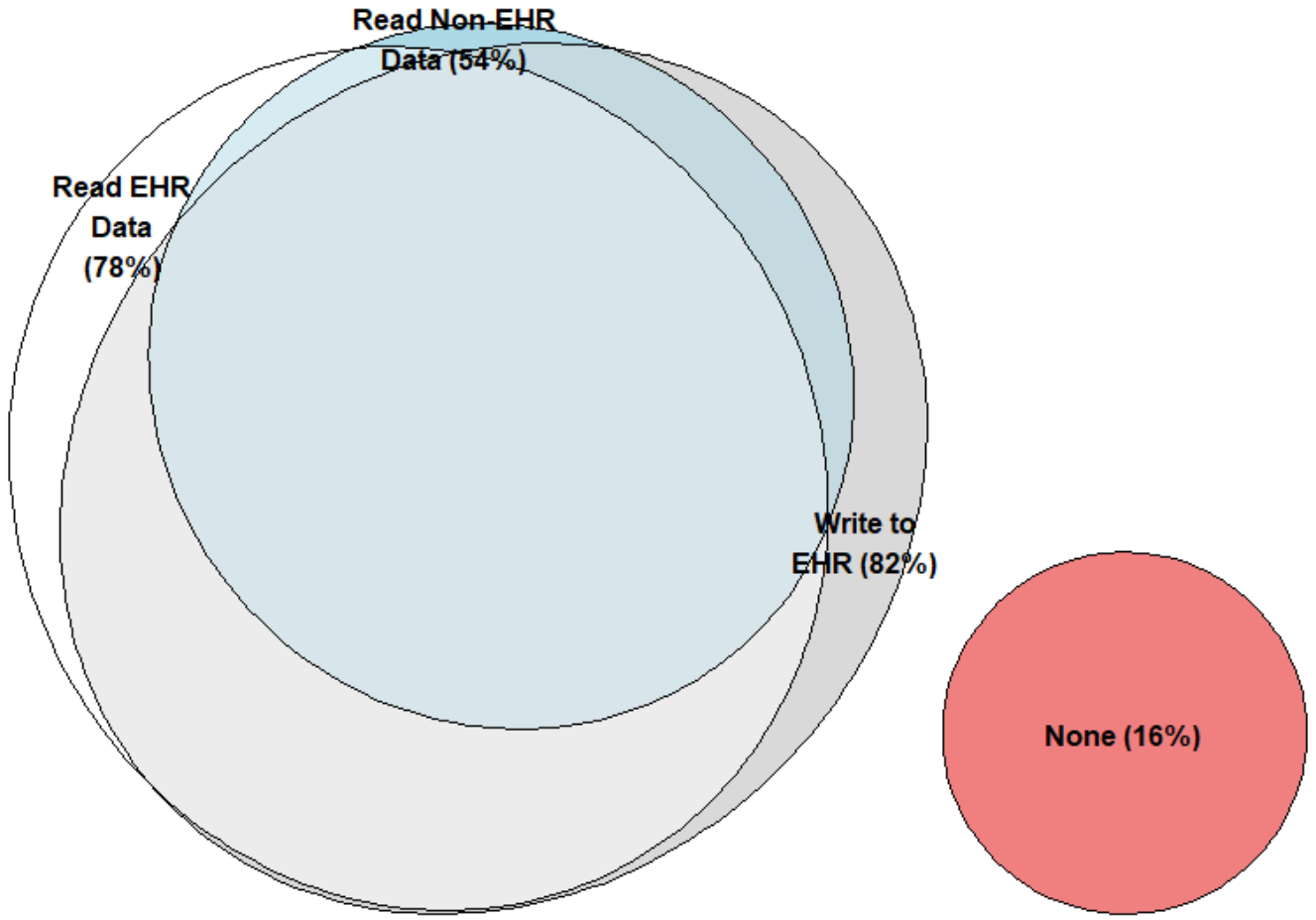
Hospital use of APIs to enable patient access and submit patient-generated data to apps by hospital and health IT characteristics, 2021-2022

	Patient Access Using a FHIR API		Patient Access Using Only a non-FHIR API		PGD-Any	
Year	2021	2022	2021	2022	2021	2022
Nationally	57%	69%*	15%	17%*	56%	61%*
Health IT Characteristics						
Top 3 EHRs	64%	73%*	13%	16%*	59%	63%*
All other EHRs	36%	42%*	22%	22%	47%	51%
Hospital Characteristics						
Small	51%	64%*	19%	17%	55%	58%*
Medium-Large	64%	74%*	11%	17%*	58%	63%*
Independent	47%	54%*	22%	20%	44%	47%
System Affiliation	62%	76%*	12%	16%*	62%	67%*

Source: AHA Annual Survey Information Technology Supplement.
Notes: *Significantly different from the prior year ($p<0.05$). Rates represent capabilities across hospital inpatient and outpatient sites. The “Top 3” and “Next 3” EHRs were determined using data reported by hospitals in the 2022 survey. Please refer to the Definitions section of this data brief for more information on the terminology.

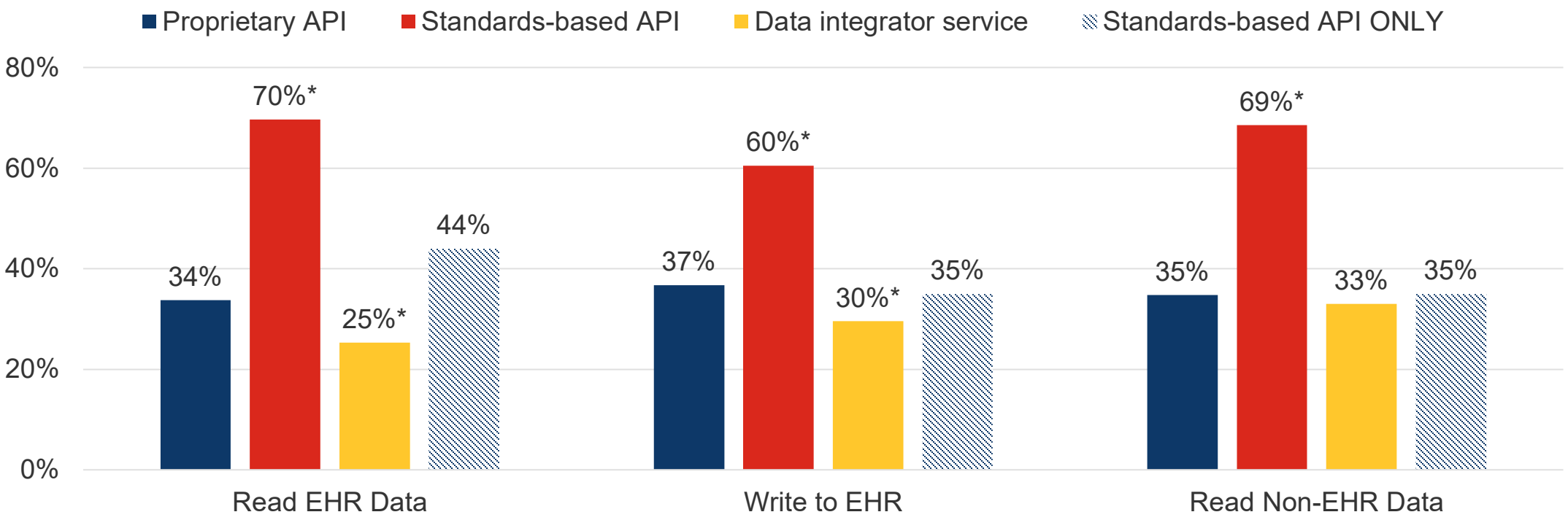
Percent of hospitals that used APIs to enable apps to read EHR data, write data to the EHR, and read non-EHR data.

- 4 in 10 hospitals reported enabling apps to read EHR and non-EHR data, as well as write data to the EHR.
- 85% of hospitals that enabled apps to write data to the EHR also enabled apps to read data from the EHR.
- 91% of hospitals that enabled apps to read non-EHR data also allowed apps to read EHR data.



Source: 2022 AHA Annual Survey Information Technology Supplement.

Methods used by hospitals to enable apps to read EHR data, write data to the EHR, and read non-EHR data, among those with each capability



Source: 2022 AHA Annual Survey Information Technology Supplement
Notes: Within each functionality (read EHR data, write data to the EHR, and read non-EHR data) included within the visualizations, only hospitals that reported having that respective functionality are included. The methods displayed are not mutually exclusive. *Significantly different from the proportion of hospitals using proprietary APIs ($p<0.05$).

Hospital use of APIs to enable apps to read EHR data, write data to the EHR data, and read non-EHR data, by hospital and health IT characteristics, 2022

	Read EHR Data	Write to EHR	Read Non-EHR Data
Health IT Characteristics			
Top 3 EHRs	83%*	88%*	60%*
All other EHRs	45%	43%	14%
Hospital Characteristics			
Medium-Large	86%*	89%*	63%*
Small	70%	75%	45%
System Affiliated	85%*	88%*	64%*
Independent	63%	68%	31%

Source: 2022 AHA Annual Survey Information Technology Supplement.
Notes: *Significantly different from corresponding category in the row below ($p<0.05$).

Summary of Findings

	Hospitals	Patients	Developers	Marketplace
Rates of patient access via apps/API	86% of hospitals reported API-enabled patient access (69% use standards).			
Rates of health system / care delivery apps/APIs	82% of hospitals enable APIs to write to EHR, and 78% enable read of EHR data.			
Rates of standards use	Standards-based APIs used more frequently than non-standards based			

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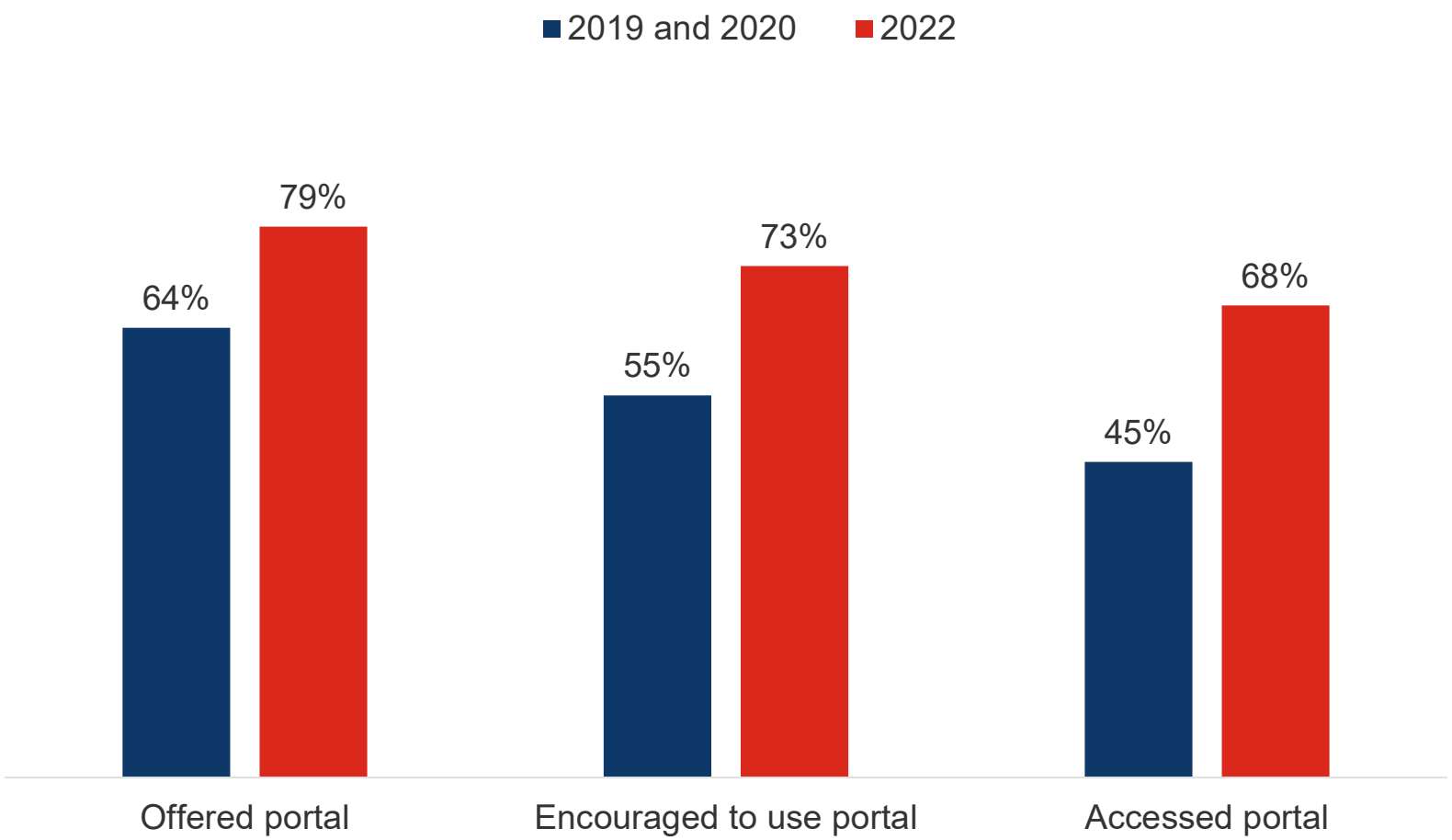
Patient Access to Electronic Health Information, Findings from HINTS 2019-2022

