

CARDIOLOGY 2025

What “Should” Our Congenital Heart Healthcare Workforce Look Like in 10 Years?

Vivek Allada, MD

Director of Strategic Operations, Cardiac Center
Professor of Clinical Pediatrics, Perelman School
of Medicine, University of Pennsylvania
Children’s Hospital of Philadelphia
Thursday, 2/20/25, 11:15am



HOPE. HEAL. LEARN.

Healthcare Administration in Pediatric and Congenital Cardiovascular Disease:
Sharing Challenges and Creating Solutions



GOOGLE AI SEARCH: *WHAT WILL LIFE BE LIKE IN 2035?*



What “Should” Our Congenital Heart Healthcare Workforce Look Like in 10 Years?

AGENDA / SCOPE

EXCLUDE: Enhancements/efficiency creators

- e-stethoscope
- Scribes/Ambient listening

INCLUDE:

- Physicians
- Physician replacements



What “Should” Our Congenital Heart Healthcare Workforce Look Like in 10 Years?



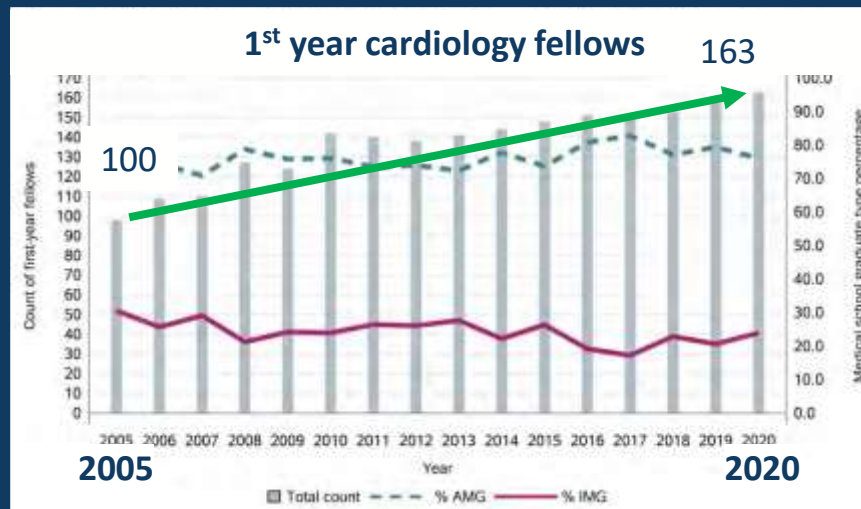
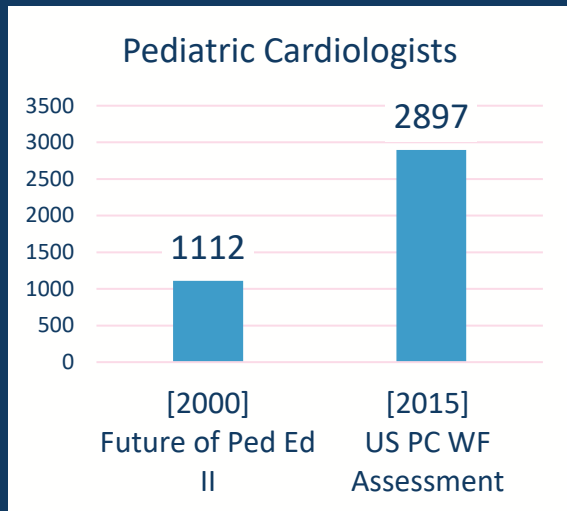
Agenda for this talk

- ☐ PAST Where have we been?
- ☐ PRESENT Where are we now?
- ☐ FUTURE Where are we going?
- ☐ INFLUENCERS What will impact the future?
- ☐ HYPOTHETICALS What if....?
- ☐ Survey the audience 😊

❑ PAST: WHERE HAVE WE BEEN?



PEDIATRIC CARDIOLOGY: PAST



- Stoddard JJ et al., for the AAP Committee on Pediatric Workforce Subcommittee on Subspecialty Workforce. Providing pediatric subspecialty care: a workforce analysis. *Pediatrics*. 2000;106: 1325–33
- Ross RD et al: The US Pediatric Cardiology 2015 workforce assessment: a survey of current training and employment patterns. *J Am Coll Cardiol*. 2017;69:1347–1352
- American Board of Pediatrics, *Pediatric Physicians Workforce Data Book, 2020-2021*, Chapel Hill, NC: American Board of Pediatrics, 2021.

□ PRESENT WHERE ARE WE NOW?



