

Innovation at Cleveland Clinic

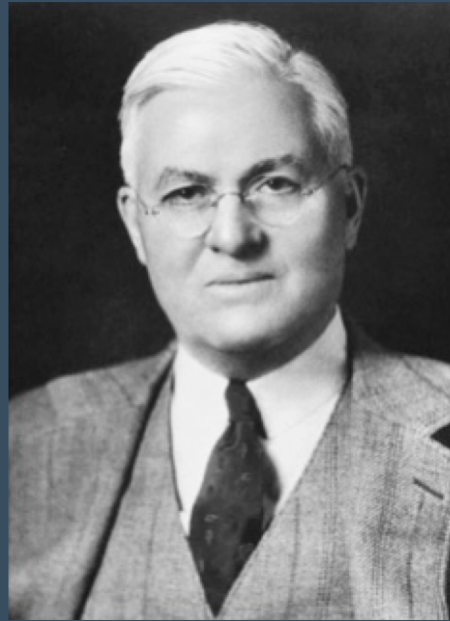
Pete O'Neill

Executive Director, Innovations

Founders - 1921



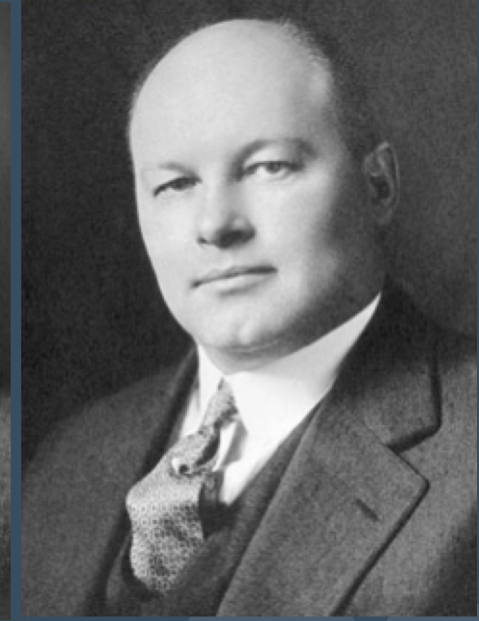
Dr. Frank E. Bunts



Dr. George W. Crile



Dr. William E. Lower



Dr. John Phillips

Cleveland Clinic



- **Physician Led / Patients First**
- **Not for profit**
- **Group Practice**
- **Salaried**
- **Research/Education**
- **Innovation**