Chelsea Richwine, Economist
Data Analysis Branch, Office of Technology, ONC

Data and Methods

- Data come from 3 waves of the Health Information National Trends Survey (HINTS), a nationally representative survey of U.S. adults that tracks individuals' access and use of health-related information (pooled sample *N* = 15,555)
  - HINTS 6 (2022): fielded March to November 2022 (*N* = 6,252; 28% response rate)
  - HINTS 5, Cycle 4 (2020): fielded February to June 2020 (*N* = 3,865; 37% response rate)
  - HINTS 5, Cycle 3 (2019): fielded January to May 2019 (*N* = 5,438; 30% response rate)
- The sample was restricted to respondents who had a healthcare visit in the past 12 month, and thus, had a reason to access their online medical record (pooled sub-sample used for analyses, *n* = 13,465*).*
- We described several outcomes related to patients' engagement with electronic health information (EHI) via online medical records or patient portals. All analyses used survey weighting procedures with jackknife replicate weights to account for the complex survey design.

Patient-reported access to online medical record or patient portal (HINTS 5 and 6)



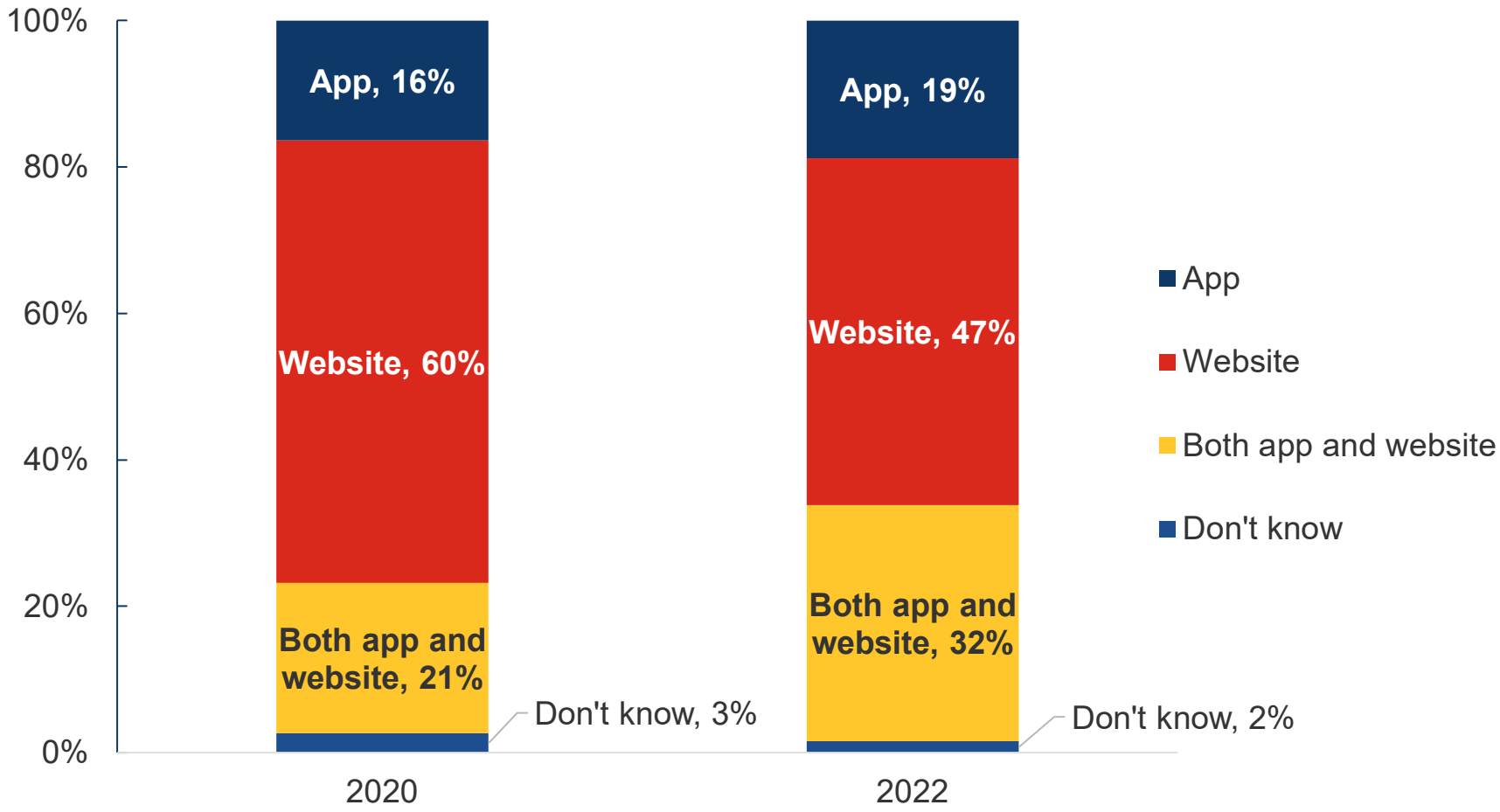
Offered portal – patient reports of being offered online access to their medical records (e.g., a patient portal) by their health care provider or insurer.

Encouraged to use portal – patient reports of being encouraged by any of their health care providers (including doctors, nurses, or office staff) to use an online medical record or patient portal.

Accessed portal – patient reports of accessing their online medical record or patient portal at least once in the past 12 months.

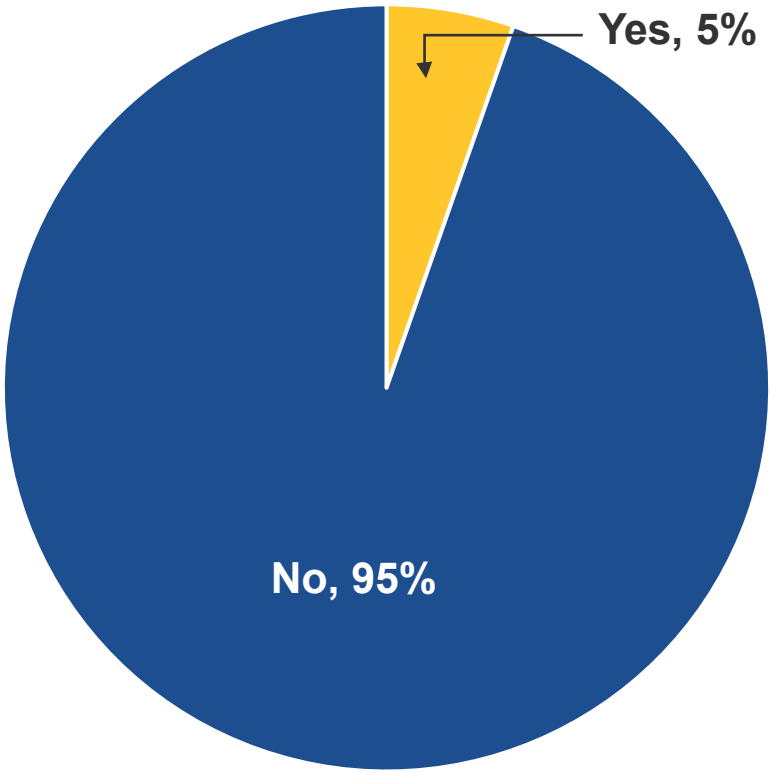
Source: HINTS 5 Cycle 3 (2019) and 4 (2020) and HINTS 6 (2022). Only includes respondents who had a health care visit in the past 12 months (*N* = 8,028 in 2019 and 2020, *N* = 5,437 in 2022).

Methods used to access online medical record or patient portal (HINTS 5 and 6)



Source: HINTS 5, Cycle 4 (2020) and HINTS 6 (2022). Only includes respondents who had a health care visit in the past 12 months and reported accessing their portal at least once in the past 12 months (*N* = 4,825).

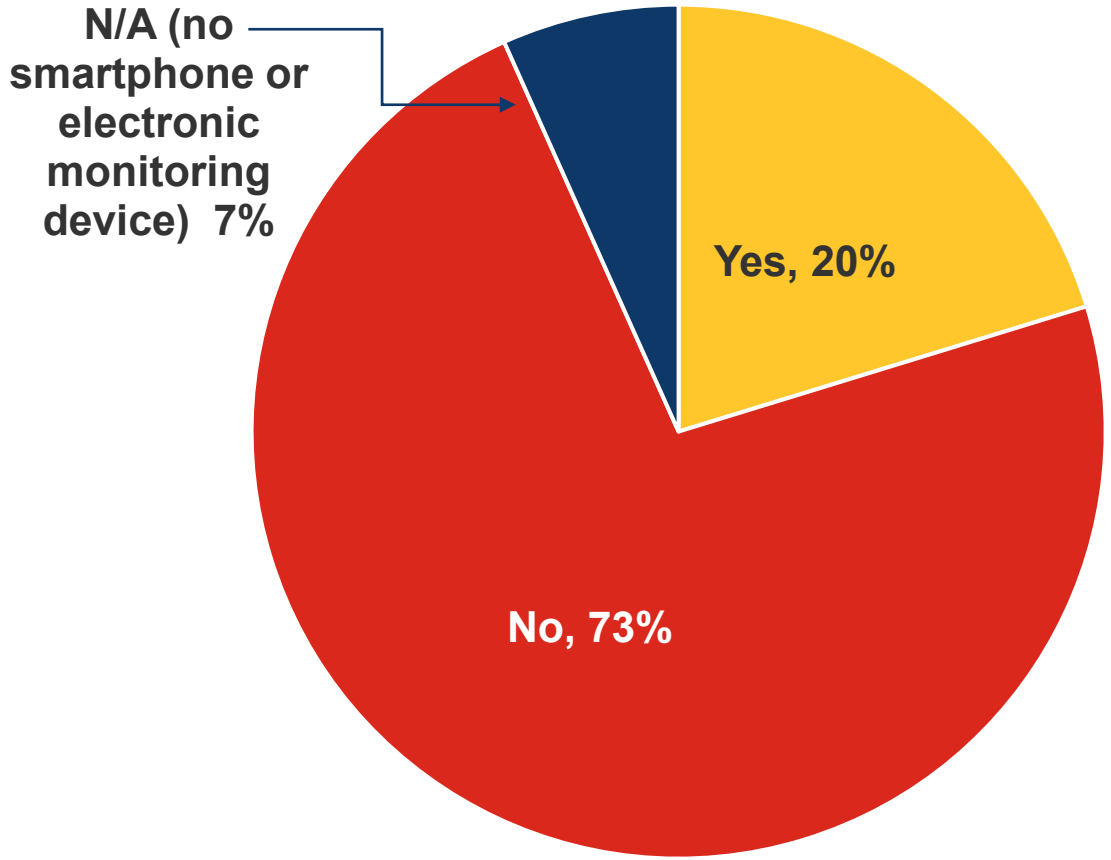
Have you ever used an app* to combine your medical information from different patient portals or online medical records into one place?(HINTS 6)



*For example, an app like ‘Apple Health Records’ or ‘CommonHealth’

Source: HINTS 6 (2022). Only includes respondents who had a healthcare visit in the past 12 months and those who indicated they had multiple portals (*N* = 1,900).