KIDS AND CARDIOLOGISTS: HERE AND NOW

- CHILDREN:
 - US child population increased from 64.2 million (1990) to 73.6 million (2021) (14% increase in 31 years)
- CARDIOLOGISTS:
 - ABP certified Pediatric Cardiologists (2023) = 3096

- National Academies of Sciences, Engineering, and Medicine (NASEM) consensus study report, “The Pediatric Subspecialty Workforce and Its Impact on Child Health and Well-being,” Washington (DC): National Academies Press (US); 2023 Sep 7. 4
- Simeone RM, Oster ME, Cassell CH, Armour BS, Gray DT, Honein MA. Pediatric inpatient hospital resource use for congenital heart defects. *Birth Defects Res A Clin Mol Teratol* 2014;100:934-43.
- Chowdhury D et al. Health Care Policy and CHD – 2020 Focus on Our 2030 Future: Top 10 Things to Know, Nov 29, 2022

CURRENT STATUS: PEDIATRIC CARDIOLOGISTS



| | |
|-------------------------|----------------------------------|
| • ER | 4.39 per 100K children in the US |
| • PICU | 4.06 |
| • Ped Cardiology | 4.02 |
| • Endo | 1.97 |
| • Adol Med | 1.01 |
| • Dev Ped | 0.99 |
| • Nephro | 0.94 |
| • Rheum | 0.65 |

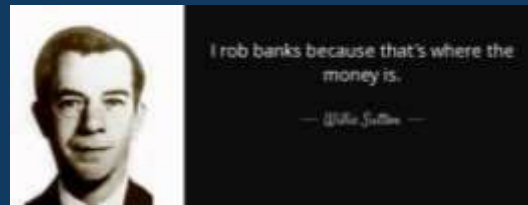


- American Board of Pediatrics, *Pediatric Physicians Workforce Data Book, 2020-2021*, Chapel Hill, NC: American Board of Pediatrics, 2021.
- 2019 US census bureau

□ FUTURE: WHERE ARE WE GOING?



FUTURE: WHERE ARE THE KIDS?



- **What will happen to the pediatric population?**
 - FUTURE projection: US Child population is anticipated to grow to 78.2 million by 2050 (6% in 29 yrs)

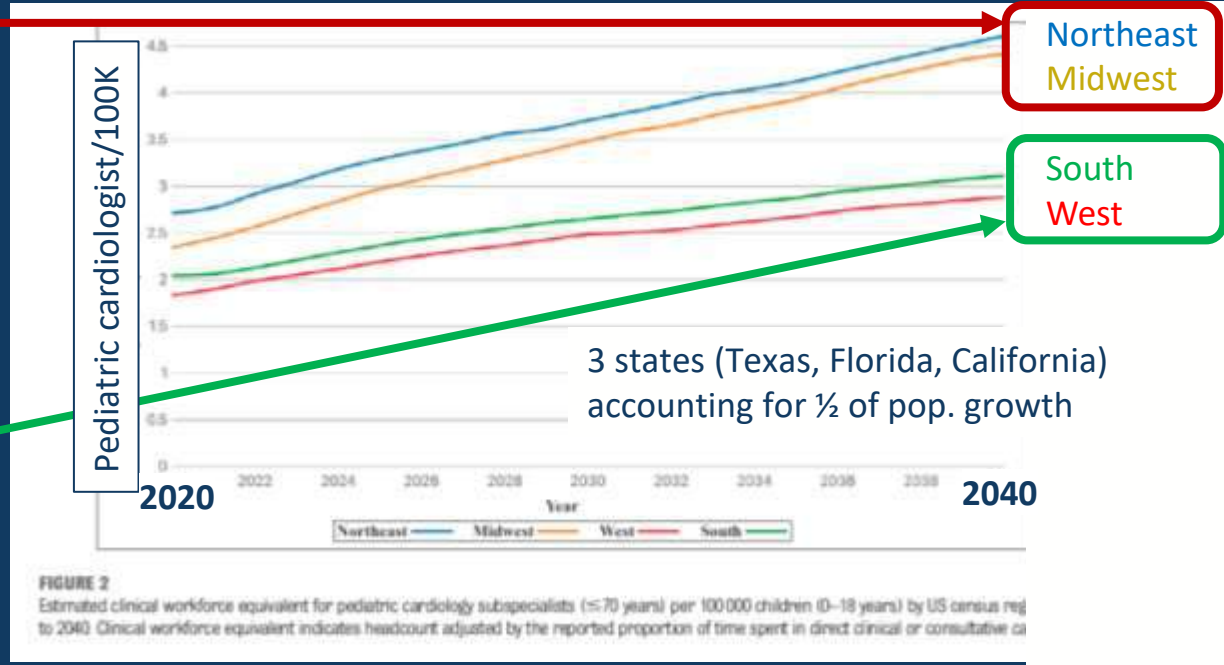
National Academies of Sciences, Engineering, and Medicine (NASEM) consensus study report, “The Pediatric Subspecialty Workforce and Its Impact on Child Health and Well-being,” September 2023.