Organization of Care Delivery

PROFESSION
ORIENTED

Division of Surgery



PATIENT
ORIENTED

Heart & Vascular
Institute



Cleveland Clinic: Cleveland

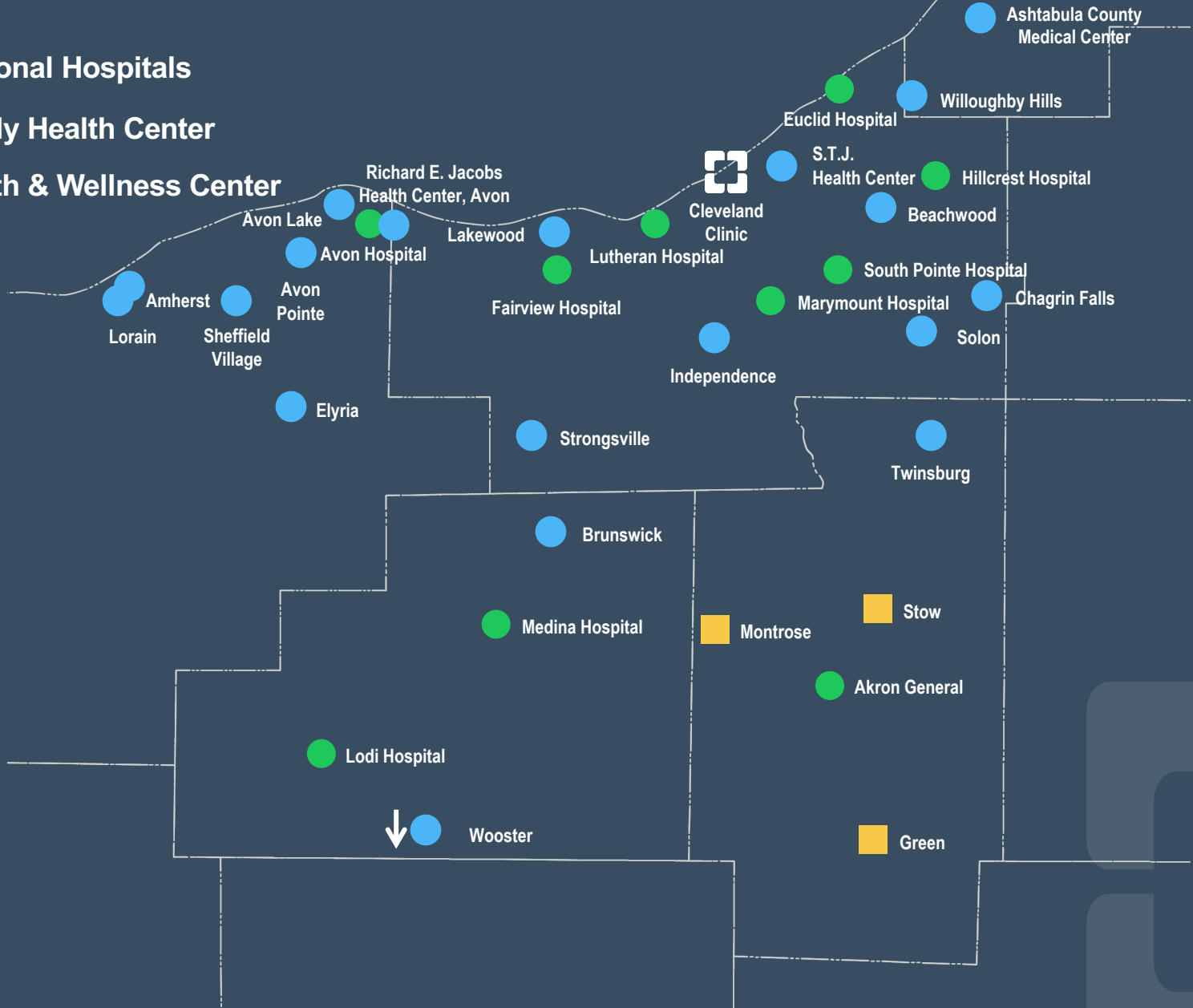


167 Acres of land 12M sq feet space

● Regional Hospitals

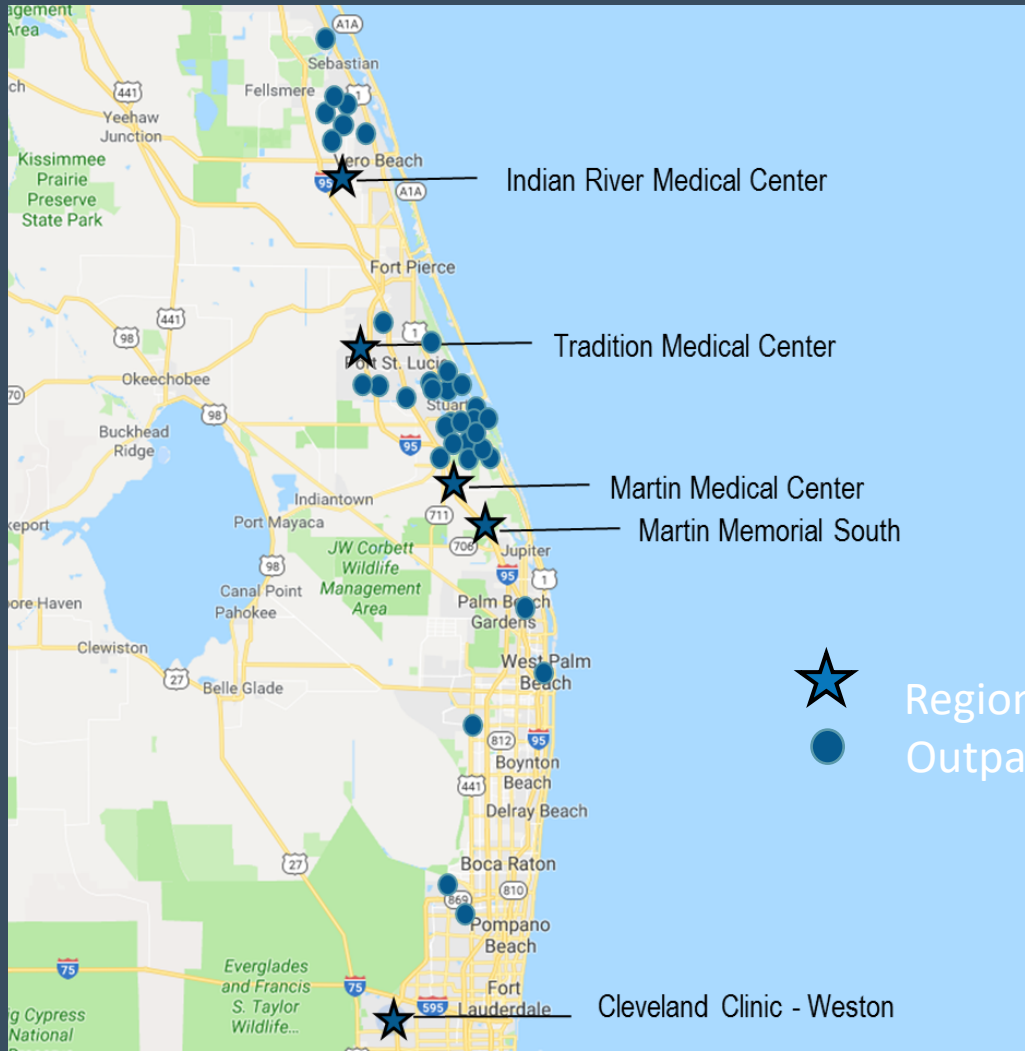
● Family Health Center

■ Health & Wellness Center



Cleveland Clinic Florida





★ Regional Hospital
● Outpatient Center



Cleveland Clinic Lou Ruvo Center for Brain Health



Cleveland Clinic Abu Dhabi





Cleveland Clinic London Opens 2021

GROSVENOR
PLACE SW1

Culture of Innovation at Cleveland Clinic

- 1958 First coronary angiography
- 1967 Development & refinement of coronary bypass surgery
- 1996 First minimally invasive aortic heart valve surgery
- 1998 First successful larynx transplant
- 2007 First kidney surgery performed through the navel
- 2008 Nation's first near-total face transplant
- 2011 Nation's first transcatheter valve replacement and repair
- 2011 Discovery that adult brain neurons can regenerate
- 2012 Demonstration that bariatric surgery controls diabetes
- 2013 Discovery that an intestinal bacteria product (TMAO) can predict heart disease
- 2015 First fMRI-guided deep-brain stimulation
- 2016 First liver transplant using normothermic organ preservation
- 2017 First AR assisted face transplant



Translate the inventions and insights
of our caregivers into commercial
products for the benefit of patients
everywhere



Inventions



IDEA SUBMISSION - Submission of Invention Disclosure Form and reply from CCI providing Innovation Manager contact (Duration: 4 days)

NEED ASSESSMENT - Initial evaluation of commercial opportunities based on unmet needs, return on investment, IP, and technical feasibility (Duration: 4 weeks)

VIABILITY ASSESSMENT - Prepare business case analysis validating clinical need and identifying market opportunities, IP, and regulatory path (Duration: 12 weeks)

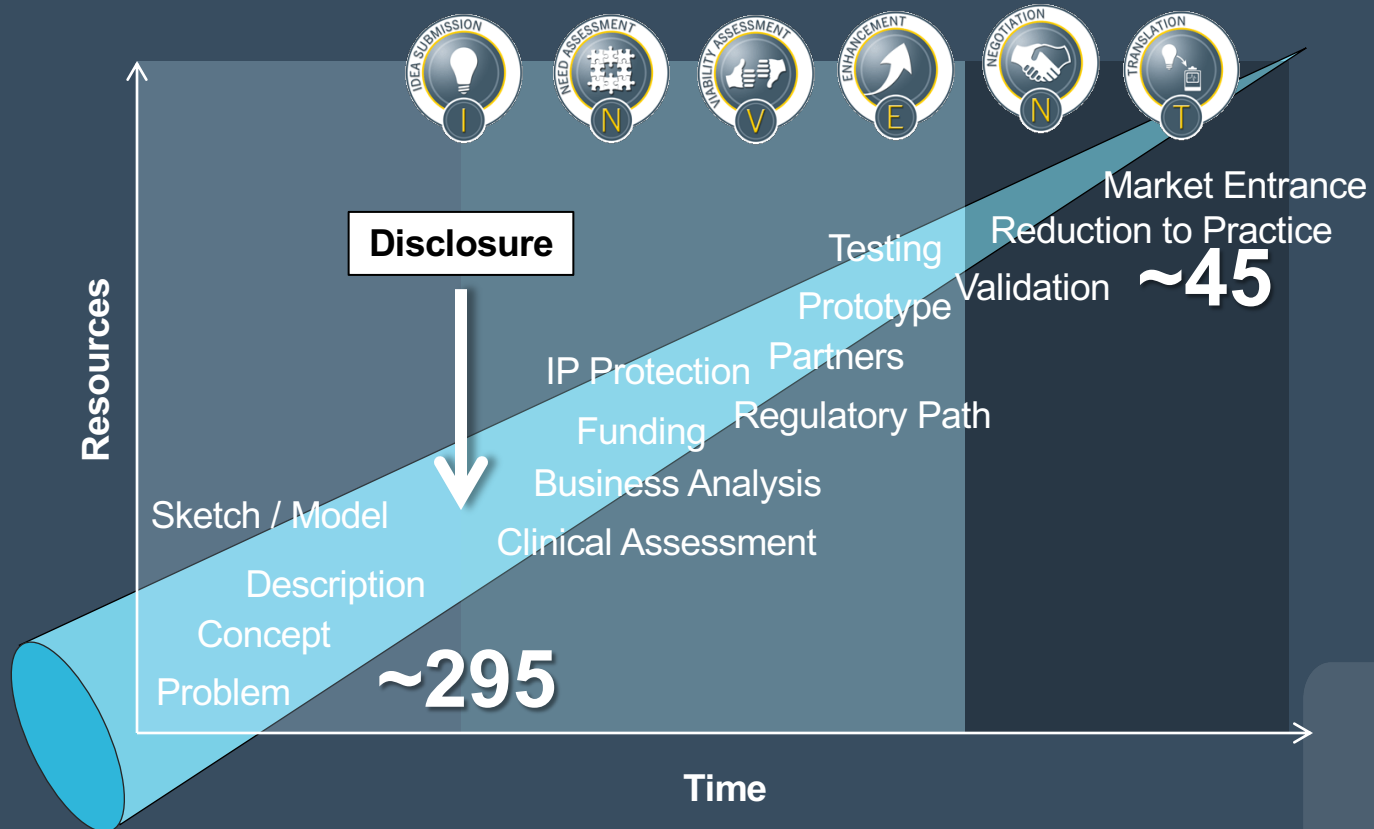
ENHANCEMENT – Create development plan for proof of concept, optimization of IP, marketing and licensing strategies, valuation analysis and identify partners

NEGOTIATION - Enter into discussions with commercial partners regarding license deal terms

TRANSLATION - Finalize deal terms, execute agreement and ensure commercial obligations are met

Find information at: <http://portals.ccf.org/innovations/>

Invention Journey



Technologies

Medical Devices

50%

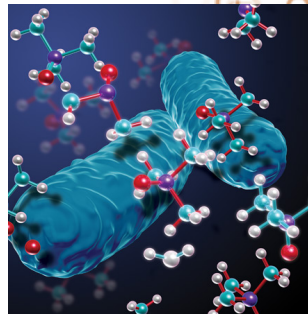
AtriClip



Therapeutics & Diagnostics

22%

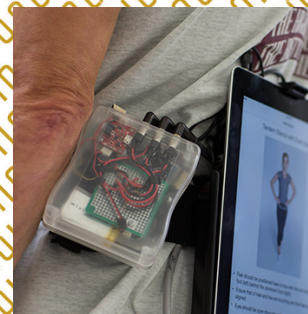
TMAO Targeting



Health IT

23%

C3 Concussion App



Delivery Solutions

5%

Communicate with H.E.A.R.T.