Have you shared health information from either an electronic monitoring device or smartphone with a health professional within the last 12 months? (HINTS 6)



Source: HINTS 6 (2022). Only includes respondents who had a healthcare visit in the past 12 months (*N* = 5,437).

Summary of Findings

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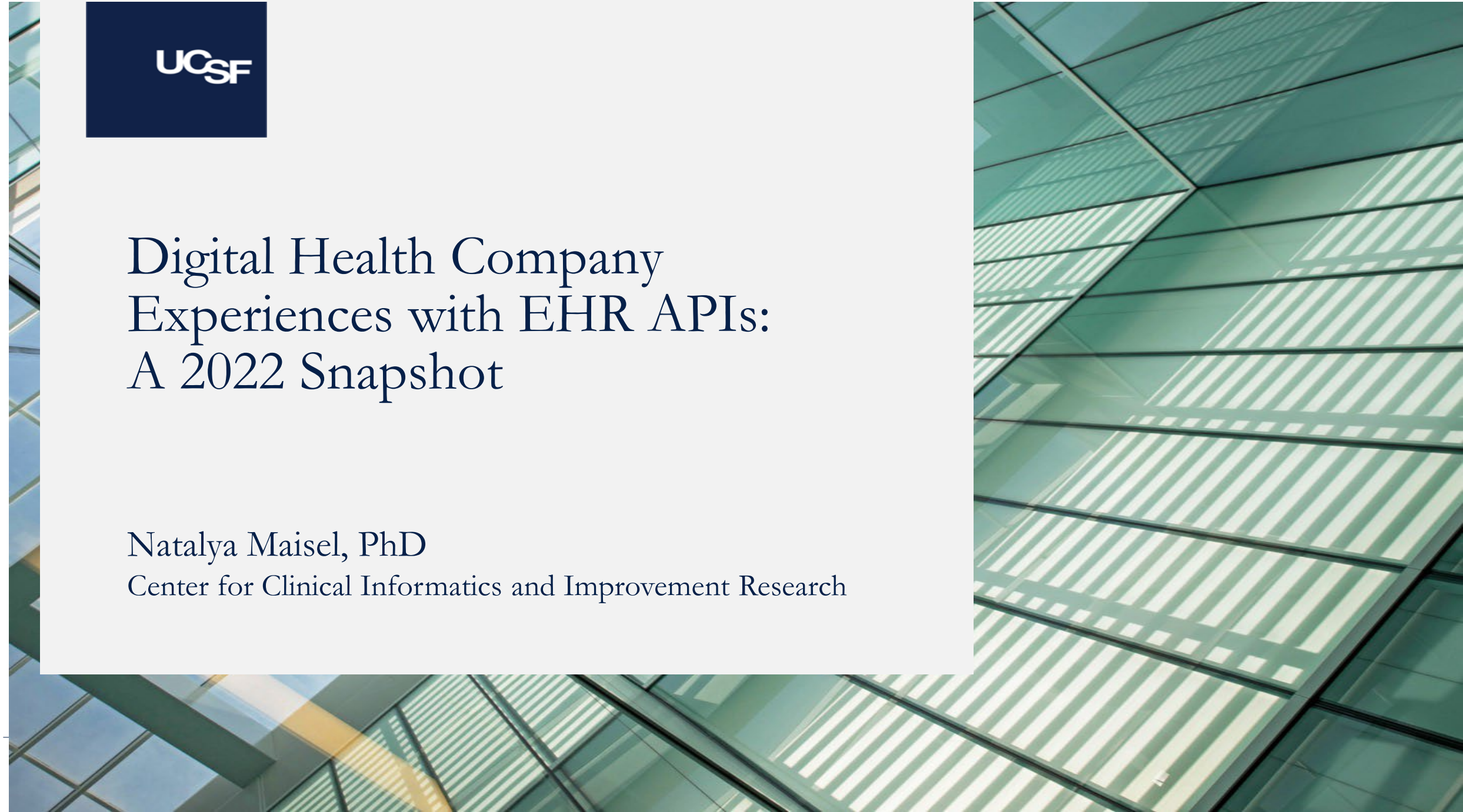
Rates of standards use	Standards-based APIs used more frequently than non-standards based			



Digital Health Company Experiences with EHR APIs: A 2022 Snapshot

Natalya Maisel, PhD
Center for Clinical Informatics and Improvement Research

Overview

GOAL: Conduct a large, national survey of digital health companies to answer the following research questions:

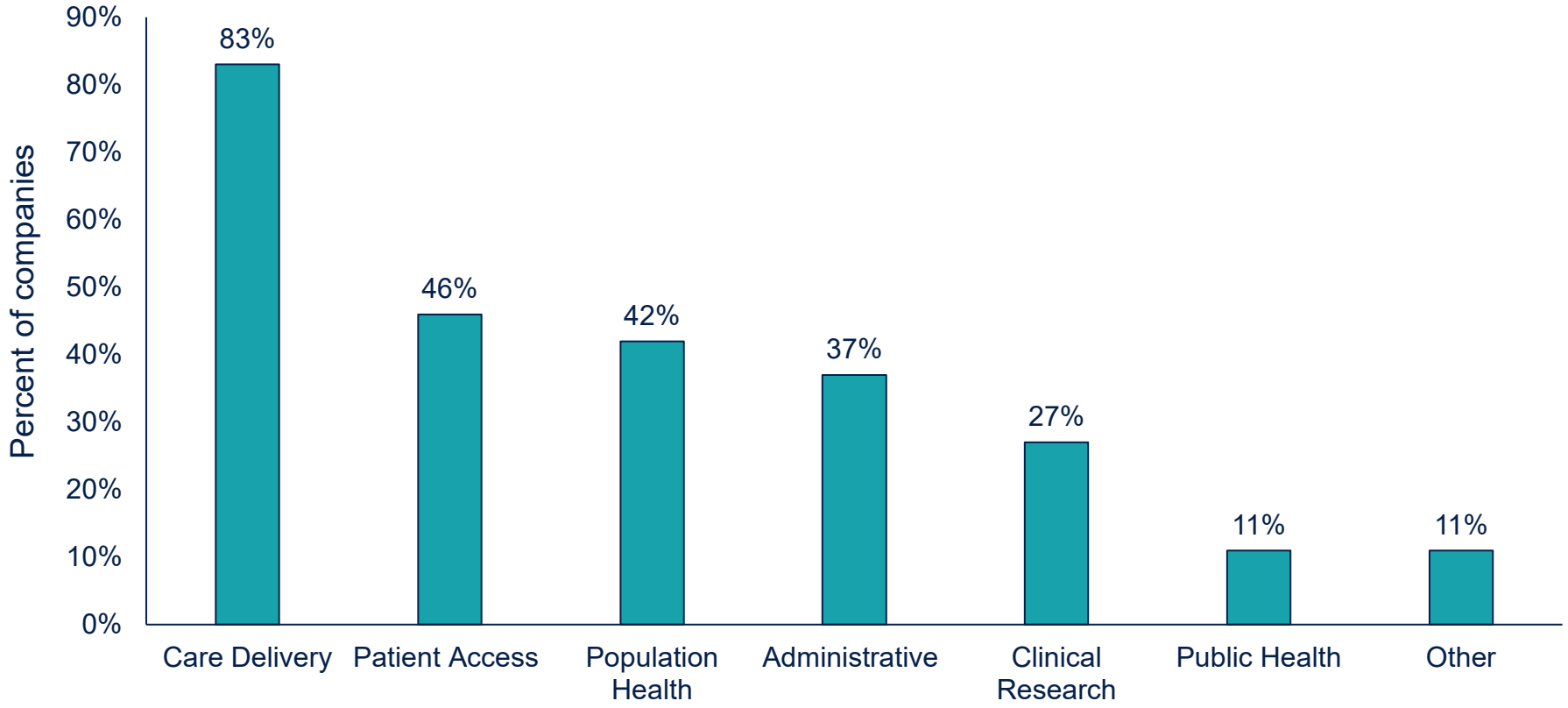
- *What type of integrations have been attempted with commercial EHRs?*
- *What are the main barriers faced during integrations with commercial EHRs using APIs?*
- *What is the perceived or observed impact of federal policy on integration efforts?*

Approach

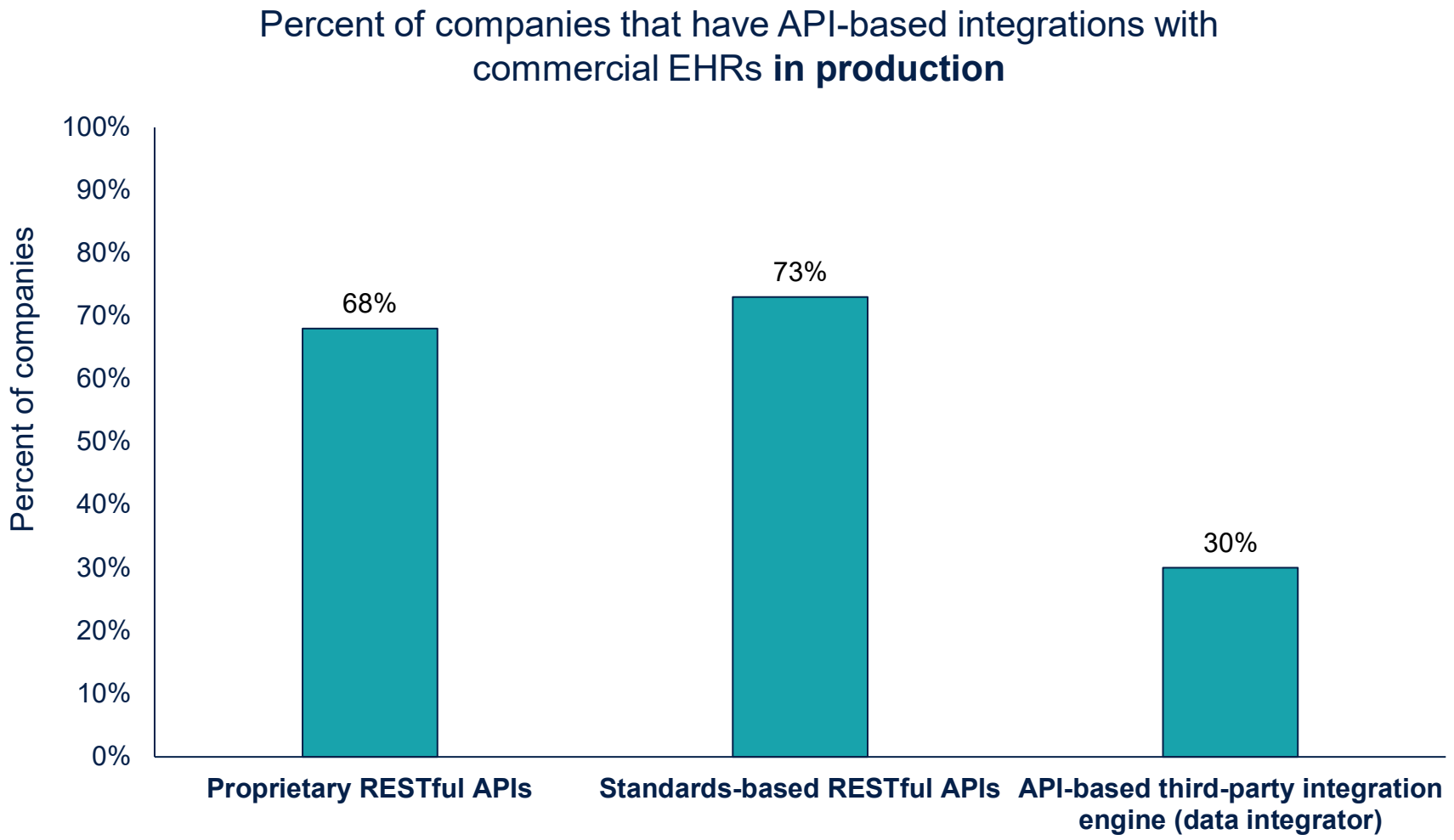
- Identified **digital health companies** that currently (or previously attempted to) **integrate with commercial EHRs**.
- Sources for company list:
  - Public EHR app galleries
  - CB Insights digital health start ups list
  - Analysis of relied upon software from ONC Health IT certification process
  - Members of our Expert Advisory Board
- Identified 704 companies
- **Results in this presentation: n=141 companies**