FUTURE: PREDICTIONS ABOUT WORKFORCE - 2040

Pediatric Cardiologists: 2020 → 2040: Headcount estimates ↑ by 83% from 2431 → **4488**

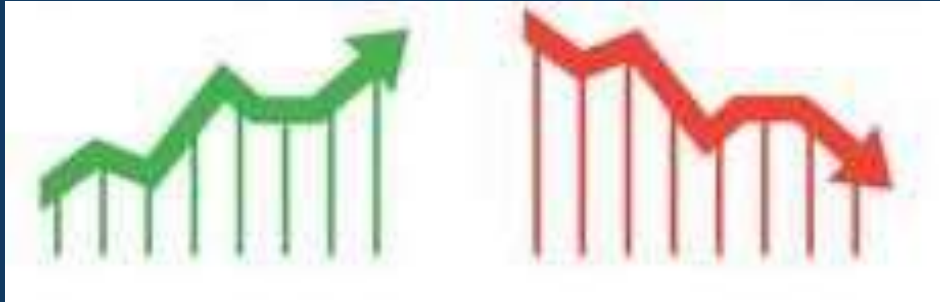
Where will
Pediatric
cardiologists
practice?

Where will
Pediatric patients
be?



❑ INFLUENCERS What will impact the future?

- ❑ What influencers will impact the future of pediatric cardiology?
- ❑ Will the impact increase or decrease the need for our profession?



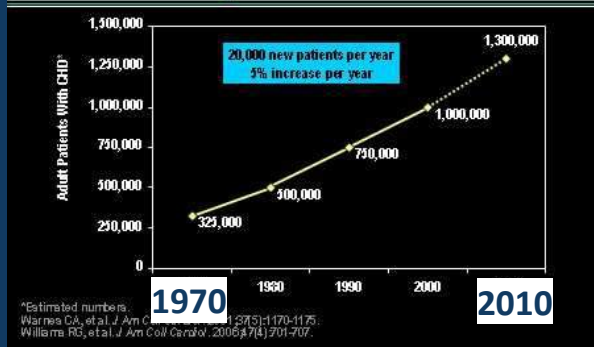
THE FUTURE OF PEDIATRIC HEART DISEASE

- ✓ Adult Congenital Heart Disease (ACHD)
- ✓ Pediatric Heart Failure
- ✓ “Worried Well”
- ✓ Birth / Termination Rate

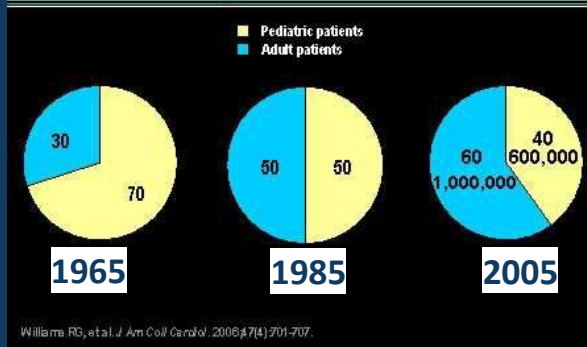


TIPPING POINT: ADULT CONGENITAL HEART DISEASE

Patients Reaching Adulthood
With Congenital Heart Disease



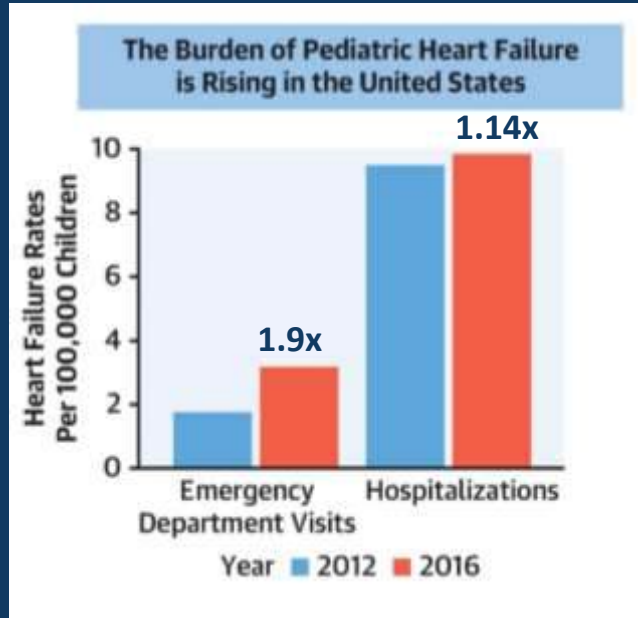
Percent of Pediatric to Adult Patients
With Congenital Heart Disease