CC Innovations Scorecard

Established in 2000

50+ staff members

625+ Licenses

85 Spin-off Companies

23 Monetized Spin-offs
\$168M+ in State Grants



**\$1.3B+ in
Follow-on Equity
Investment**

4200+ Patent Applications

1,600+ Issued Patents

2,200+ Jobs Created

**\$92M+
Returned to
Inventors**

Industry Experience

50+ Staff Members, 450+ Years Combined



Advisory Groups

- Clinical focus: Peer Review Committees:
 - 13 Clinically focused groups with 80+ expert participants
 - All CCF Employees
 - Facilitates confidentiality
- Market focus: Advisory Councils
 - 3 technology domains; Device, Life Science, HIT
 - Includes internal and external
 - Clinical experts
 - Venture investors
 - Strategic partners



Global Partner Network



Insights

- Identify needs for CCF
 - Often similar needs for broader healthcare market
- Target solutions to improve patient care
 - Plug & Play example of tool to identify possible solutions
- Why?:
 - Expand commercialization pipeline beyond CCF inventions
 - Faster to help CCF and to market
 - Work on projects with best market potential
- Examples



Spin-off Companies

- Pathway criteria:
 - Appetite for Risk
 - Market opportunity
 - Technology valuation
 - Stage of technology
 - Product vs. Platform
 - Capital availability
 - Inventor entrepreneurship
 - Management recruitment
- CCV



Explorys Case Study

- Explorys, Cleveland Clinic spin-off 2009
- Grew to >200 jobs
- IBM acquired Explorys in 2015
- Strengthened existing partnership with Cleveland Clinic
 - Building @ 105 & Cedar
 - Adding jobs to Cleveland location
 - New partnership agreements between IBM-CCF



“Caring for Every Life through Innovation”

2019
SAVE
THE
DATE

October 21–23

Register today to reserve your seat to be at the front lines of this changing landscape.

summit.clevelandclinic.org

CONNECT. STRATEGIZE. DISCOVER. IGNITE.



Innovation Themes

- CULTURE OF INNOVATION IMPORTANT FROM TOP
 - CCF: CEO and many Institute and Department Chairs are personally very innovative
 - Innovative people are promoted into leadership roles



Innovation Themes

- INVEST IN RESOURCES TO ENABLE EXECUTION
 - CCF: Innovations >50 full-time staff, with significant resources for patents and prototyping
 - Need to have long term view of returns on this investment



Innovation Themes

- COMMERCIALIZATION IS NOT RESEARCH
 - CCF: Innovations reports to Chief Business Development Officer



Innovation Themes

- ATTRACT, MOTIVATE, RETAIN; ENTREPRENEUR BEHAVIOR
 - CCF: Inventors and Innovations Team participate in commercialization revenue



Innovation Themes

- THE MARKET IS ALWAYS RIGHT
 - CCF: Advisory groups of clinical, investment, and strategic partners with experts to access market perspectives



Innovation Themes

- COLLABORATION IS ESSENTIAL
 - CCF:
 - Focus where we are expert
 - Partner with other world-class experts
 - Build an ecosystem



Innovation Themes

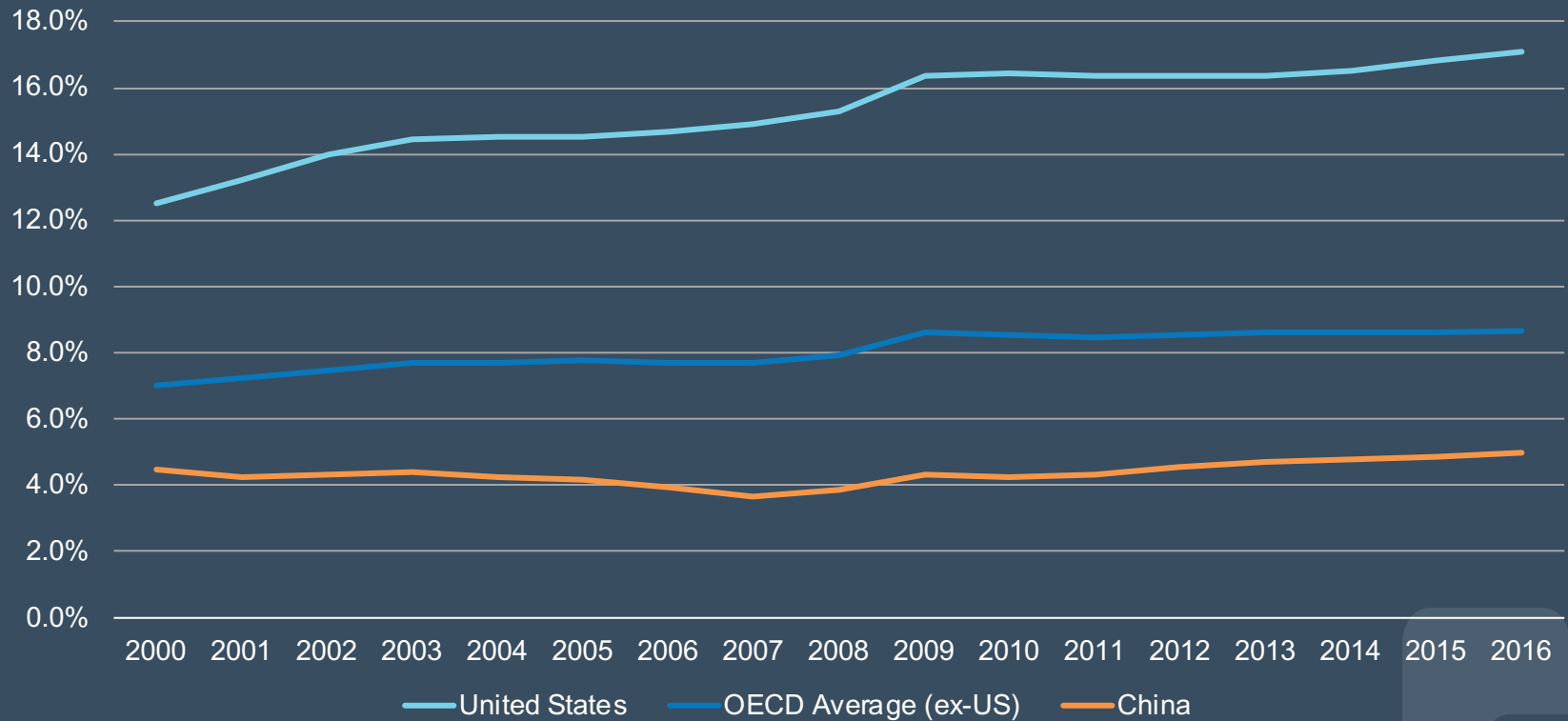
- NEED TO BE COMFORTABLE WITH RISK/DISRUPTION
 - If you don't have failures, you aren't pushing boundaries of innovation



USA Healthcare Market Trends



Healthcare Expenditure as % of GDP



Source: World Health Organization, OECD

“Health” of the US Population



71% of the nation’s health care spending is for patients with multiple chronic conditions



Nearly 40% of American adults are obese

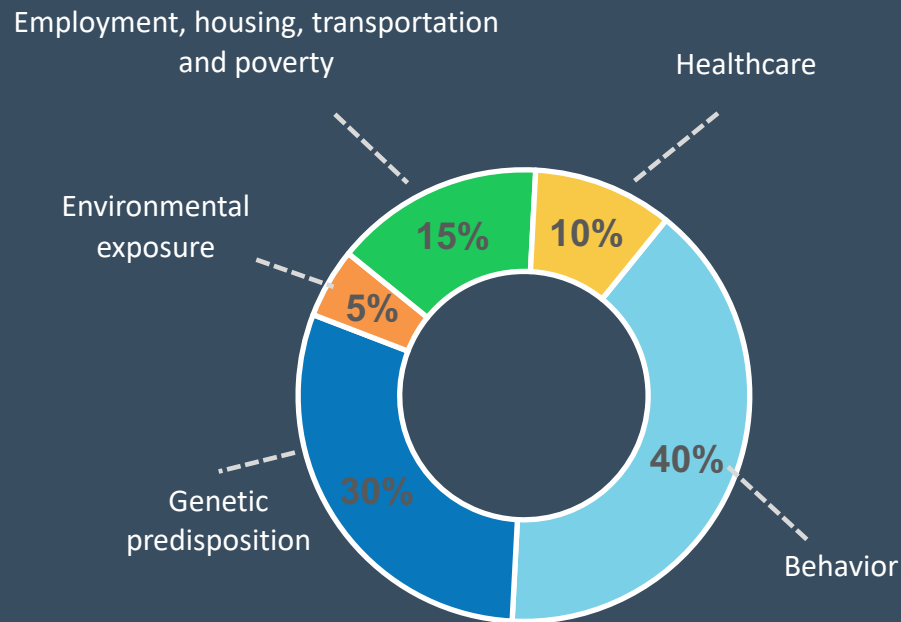


One in five adults in the U.S. - 43.8 million, or 18.5% experiences mental illness in a given year.