Application domains of products

Primary application domains of your product(s) that integrate/will integrate with commercial EHRs using APIs

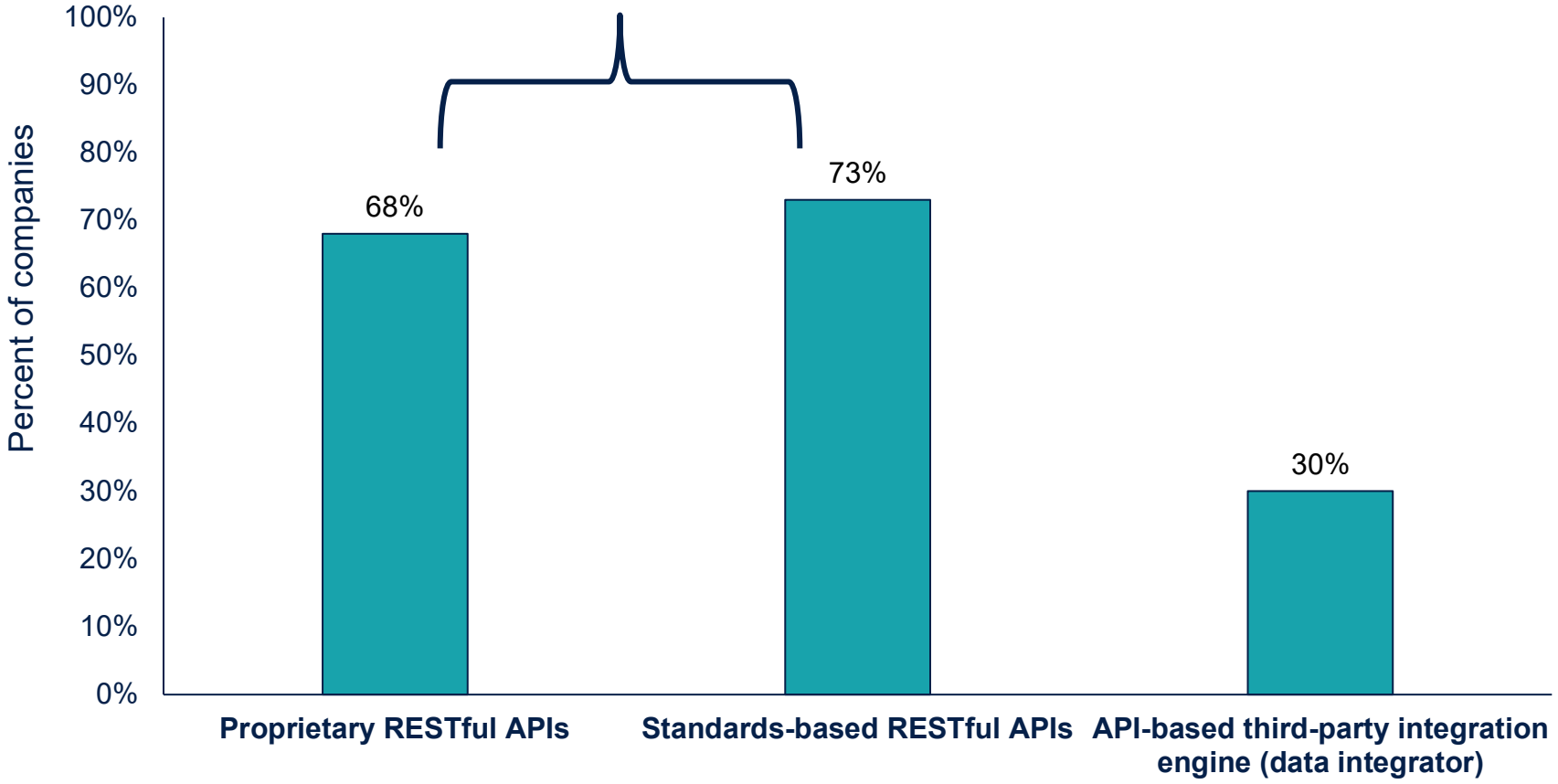


Types of integrations with commercial EHRs



Types of integrations with commercial EHRs

57% of companies had both proprietary and standards-based API-based integrations in production



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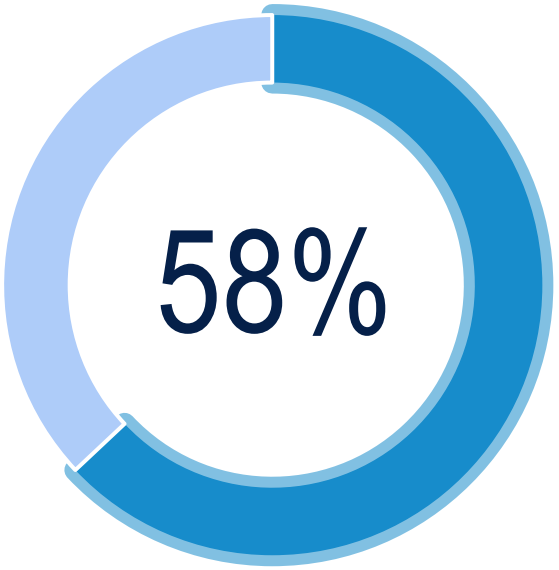
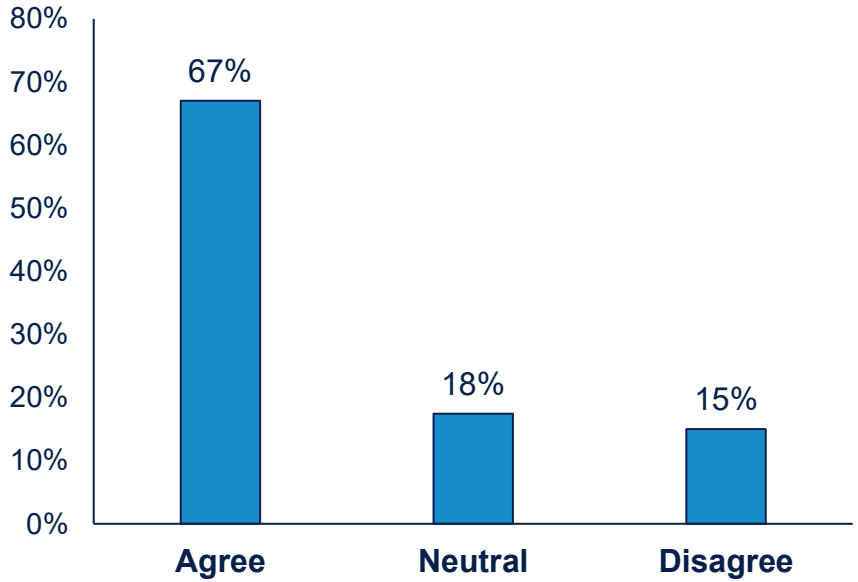
API vs. Non-API based integrations



Companies currently **integrating using non-RESTful APIs or integration approaches that do not rely on APIs**

Companies using approaches that do not rely on RESTful APIs because **current RESTful APIs are not able to meet business needs**



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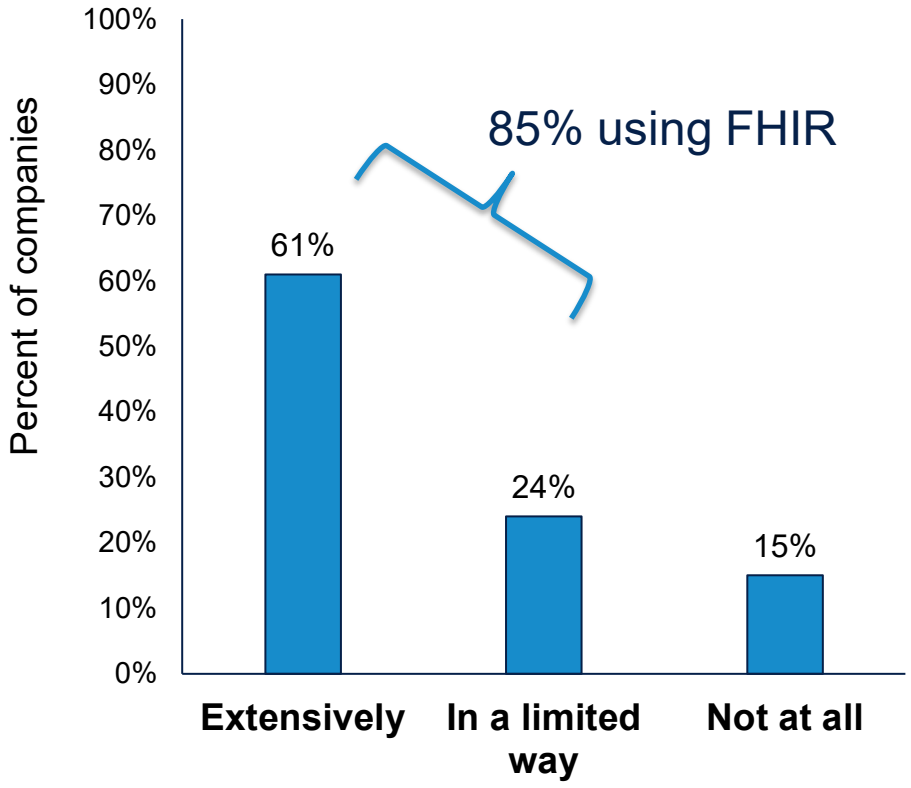
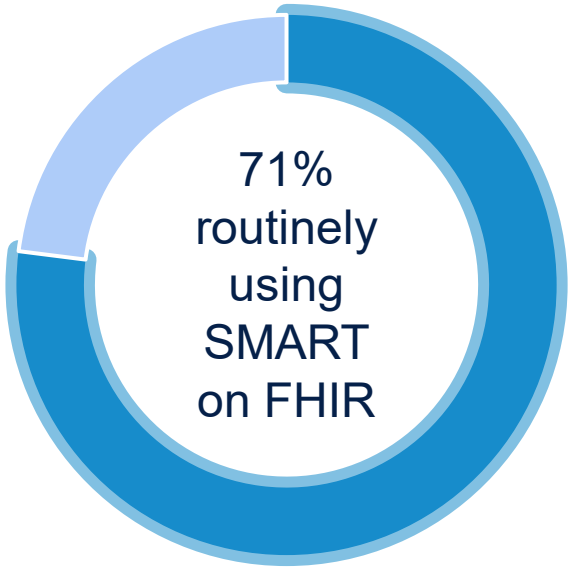
FHIR use