Pediatric patients
Adult patients

- 40K children are born each year in the United States with some form of CHD
- Most children born with CHD now survive into adulthood,
- In 2005, more adults are living with CHD than children estimated 2 to 3 million people are alive with CHD

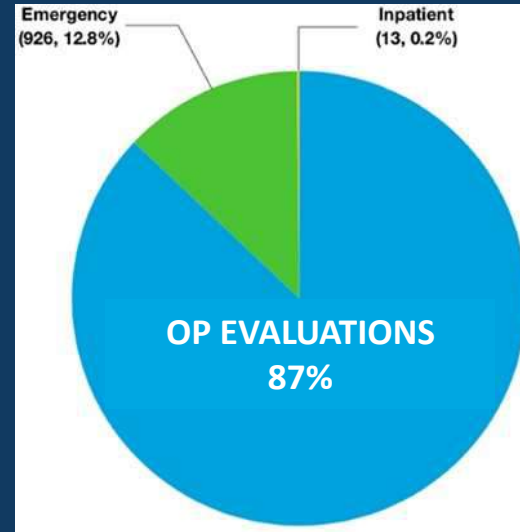
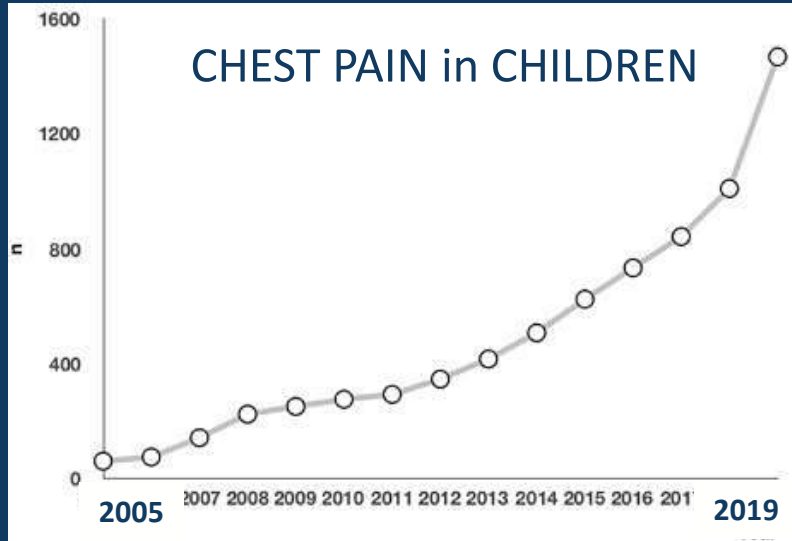
PEDIATRIC HEART FAILURE



- Burden of pediatric HF continues to increase
- A commensurate increase in pediatric cardiology workforce will be needed

Amdani, S, Marino, B, Rossano, J. et al. Burden of Pediatric Heart Failure in the United States. *JACC*. 2022 May, 79 (19) 1917–1928. <https://doi.org/10.1016/j.jacc.2022.03.336>

THE 'WORRIED WELL'

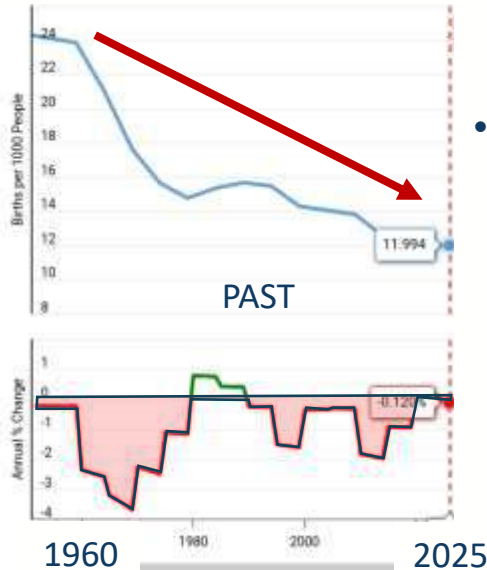


Chest pain, palpitations, syncope, dizziness evaluations are increasing = Worried well?
Anxiety, deconditioning, obesity...