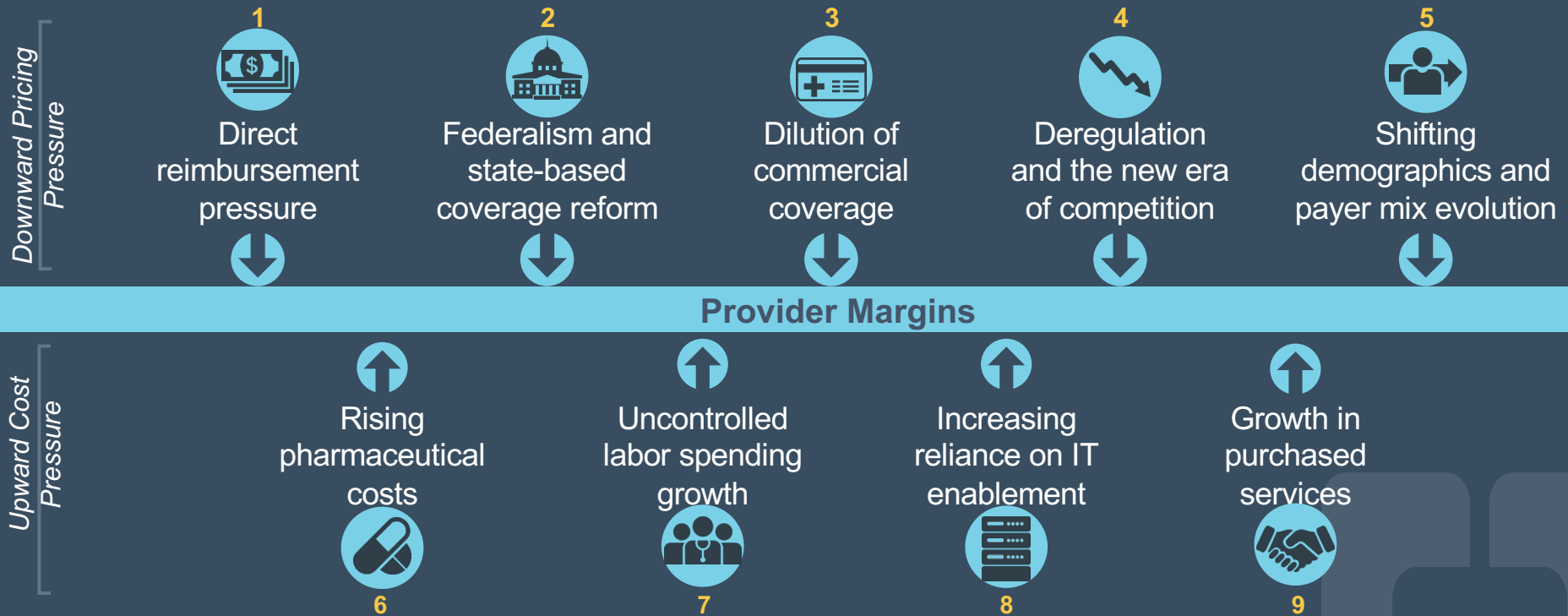
54.9 million Americans will have diabetes by the year 2030, costing the economy \$622 billion in care

Social Determinants of Health



Source: Top health industry issues of 2017: A year of uncertainty and opportunity," PWC's Health Research Institute, Dec 2016; "Datagraphic — Health Equity," Health Affairs, June 2017; Cost of community violence to hospitals and health systems," Milliman Research Report, July 26, 2017

Nine Price and Cost Pressures Squeezing Margins



Source: Health Care Advisory Board interviews and analysis.

Value-Based Care: New Paradigm

Recent Headlines

Value-based contracts key to solving U.S. drug pricing 'crisis'

Value-based drug contracting shifts risk to manufacturers

UK On Cusp Of Value-Based Procurement With NHS Future Operating Model Going Live

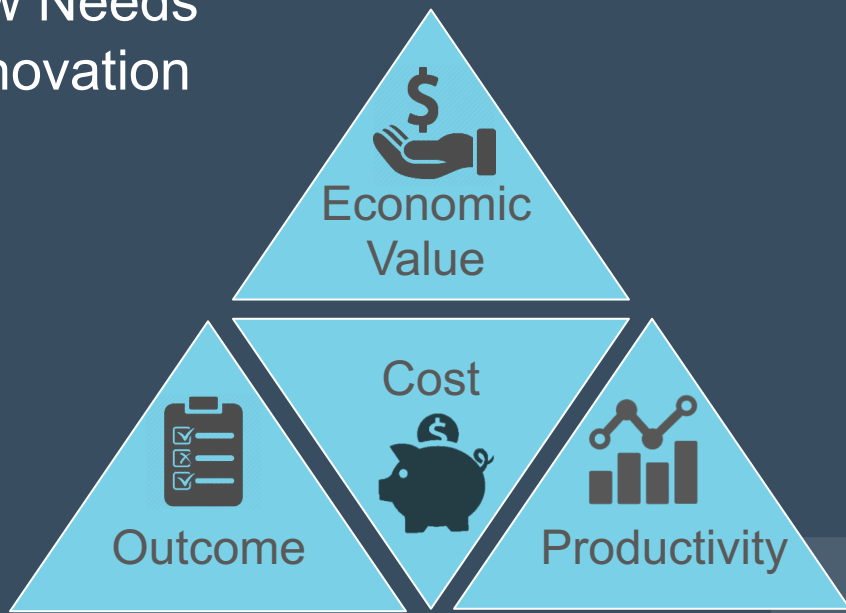
Could outcomes-based reimbursement work for medical devices?

GE, Medtronic among those linking with hospitals for value-based care

Manufacturers are putting their money where their mouth is — tying payment to real outcomes.

New Paradigm For Healthcare Innovation Ecosystem

New Economics Drive New Needs
New Needs Drive New Innovation



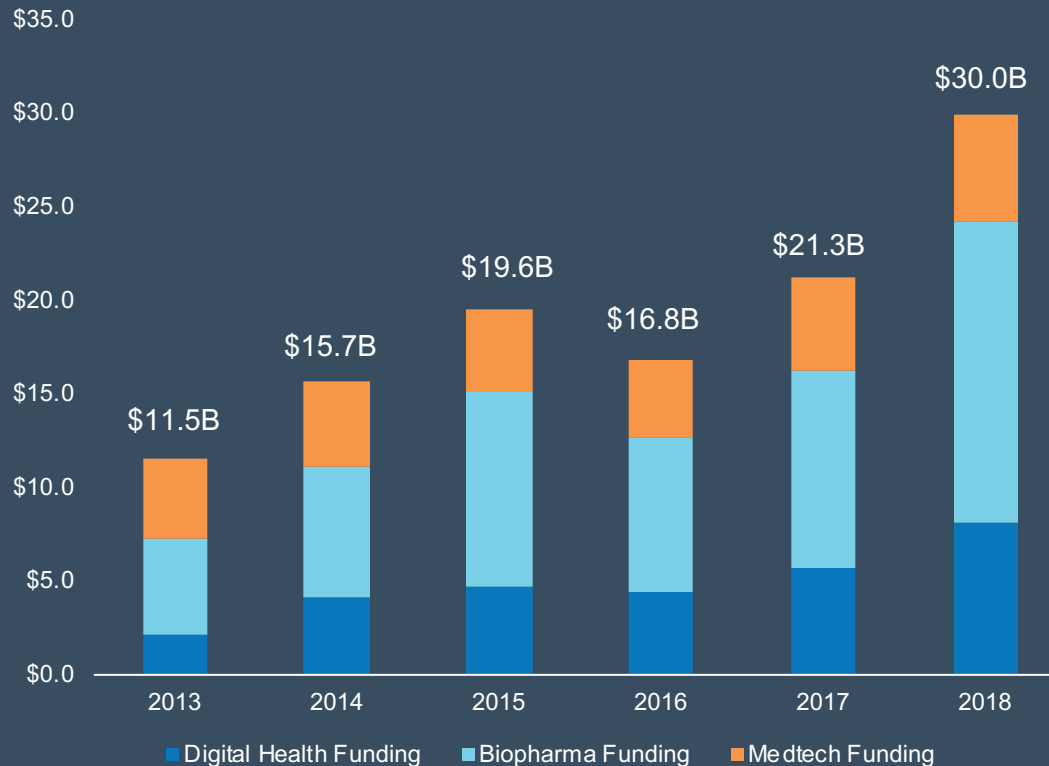
Commercialization Trend: Users Want New Technologies “De-Risked”