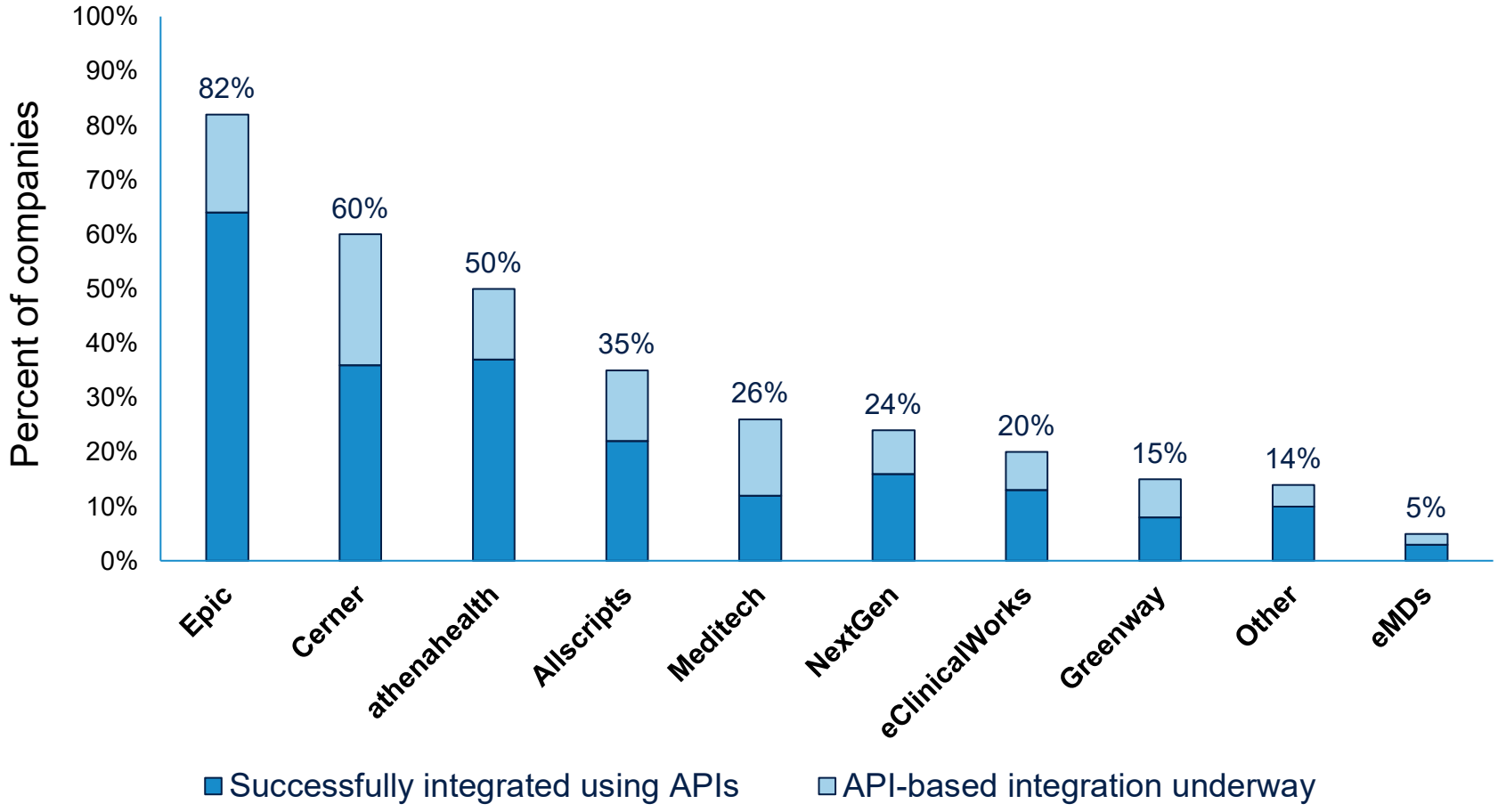
Do you **use FHIR** in your product(s)?



If using FHIR:



Integrations with specific EHR vendors



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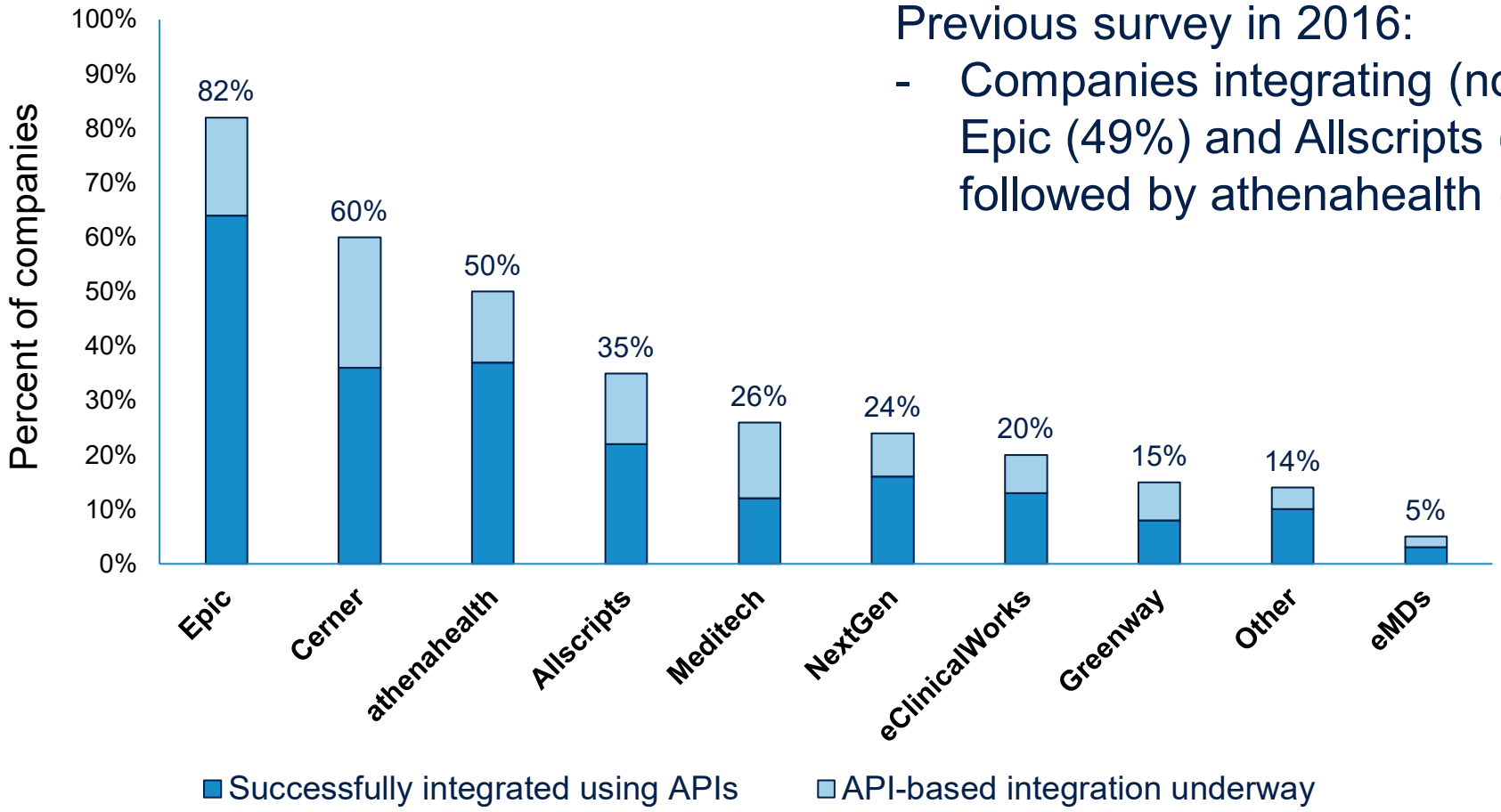
Integrations with specific EHR vendors



Previous survey in 2016:

- Companies integrating (not just API-based) with Epic (49%) and Allscripts (49%) most-frequently, followed by athenahealth (39%) and Cerner (33%)

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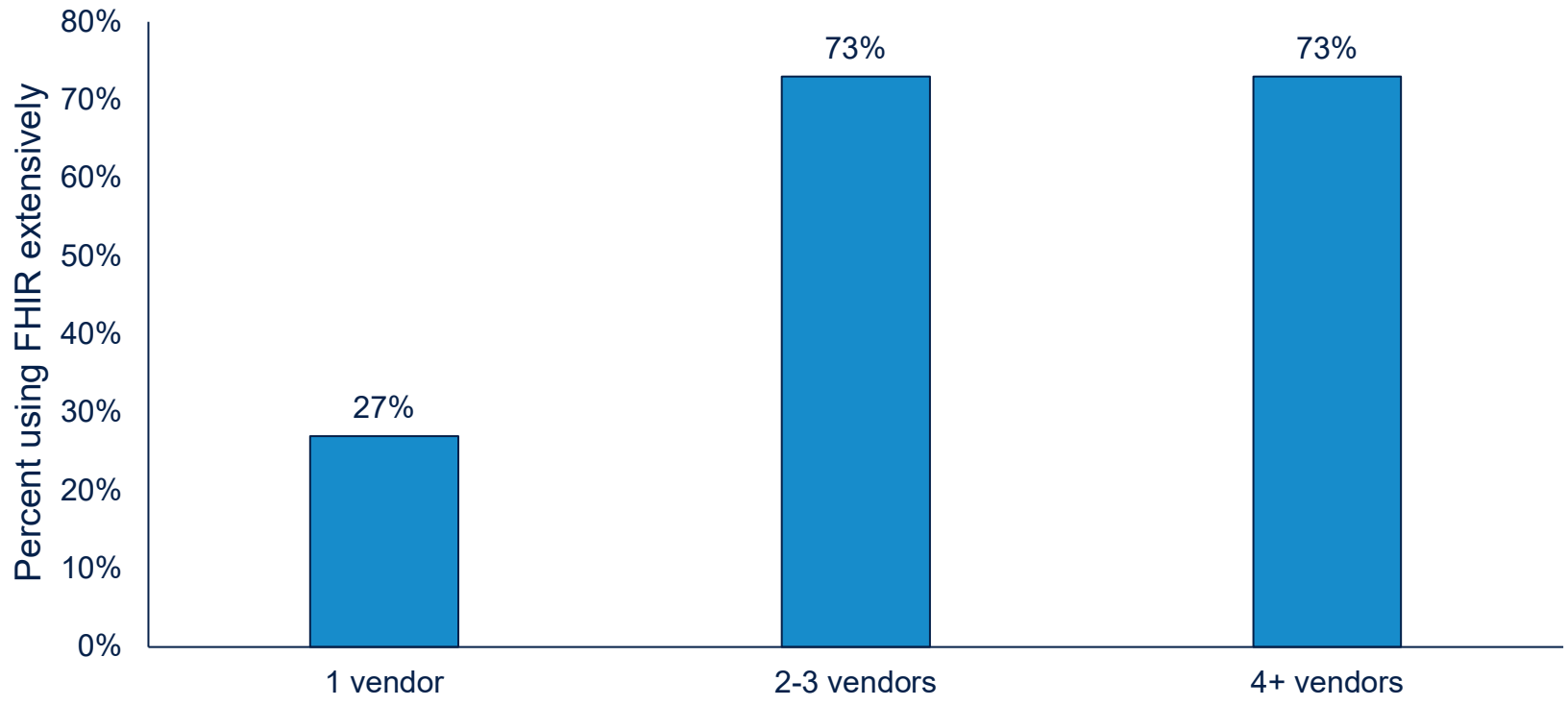
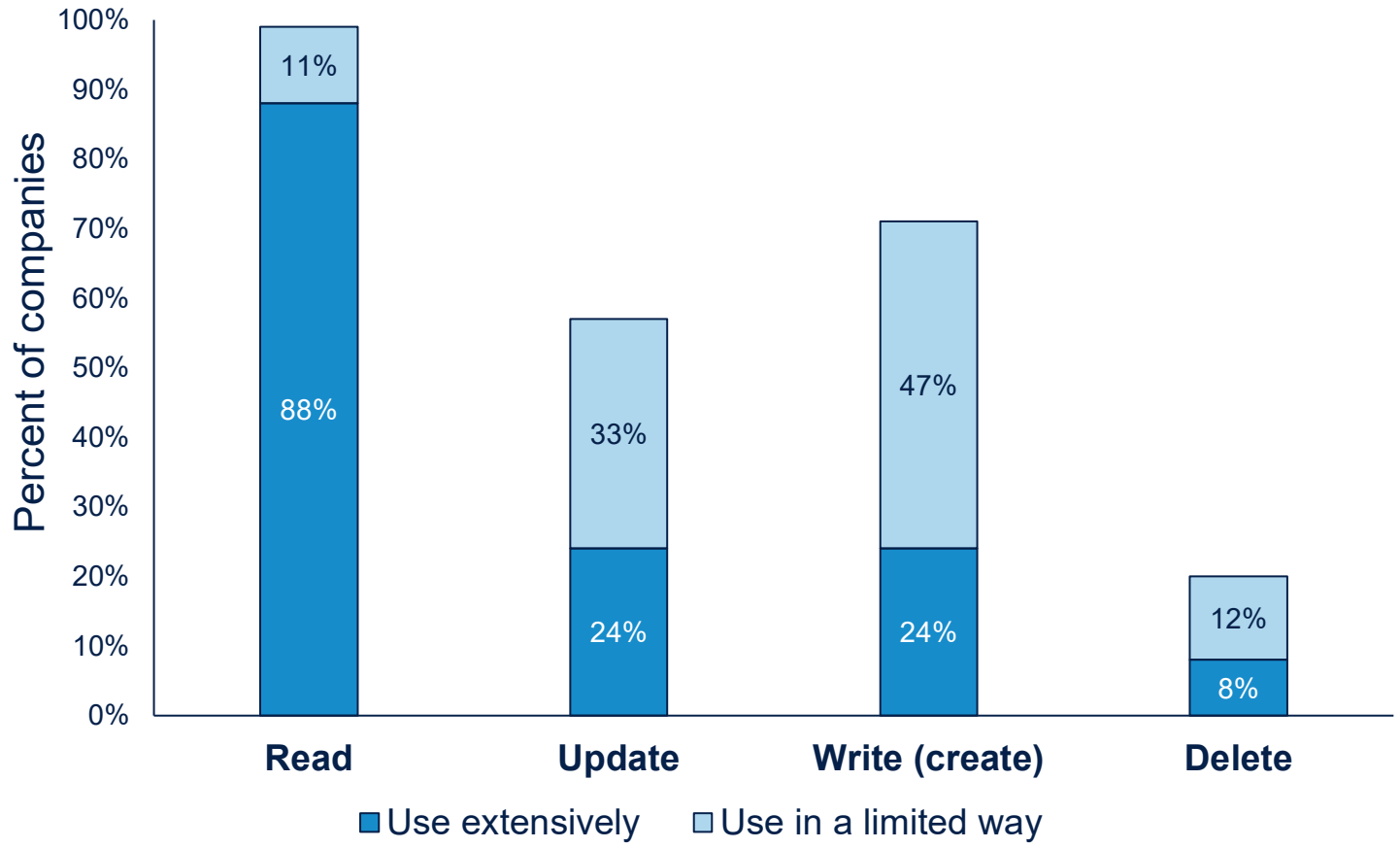
Multiple EHR vendors & FHIR use