Chen L et al. Front. Cardiovasc. Med., 01 March 2021 The Causes of Chest Pain in Children and the Criteria for Targeted Myocardial Enzyme Testing in Identifying the Causes of Chest Pain in Children

BIRTH RATE: THEN, NOW AND IN THE FUTURE

U.S. Birth Rate 1950-2025



- US Birth rate has been declining for decades
- One would expect to see a commensurate decline in pediatric heart disease

- United Nations projects that while the decline is projected to be stabilize
- Its still a declining birth rate

<https://www.macrotrends.net/global-metrics/countries/usa/united-states/birth-rate>
Data Source: United Nations - World Population Prospects

TERMINATION RATE IMPACTS CARDIOLOGY WORKFORCE NEEDS

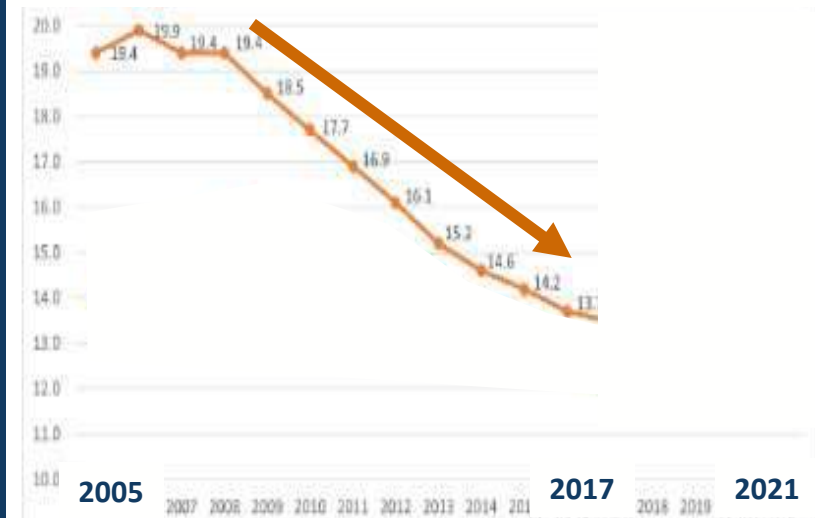
2007 until 2017

- Termination rates have been steadily declining
- ↑ CHD

2017 – 2021

- Termination rate have been increasing ↑ slightly
- Slight ↓ CHD

US Abortion rate



<https://app.powerbigov.us/view?r=eyJrIjojZmQ4NzdIMjYtM2UwYy00NjJLTk0NjUtZDI3YTc0MDZkZTlwIiwidCI6IjQxOGUyODQxLTAxMjgtNGRkNS05YjZjLTQ3ZmM1YTlhMWJkZS9>

□ FUTURE HYPOTHETICALLY...



THOUGHT EXPERIMENT #1

What if there was a nation-wide ban on abortions?



Dobb's decision – What would be the impact on pediatric cardiology resource allocation?

- 53.7% ↑ in single-ventricle cardiac defects
- + 9 cases per 100,000 live births

This increase would result in

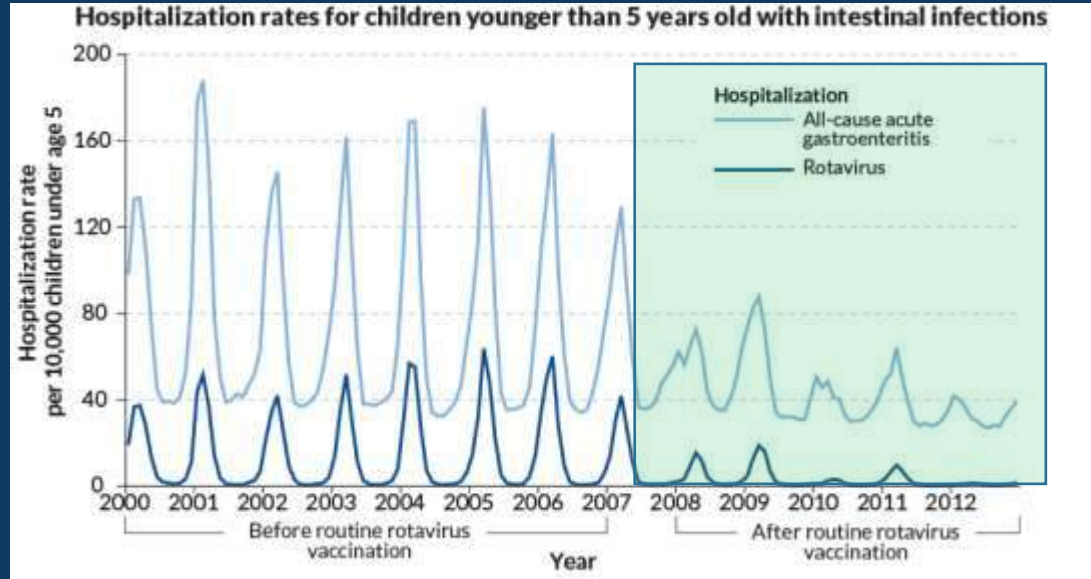
- + 531 neonatal heart surgeries
- + 16 heart transplants, 77 ECMO utilizations