- Over the past 10+ years preference has shifted towards new technologies being thoroughly vetted before potential acquirers become interested
- Increasingly, companies want to see more development and demonstration of new technologies value proposition before getting involved
- This has increased the risk to startups by requiring additional validation (and money) in order to demonstrate value



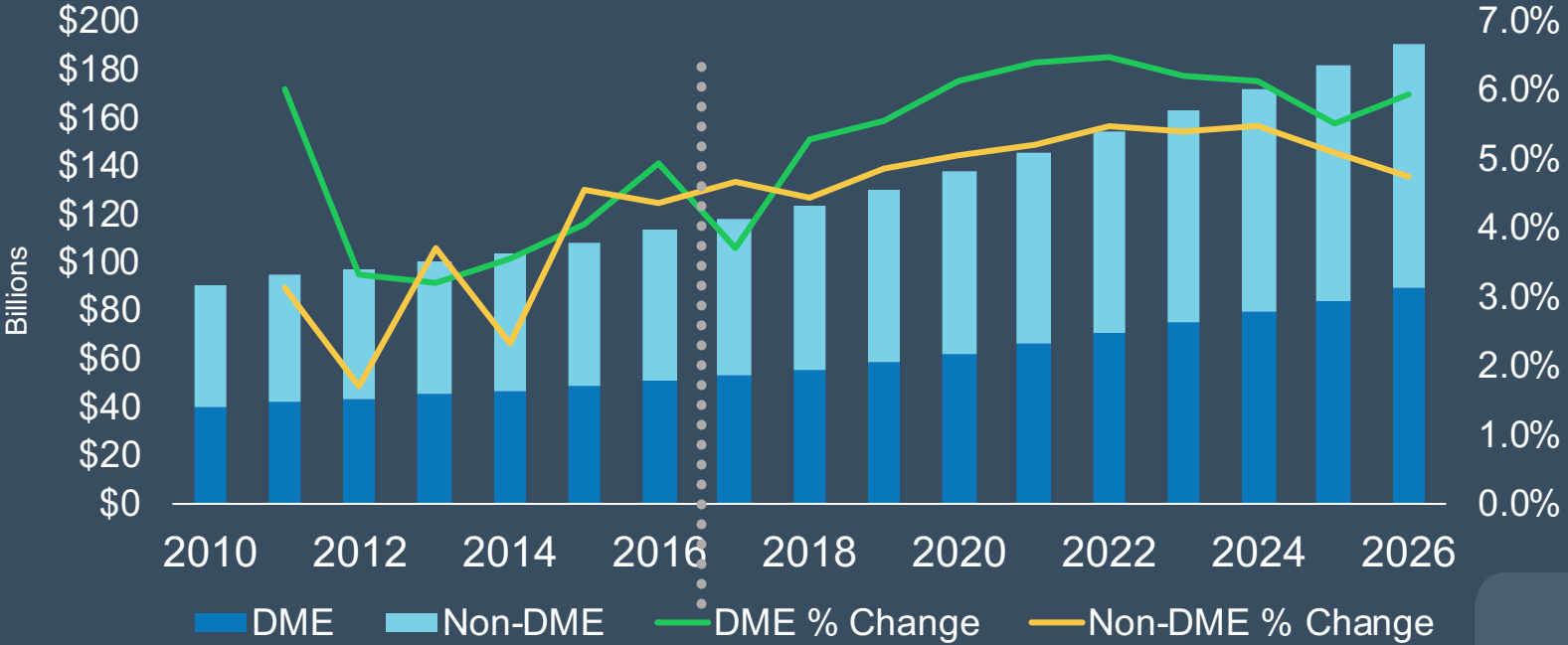
Record Setting U.S. HC Investments in 2018

HC VC \$ Fundraised (\$ BILLIONS)



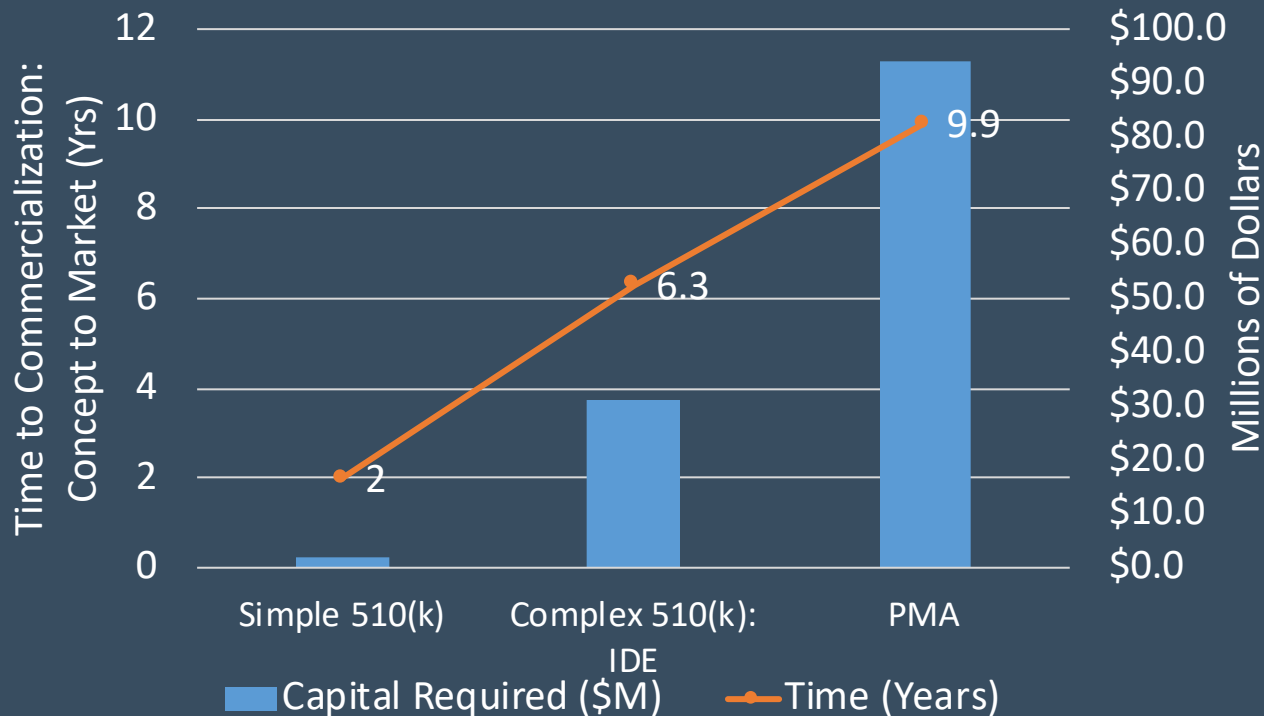
Source: PitchBook & Silicon Valley Bank, Rock Health, Evaluate MedTech

Medical Device Expenditure Trend



Source: Centers for Medicare & Medicaid Services, Office of the Actuary, National Health Statistics Group