- 27% of companies that integrated with 1 EHR vendor used FHIR extensively
- **FHIR use is more common if company is integrating with more than 1 vendor**



Level of use for API-based EHR integrations

Current level of use for your API-based commercial EHR integrations:



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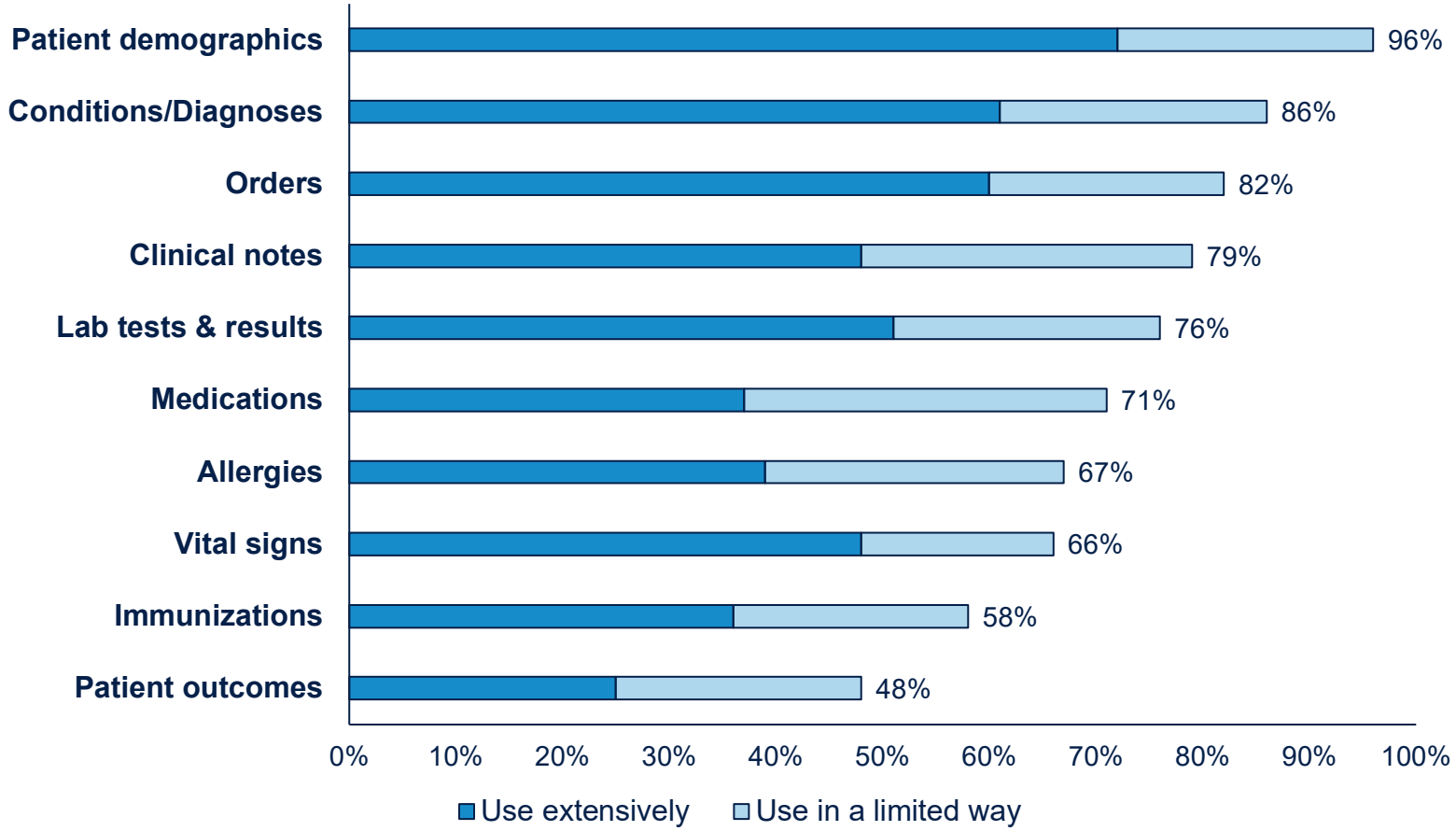
Level of use for API-based EHR integrations

Current level of use for your API-based commercial EHR integrations:



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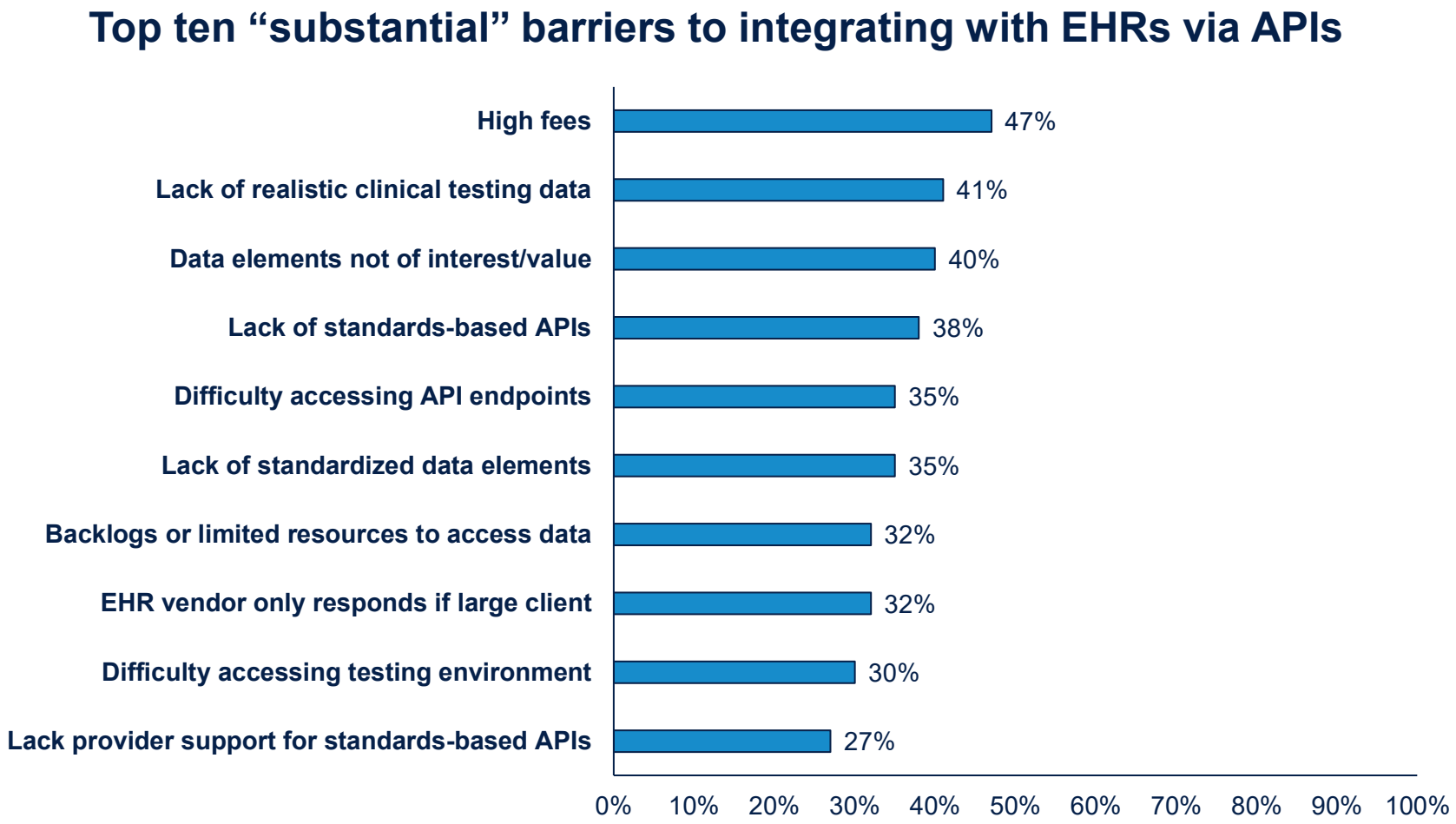
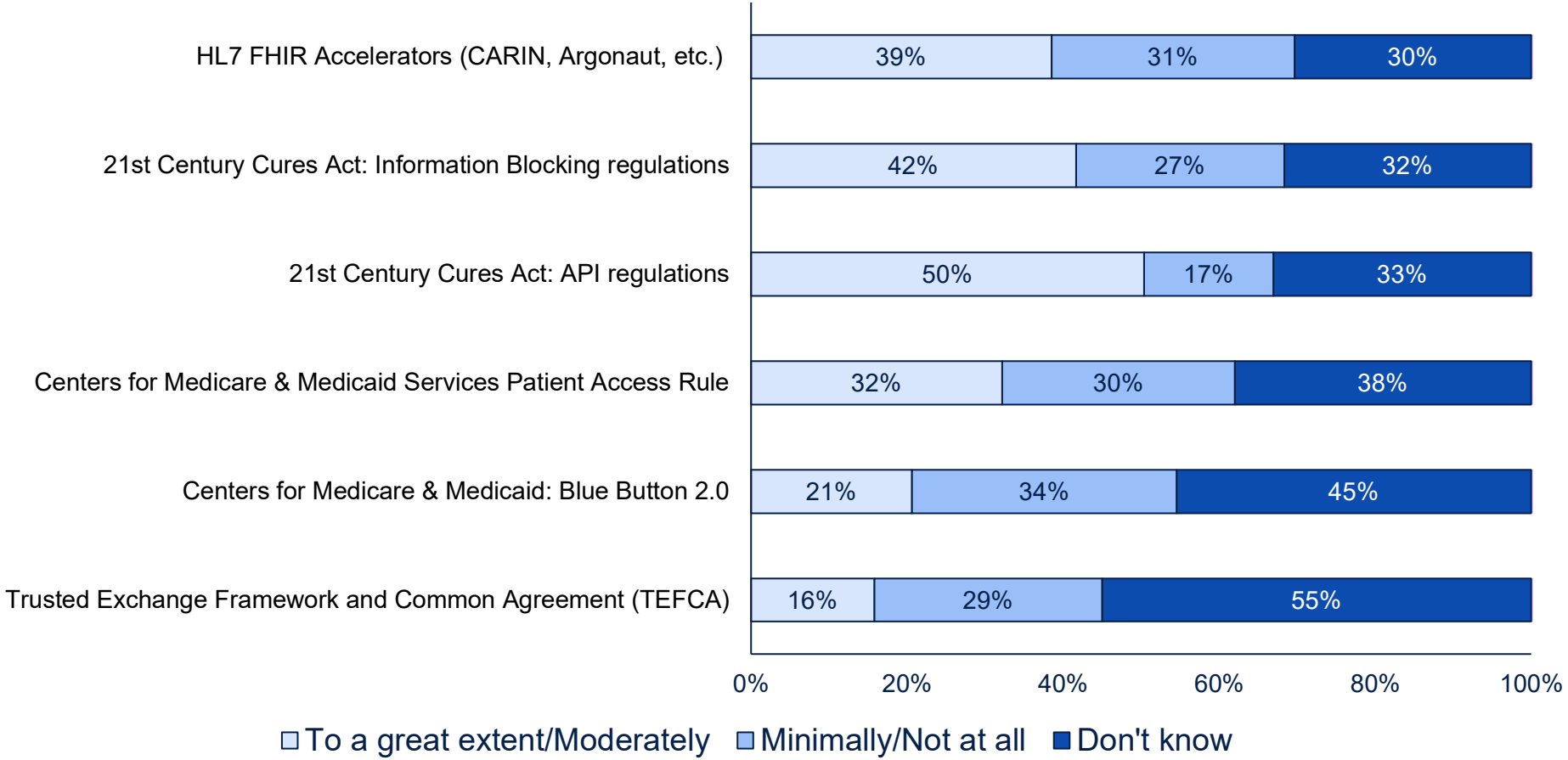
Barriers to EHR integration via APIs



Impact of federal policy

To what extent is each making it easier to use APIs to integrate with commercial EHRs or payers:



Key Insights

- **Many companies** are integrating with commercial EHRs **using both standards-based and proprietary APIs** (57%) **and non-API based integration approaches** (58%).
- **Broad use of FHIR**, particularly when integrating with multiple vendors. But only 61% of companies use extensively.
- **Wide array of barriers to using APIs**, with high fees as top barrier (47%).
- **Limited awareness of regulations** that will impact the industry.