Miller HE, et al, OBSTETRICS & GYNECOLOGY VOL. 142, NO. 3, SEPTEMBER 2023 Abortion Bans and Resource Utilization for Congenital Heart Disease A Decision Analysis

THOUGHT EXPERIMENT #2

WHAT IF WE “CURED” PEDIATRIC HEART DISEASE?

- Vaccine for viral myocarditis?
- Far-fetched?
- Remember Rotavirus?

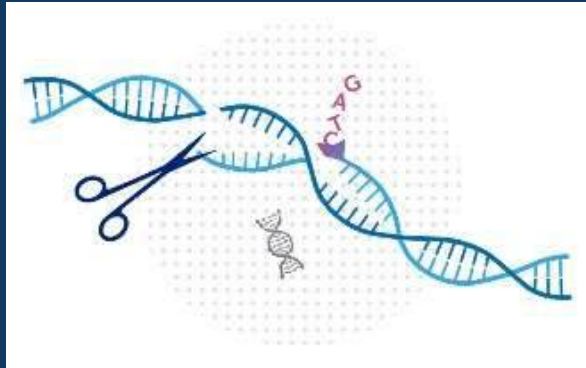


E. LESHEM *ET AL*, Acute Gastroenteritis Hospitalizations Among US Children Following Implementation of the Rotavirus Vaccine
JAMA. 2015;313(22):2282-2284

THOUGHT EXPERIMENT #2A

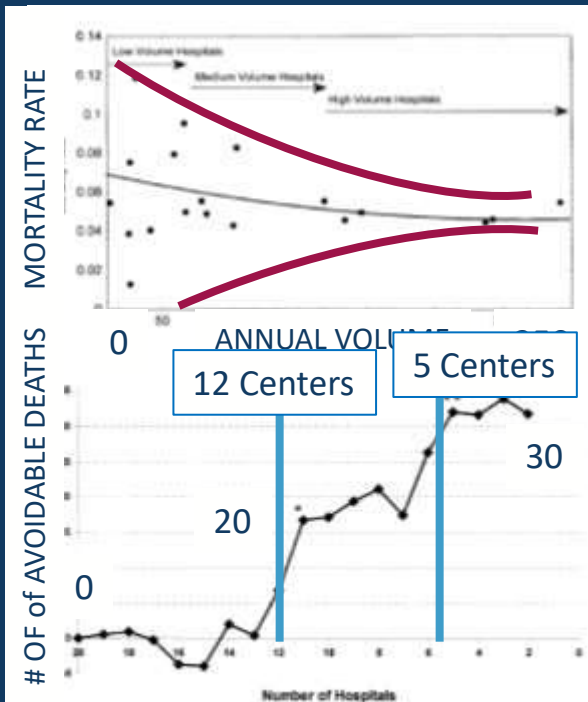
WHAT IF WE “CURED” PEDIATRIC HEART DISEASE?

CRISPR



<https://innovativegenomics.org/news/crispr-clinical-trials-2024/>

THOUGHT EXPERIMENT #3: CARE CONSOLIDATION



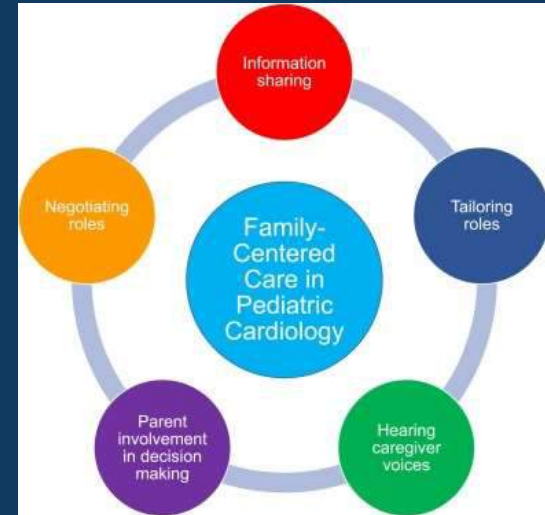
Thought experiment: If you REDUCE the # of Centers, you can reduce the # of avoidable congenital heart surgery deaths?