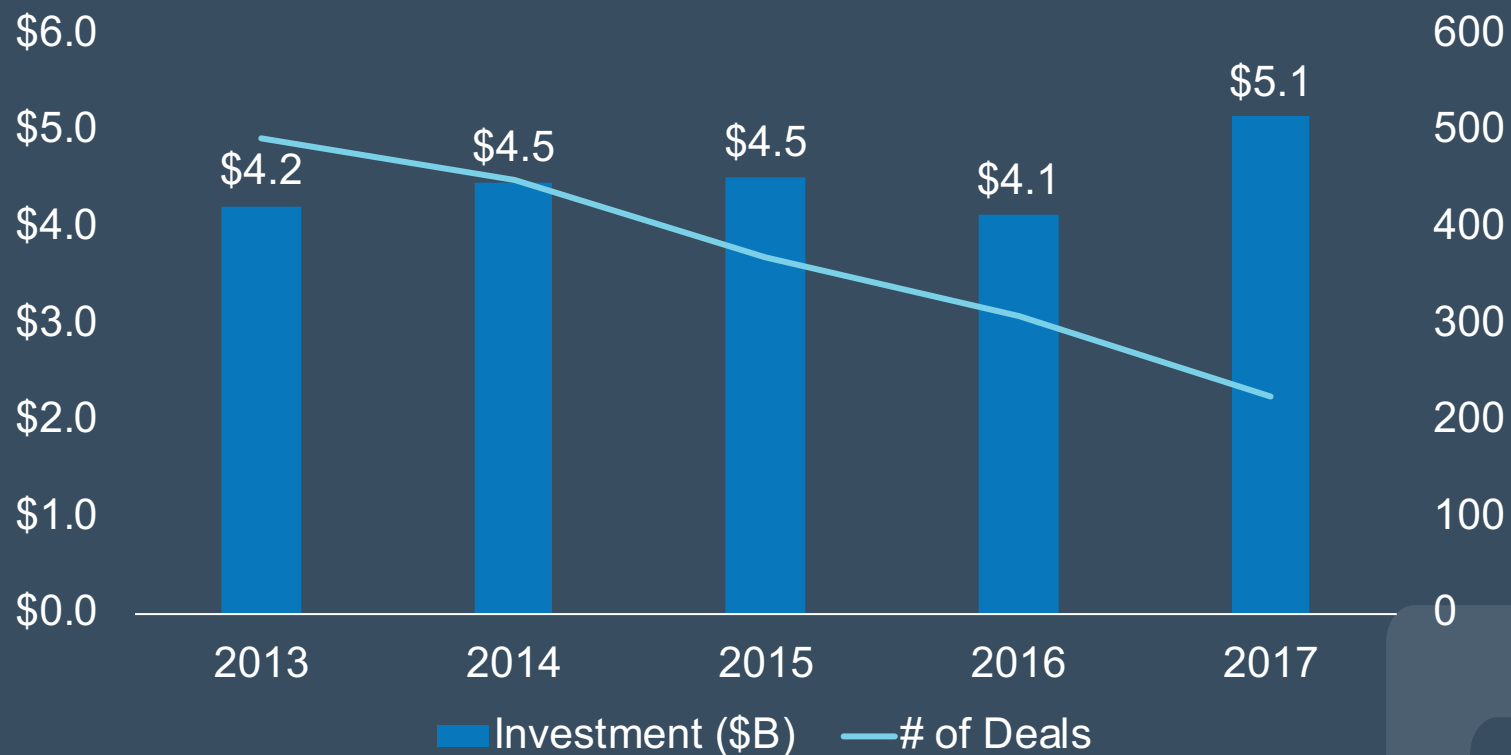
Medical Device Regulatory Pathways



Source: Makower et al, 2010



















Medical Device VC Activity

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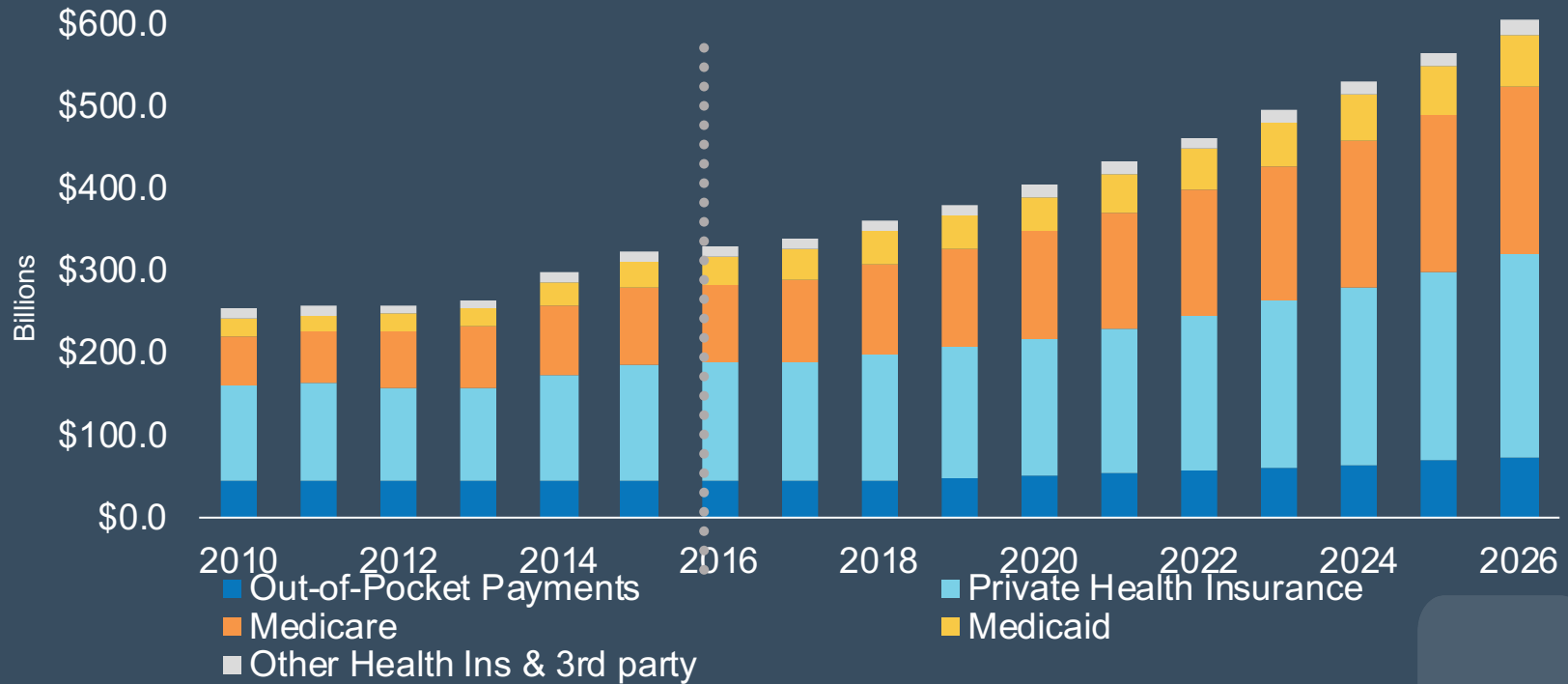
Source: Evaluate February 2018 Report

Medical Device: Era of Mega Medtech M&A

Acquirer	Acquired	Deal Value (\$B)	Business
 BD		24.0	Diversified medtech
 Abbott		25.0	Cardiovascular devices
		17.1	Infusion pumps, Rx
		13.8	Filtration and purification
	 <small>The Dental Company</small>	13.3	Dental devices
		47.5	Surgical supplies
		13.4	Orthopedic devices
 BD		11.8	Patient safety products
		21.3	Orthopedic devices

Source: Informa/Strategic Transactions

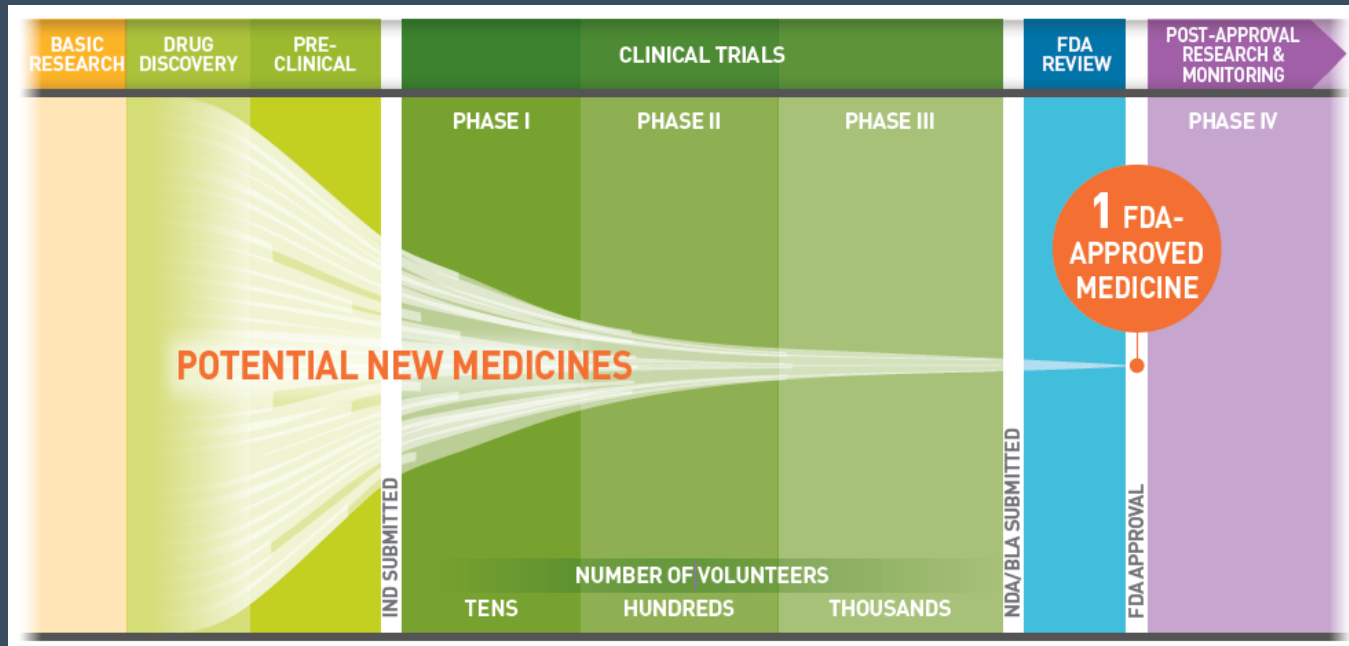
Prescription Drug Expenditure Trend



Source: Centers for Medicare & Medicaid Services, Office of the Actuary, National Health Statistics Group