Summary of Findings

	Hospitals	Patients	Developers	Marketplace
Rates of patient access via apps/API	86% of hospitals reported API-enabled patient access (69% use standards).	51% of individuals accessed their online medical record via app in 2022	46% of companies had “patient access” as a primary application domain	
Rates of health system / care delivery apps/APIs	82% of hospitals enable APIs to write to EHR, and 78% enable read of EHR data.		83% of companies had “care delivery” as a primary application domain	
Rates of standards use	Standards-based APIs used more frequently than non-standards based		74% of companies had standards-based API integrations in production	

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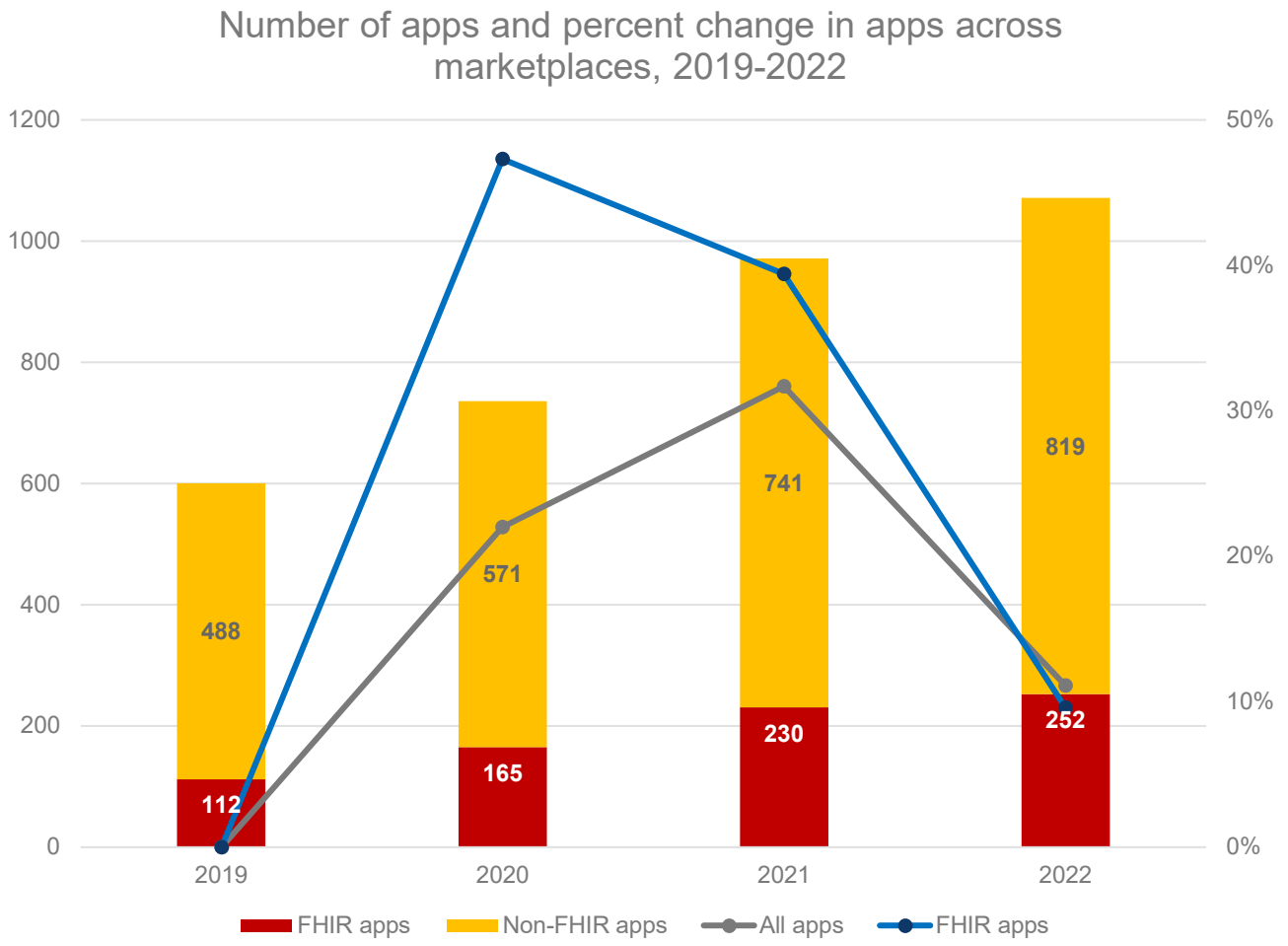
Changes in the App Marketplace

Wesley Barker, Branch Chief
Data Analysis Branch, Office of Technology, ONC

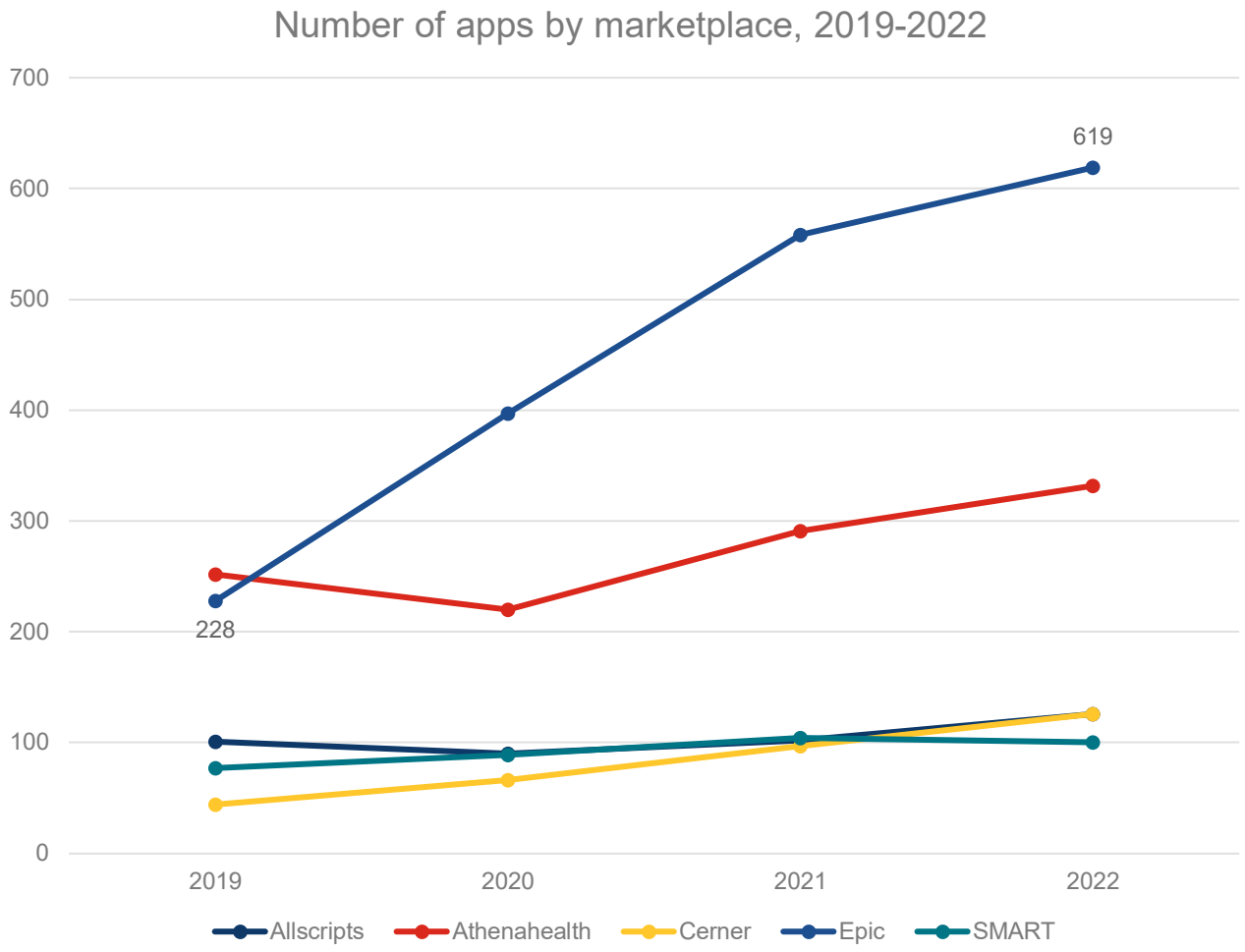
Changes in App and Software EHR Integrations, 2019-2022

- We analyzed the apps discoverable in the marketplaces for Allscripts, Athenahealth, Cerner, and Epic, and the SMART App Gallery from 2019 to 2022.
- From 2019 to 2022, the number of apps discovered from these data sources increased from 600 to 1071 (79%).
- The number of apps that described support for FHIR also increased from 112 in 2019 to 252 in 2022 – a 125% increase.
- Growth in new integrations slowed after 2021.



Changes in App and Software EHR Integrations, 2019-2022

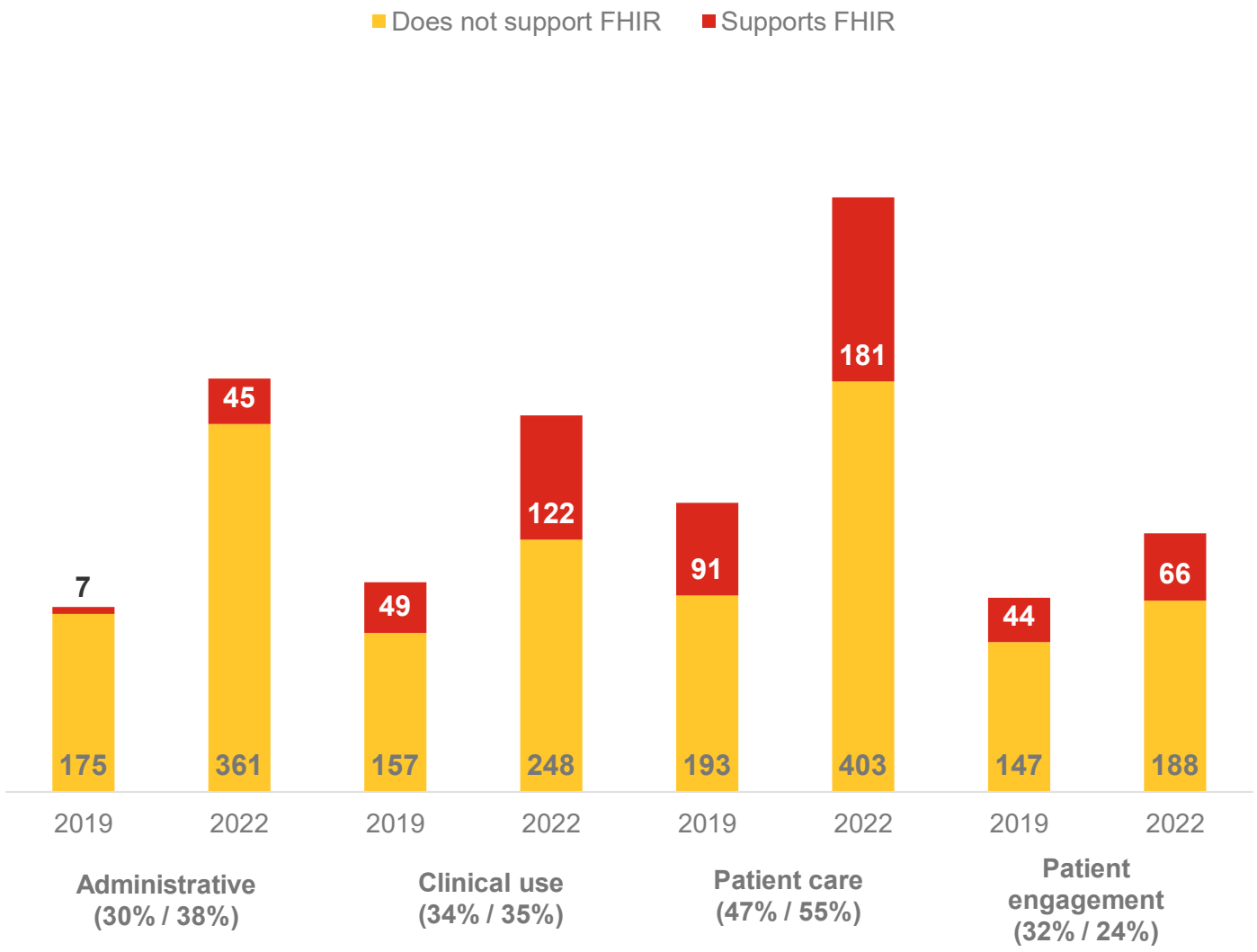
- Most of the increase in new apps was due to a nearly 170% increase in the number of apps in the Epic App Orchard (228 to 619 apps).
- Apps discovered in the Epic App Orchard represented over half of all apps in this study.