What if we went to sleep and woke up in Canada?

- Higher volume centers have lower mortality
- Regionalization – ‘Centers of Excellence’
- One Model of regionalization would be a SINGLE PAYOR MODEL

Can Regionalization Decrease the Number of Deaths for Children Who Undergo Cardiac Surgery? A Theoretical Analysis
Ruey-Kang R. Chang, MD, MPH*, and Thomas S. Klitzner, MD, PhD† PEDIATRICS Vol. 109 No. 2 February 2002

FUTURE: NEW CARE MODELS



Vervoort et al. Global Access to Comprehensive Care for Paediatric and Congenital Heart Disease Dominique, CJC Pediatric and Congenital Heart Disease, vol 2 2023

Dorfman TL et al, Strategies to maintain a family-centered care approach in the era of COVID-19: Experiences of a Canadian pediatric cardiology program, Progress in Pediatric Cardiology, Volume 61, 2021, 101370, ISSN 1058-9813, <https://doi.org/10.1016/j.ppedcard.2021.101370>.

NON-TRADITIONAL CARE STREAMS

- Can Amazon, CVS, Walmart do what we do?

Why Retail Health Clinics Failed

by Timothy Hoff

October 10, 2024



What's the difference between a hospital and a bottling factory?

Alec Morton, 2009

Harvard Business Review

2024 | *Health Exec* | *Legal News*

doi: <https://doi.org/10.1136/bmj.b2727>

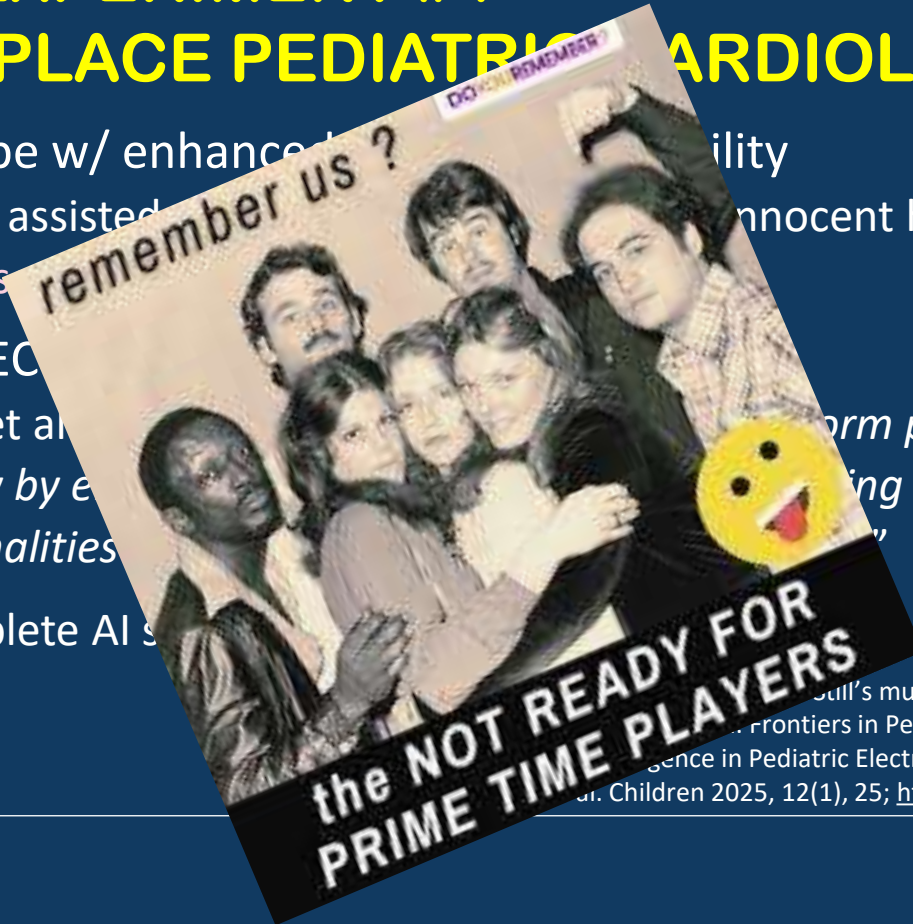
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THOUGHT EXPERIMENT #4

CAN WE REPLACE PEDIATRIC CARDIOLOGISTS?