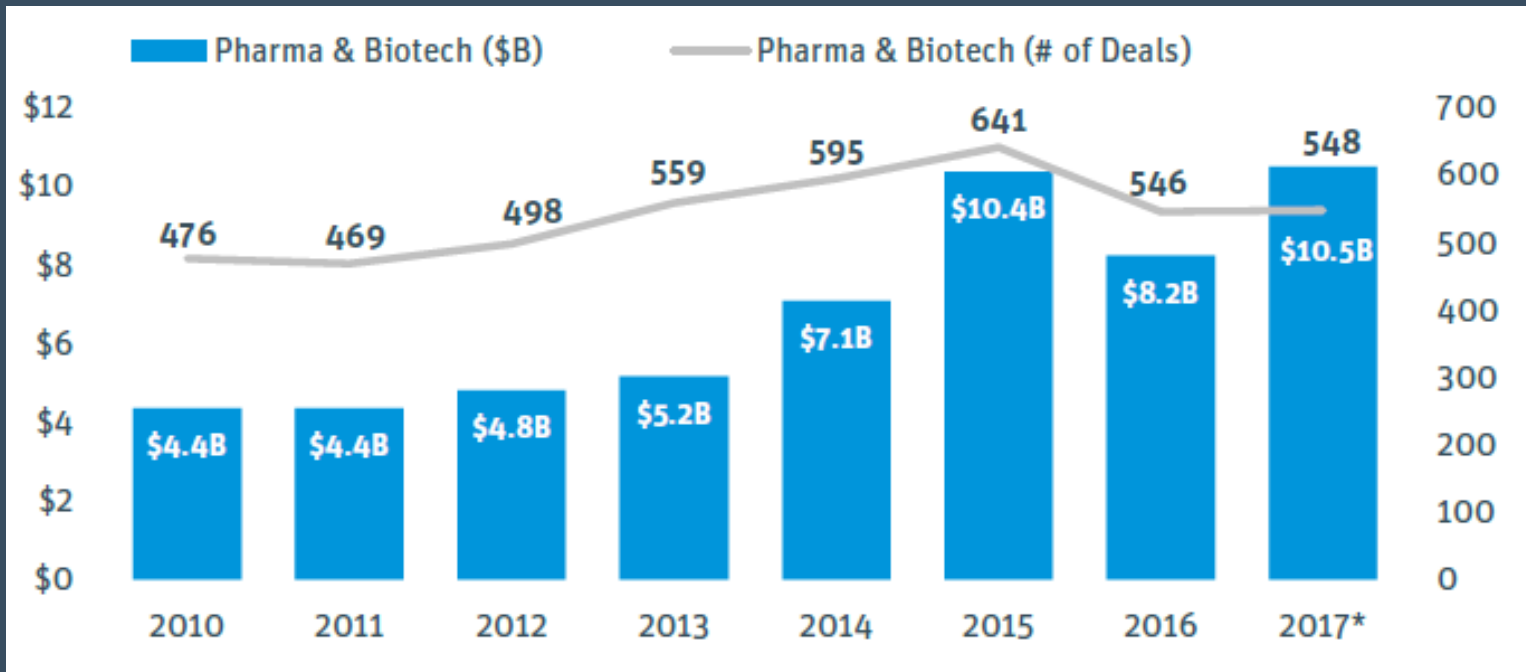
"Other Health Ins & 3rd Party includes worksite health care, other private revenues, Indian Health Service, workers' compensation, general assistance, maternal and child health, vocational rehabilitation, other federal programs, Substance Abuse and Mental Health Services Administration, other state and local programs, and school health.

Biopharma R&D Process



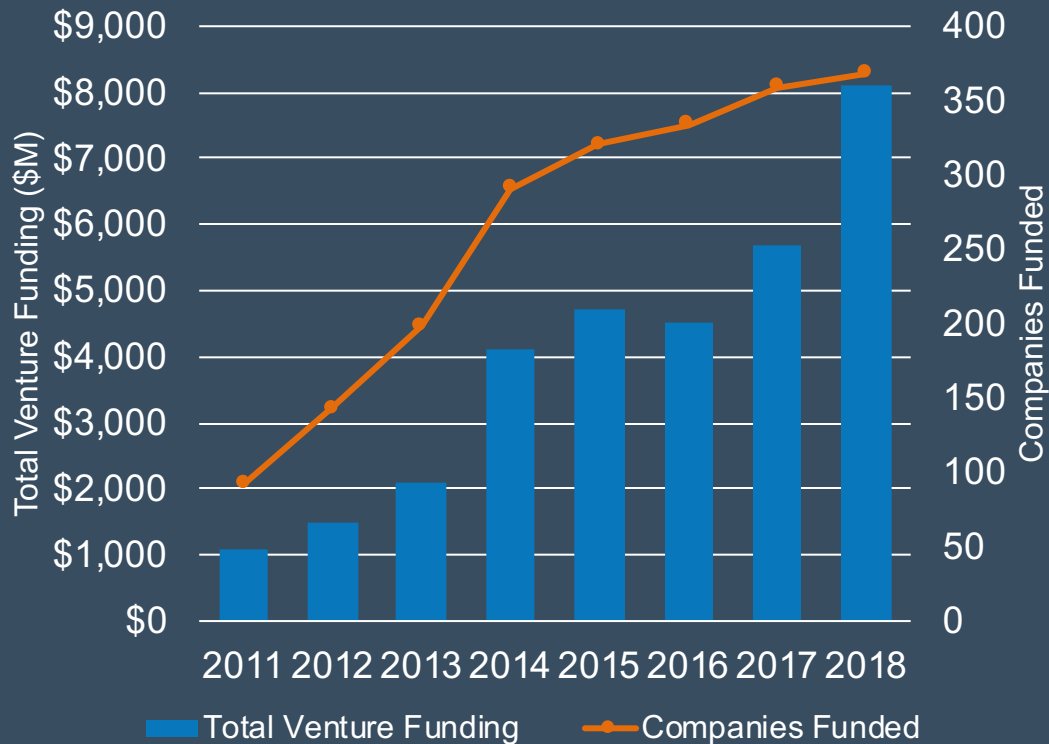
Source: PhRMA

Biopharma VC Activity



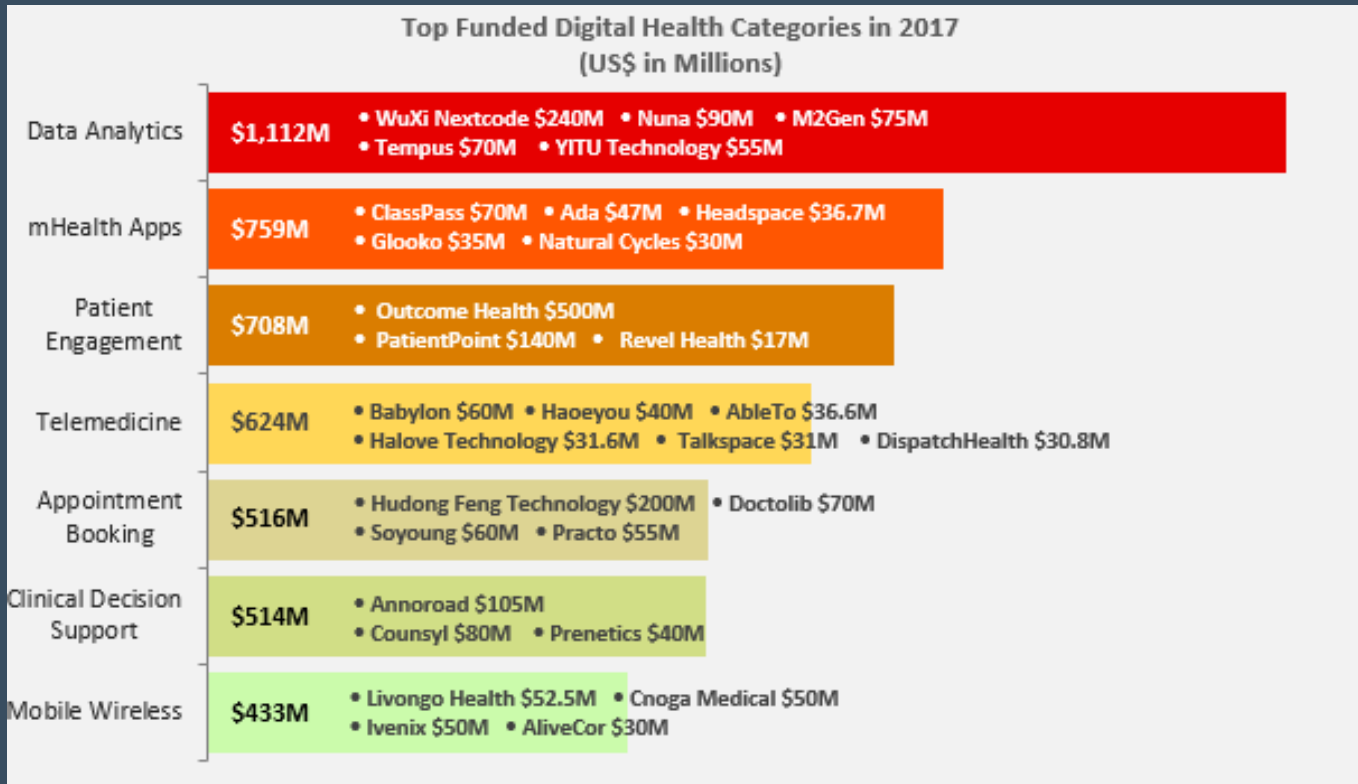
Source: PitchBook; Silicon Valley Bank proprietary data