Sorting the apps into categories

- As part of the study, we sorted apps into **four** overarching non-mutually exclusive categories:
  - Administrative
    - Billing, scheduling, intake
  - Clinical use
    - Pop health, clinical decision support, analytics, research
  - Patient care
    - Telehealth, medication management, remote care, documentation, device integration
  - Patient engagement
    - Patient communications, patient experience, marketing, acquisition
- These categories are based on a text analysis of web data pulled from the individual app pages.

Changes in app types, 2019 - 2022



Note: (% = 2019 / % = 2022)

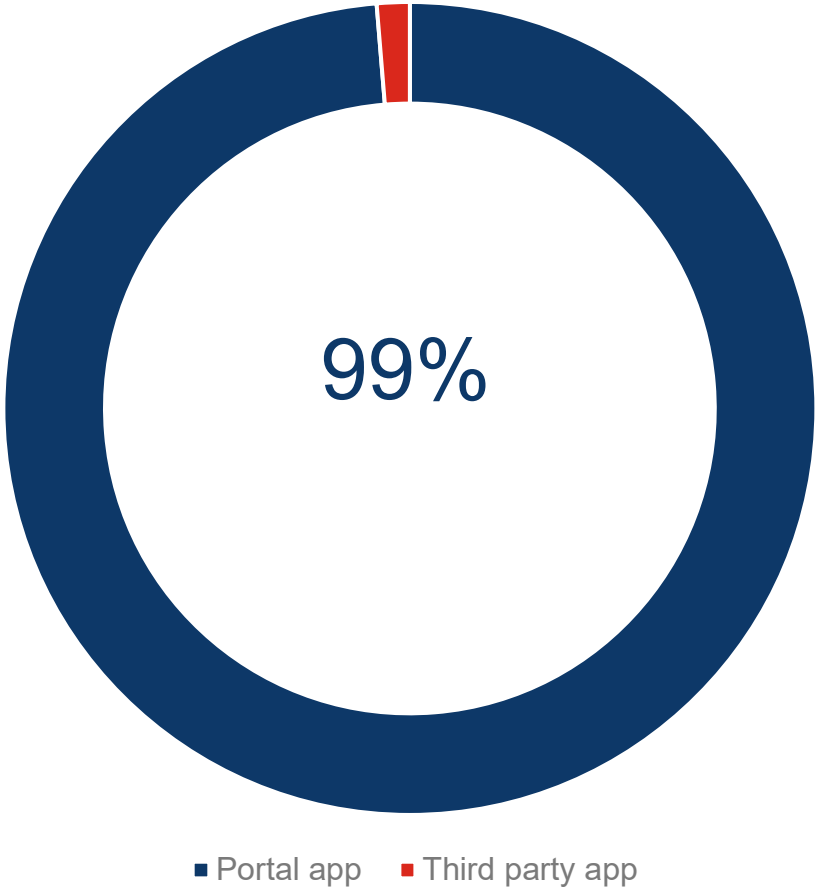
- In 2022, about 25% apps described support for FHIR. In 2019, about 18% did.
- The types of apps that described support for FHIR in 2022 differ.
  - Administrative apps: 10%
  - Clinical use: 33%
  - Patient care: 31%
  - Patient engagement: 26%
- Apps that described clinical use and/or patient care capabilities represented over 70% of all apps in 2022, a jump from 65% in 2019.
  - The jump in FHIR support among all apps is largely due to the increase in these types of apps that are more likely to describe support for the data standard.

Consumer Technology Choices for Health Information Access

- Another study we conducted uses data collected from the Apple App Store and Google Play store to study consumer choices for patient medical record access apps, including traditional patient portal apps available from leading EHRs and emerging apps enabled by standards-based application programming interfaces or APIs to connect to EHR data systems.

- Patient portal apps, including those developed by EHR developers, such as Epic, and health care providers and insurers, such as Kaiser Permanente, represent nearly all consumer choices for accessing their health information through a mobile app.

Percent of Google Play Store Installs by App Type, 2022



Consumer Technology Choices for Health Information Access

- We wrote a computer program to programmatically pull the data from the public Apple App Store and Google Play store websites. The data pulls were done in December 2019, December 2021, and December 2022. Data were pulled on 30 patient portal apps and 40 patient access (PHR) apps available on the Apple App Store and Google Play store in 2019, 2021, and 2022

- Underlying data pulled from the stores represent mobile technology user app installs, ratings, rankings, and reviews for these time periods. Metrics available from the two stores differ and not all are comparable across the two data sources.

- Third-party patient access apps, like CommonHealth and Apple Health, represent an emerging method for patients to access their health information, but their current use is low compared to portal apps. It should be noted that 1 third-party patient access app – CommonHealth – comprises 75% of all patient access app installs from the Google Play store.

Patient Portal and Third-party Patient Access App Use, 2019-2022

Year	App Type	Apple Store		Google Store	
		Top 100 ranking (#)	Review count	Installs	Review count
2019	Patient portal (n=30)	10	53,292	17,159,602	214,880
2021		14	292,724	35,973,460	361,017
2022		15	549,440	43,349,252	477,442
2019	Third party patient access*^ (n=40)	0	239	28,596	253
2021		1	745	454,381	2,276
2022		0	920	573,677	6,735

* In 2021, CommonHealth comprised 350,705 (77%) of total Google Store installs and 1,505 (66%) Google Store reviews. ^ In 2022, CommonHealth comprised 444,119 (77%) of total Google Store installs and 5,790 (86%) Google Store reviews.

Summary of Findings

	Hospitals	Patients	Developers	Marketplace
Rates of patient access via apps/API	86% of hospitals reported API-enabled patient access (69% use standards).	51% of individuals accessed their online medical record via app in 2022	46% of companies had “patient access” as a primary application domain	99% of apps installs are traditional patient portals
Rates of health system / care delivery apps/APIs	82% of hospitals enable APIs to write to EHR, and 78% enable read of EHR data.		83% of companies had “care delivery” as a primary application domain	70% of apps in EHR marketplaces are for clinical use
Rates of standards use	Standards-based APIs used more frequently than non-standards based		74% of companies had standards-based API integrations in production	About 1 in 4 apps described support for FHIR.

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Wrapping Up

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ONC and the App Ecosystem

- ONC has supported the adoption of standards by developers of certified health IT
- Goal to enable an app ecosystem that
  - Ensures health care providers, public health agencies, and other health care entities can access and use patient data in new ways to manage their patients' health and care
  - Helps patients more easily connect to different sources of their own health data, enabling aggregation into a singular view or use different apps to understand their health
- Certification criterion includes adherence to FHIR r4 in certified products as of Dec 31, 2022.
- Presented four different 'cuts' on the current state of the App Ecosystem

Patient Access Through Apps

- About half of patients accessed their EHR using an App
- The vast majority of hospitals (and their health system) enabled apps through an API
  - Almost 70% through a standard
- About half of developers are focused on patient uses
- But, almost all app installs are of patient portals
- Conclusion:
  - Many patients are accessing their records using an App, almost always through the portal app.
  - Hospitals are ready for other apps, and developers are creating them, but uptake seems low.

Clinician / Health System Apps

- About 80% of hospitals enable read / write, most commonly through standards-based APIs
- 70% of EHR Marketplace apps are for clinical use or patient care
- 83% of companies had “care delivery” as a primary application domain for their APIs

- Conclusions:
  - Healthcare providers are enabling apps, and many apps are available through the EHR marketplace.
  - Apps are maturing, with numerous developers with varied active integrations
  - More apps are coming and most developers are focused on care delivery

Change over time

- Rapid increase in patient portal use from 2020 to 2022 (45% to 68%) and app use specifically
- Number of apps on EHR Marketplace grew rapidly 2019-2022, but growth is slowing
- Substantial increases in hospitals enabling apps through standards-based APIs from 2021 to 2022

- Conclusion:
  - Increasing centrality of digital health for patients: Rapid increase in use of portals during/following pandemic coupled with widespread support for APIs by hospitals
  - Does slowing growth in app marketplace represent maturation, market consolidation or declining interest?

Tensions

- More app developers report using proprietary APIs (68%) compared to hospital support for proprietary APIs (35%)
  - May be that apps using proprietary APIs achieve smaller scale
  - Proprietary APIs may better support specific use cases
- Widespread support for patient engagement among hospitals compared with very low installation of non-portal apps
  - May be limited uptake and use of APIs even when enabled
  - Continued development of value from patient generated health data may change this landscape
- Epic marketplace includes far more apps than other developers of health IT (>600 compared to ~120 on Cerner's marketplace) but App developers say they enable integration at more similar rates (82% Epic compared to 60% Cerner).
  - Marketplace may be more central to some health IT developer's app support than other

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Summary of Findings

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Rates of health system / care delivery apps/APIs	Hospitals use clinician APIs to enable apps to write to EHR (82%), read EHR data (78%), read non-EHR data (54%). 4 in 10 enable all 3.		83% of companies had “care delivery” as a primary application domain for their APIs	70% of apps in EHR marketplaces are for clinical use.
Rates of standards use	Standards-based APIs used more frequently than non-standards based to enable app functionalities		74% of companies had standards-based API integrations in production	About 1 in 4 apps described support for FHIR.
Rates of PGD	61% of hospitals reported API-enabled PGD submission (45% standards-based).	About 1 in 5 individuals shared health information from an electronic monitoring device or smartphone with a health care provider in 2022		
Rates of Write (create/update)	82% of hospitals reported API-enabled write to the EHR functionality in apps (49% standards-based)		24% of companies used write extensively and 47% used it in a limited way	
Change over time	Substantial and significant year-over-year increase in patient access w/ FHIR API (regardless of hospital or IT characteristics)	The share of individuals who reported accessing their patient portal increased significantly in the past few years from 45% in 2019 and 2020 to 68% in 2022.		Portal installs increased 150%. Apps integrated with EHRs nearly doubled.
Concentration in market leading developers	Hospitals using top 3 EHRs more frequently reported use of APIs to enable apps to read EHR and non-EHR data and write to the EHR, as well as enable PGD submission and patient access (using FHIR, specifically).		82% of companies were integrating (in production or underway) with Epic, followed by Cerner (60%) and athenahealth (50%)	Nearly 60% of apps are in Epic App Orchard.
Non-Portal Apps		In 2022, only 5% of individuals with multiple records used an app to combine information from different patient portals or online medical records into one place		~1% of Google app installs are PHR apps.