- E-Stethoscope w/ enhanced ability
 - Computer assisted diagnosis of innocent heart murmur with 90% sensitivity
- Automated ECG interpretation
 - D. Leone et al. *Artificial intelligence in pediatric cardiology by electrocardiogram: A comprehensive review of abnormalities*
- Families complete AI stethoscope



Vs.



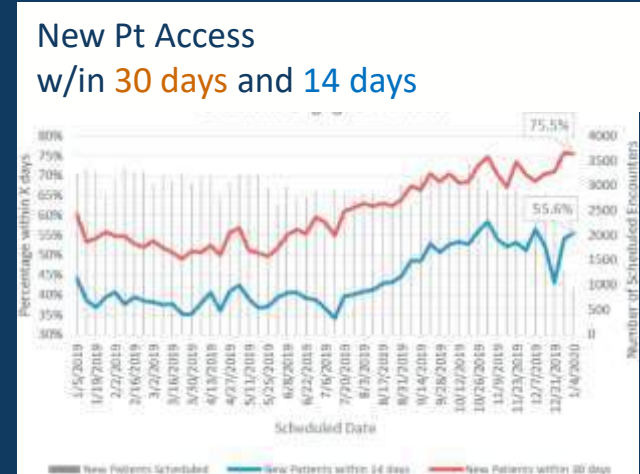
...ull's murmur using convolutional neural network, *Frontiers in Pediatrics*, 202210.3389/fped.2022.923956
 ...gence in Pediatric Electrocardiography: A Comprehensive Review
Children 2025, 12(1), 25; <https://doi.org/10.3390/children12010025>

ADVANCED PRACTICE PROVIDERS: WORKFORCE OF THE FUTURE?

Can APPs be an integral part of an Outpatient Cardiology program?

UPMC Children's Hospital of Pittsburgh: APP program

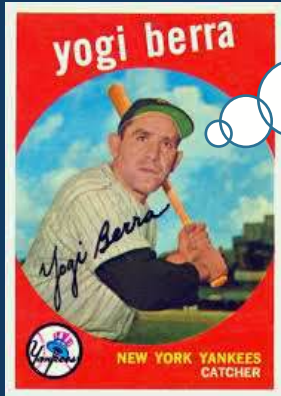
- Subspecialty fellowship programs:
 - Curriculum/training, Boot camp, critical situations, assignment of a mentor, *feedback loops
- Work measured by RVUS (previously attributed to MD)
- Evidence based clinical pathways



Comunale M, Lerch W, Reynolds B, Integrating Advanced Practice Providers into value based care strategies: One organization's journey to achieve success through interprofessional collaboration, Journal of Interprofessional Education & Practice <https://doi.org/10.1016/j.xjep.2020.100384>

THANK YOU!

"It's tough to make predictions, especially about the *future*"



A GOOD HOCKEY PLAYER PLAYS
WHERE THE PUCK IS. A GREAT
HOCKEY PLAYER PLAYS WHERE
THE PUCK IS GOING TO BE.

-Wayne Gretzky



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SURVEY: QUESTION #1

Who SHOULD be the KEY players in 10 years?



- ☐ Retail Health Clinics (Walmart, Walgreens, CVS)
- ☐ AI Assisted technology: e-stethoscope/AI-ECG
- ☐ AI-Generated Clinical assessment by patients/families
- ☐ Advanced Practice Providers
- ☐ More Pediatric Cardiologists

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Who SHOULD be the KEY players in 10 years?

1st | Retail Health Clinics
(Walmart, Amazon, CVS)

2nd | AI-Assisted technology
(e-Stethoscope, AI-ECG)

3rd | AI-Generated Clinical
Assessment by Families

4th | Advanced Practice
Providers

5th | More Pediatric
Cardiologists



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SURVEY: QUESTION #2

Who WILL be the KEY players in 10 years?

- ☐ Retail Health Clinics (Walmart, Walgreens, CVS)
- ☐ AI Assisted technology: e-stethoscope/AI-ECG
- ☐ AI-Generated Clinical assessment by patients/families
- ☐ Advanced Practice Providers
- ☐ More Pediatric Cardiologists





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Feb. 19-23, 2025

Disney's Yacht & Beach Club Resort
Lake Buena Vista, Florida



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www.chop.edu/cardiology2025



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