Digital Health VC Funding Trend



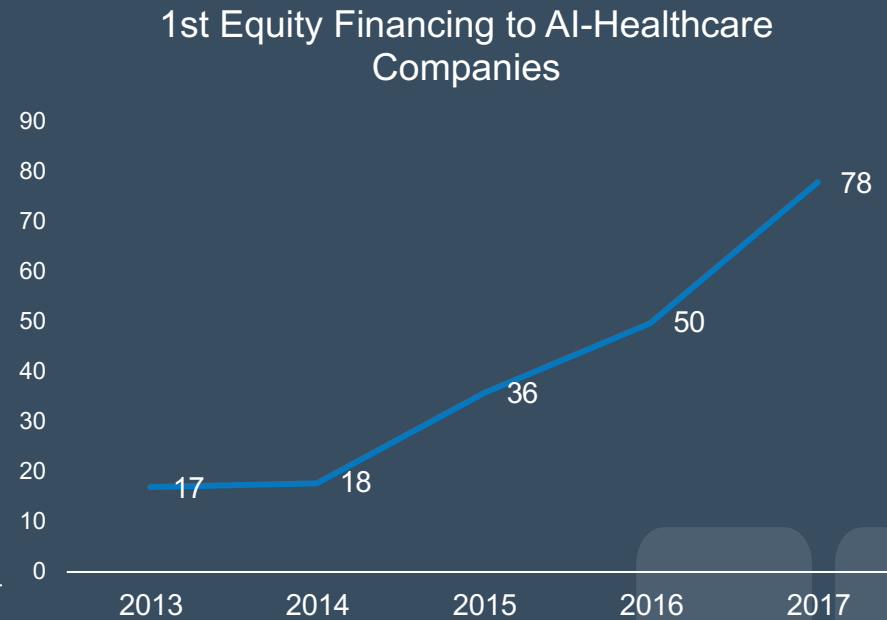
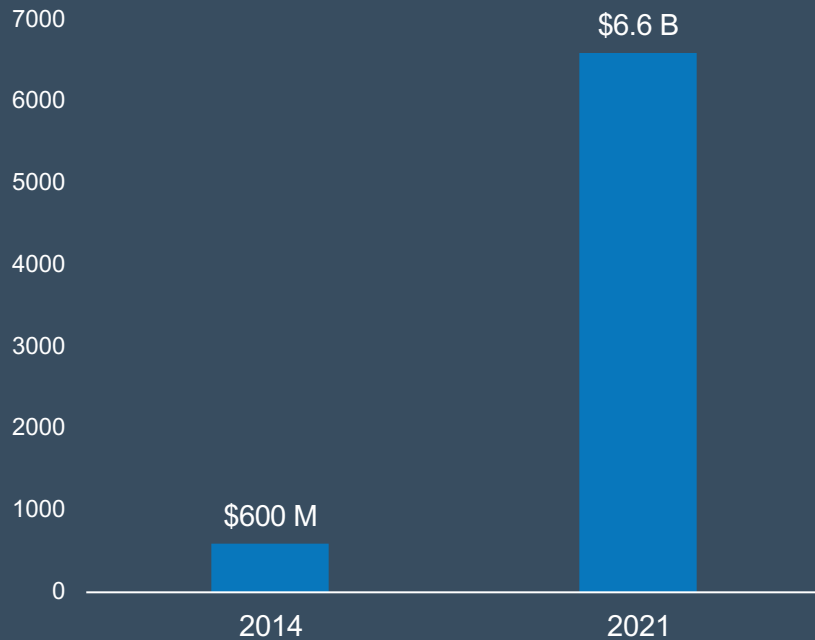
Source: Rock Health; Note: Excludes deals <\$2M

Top-Funded Digital Health Categories



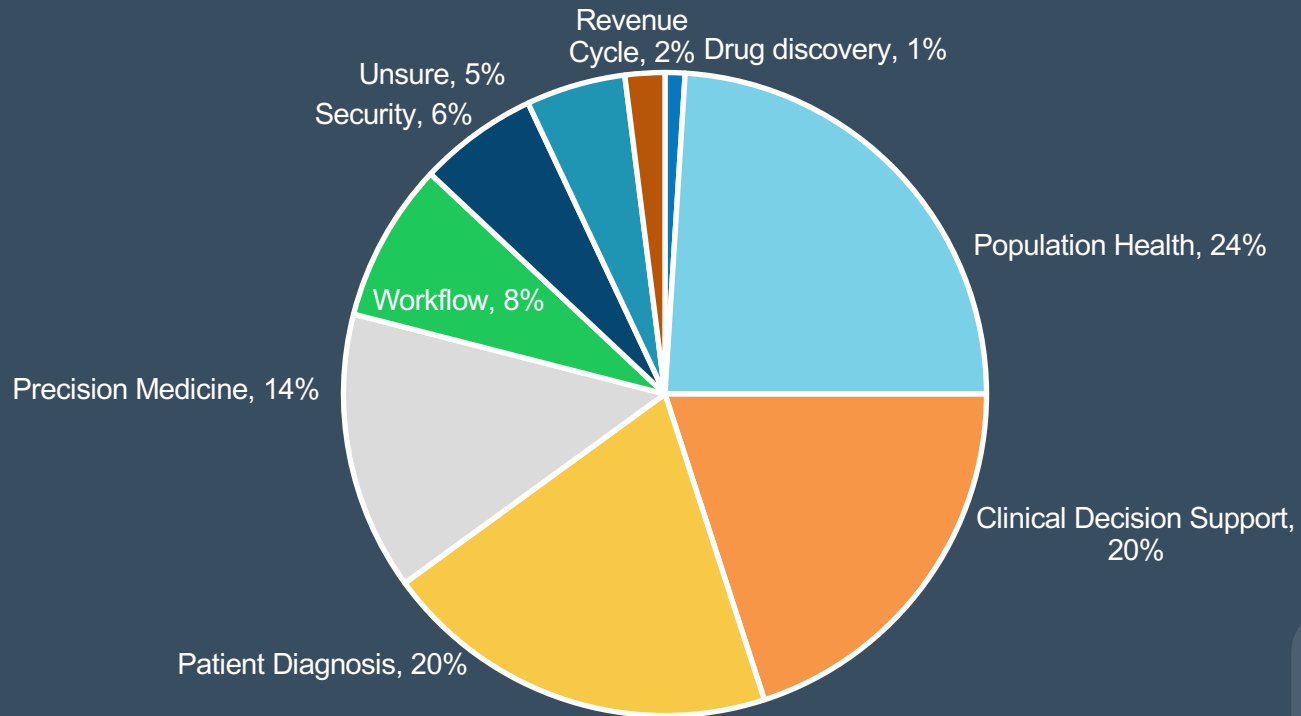
Source: Mercom Capital

Health AI Market: Expected to Reach >\$6 B by 2021



Source: Accenture, "Artificial Intelligence: healthcare's New Nervous System"

Where Will AI Have its Greatest Impact on Healthcare?



Source: 2017 HIMSS Analytics Survey of Health IT Professionals