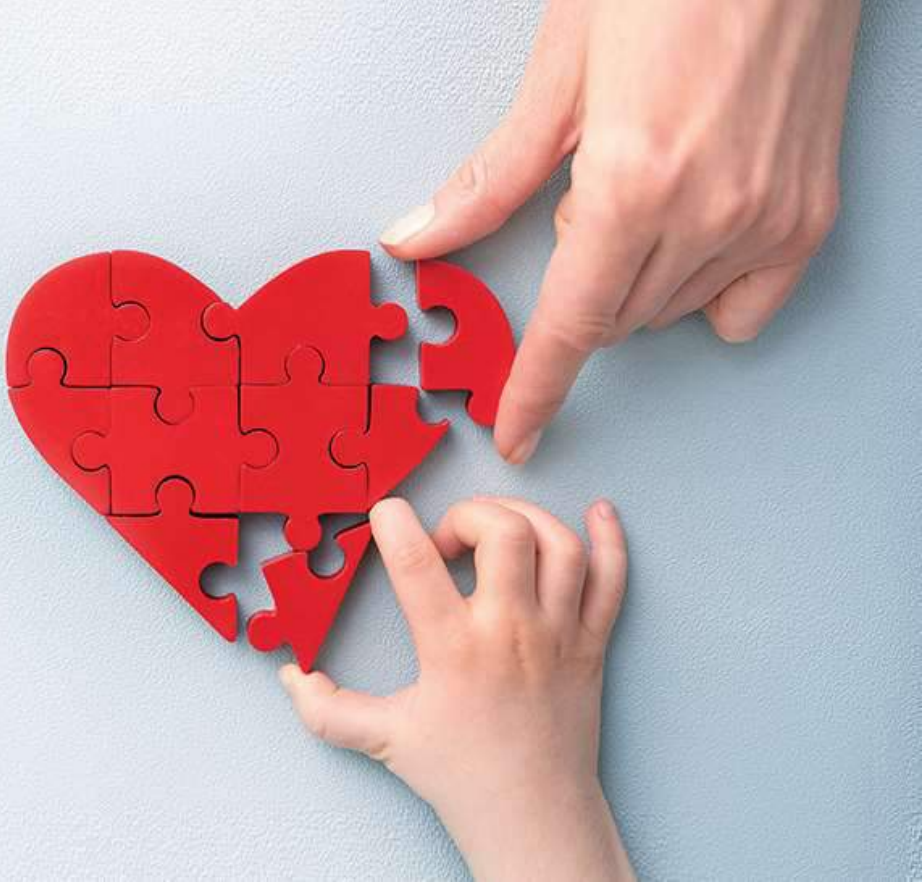
CARDIOLOGY 2024

Telemedicine in Pediatric Cardiology: no longer *revolution* but *evolution*



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I have no disclosures

Children's Hospital of Philadelphia
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BACKGROUND

"Never let a good crisis go to waste"

- Winston Churchill

- Telehealth usage spiked to 70% in 2020 during COVID 19 pandemic
- The usability and culture did not exist, leading to the return to in-person visits post-pandemic
- ~25% of patients used telehealth last year; 5% pre-pandemic
- Telehealth is critical to the future of healthcare
- Estimate digital health interventions could save ~ $500 billion
- Digital health chasm: digital health lags behind technology's potential
- Therefore, we will experience an ***evolution—not a revolution***—of telehealth
- Predict a gradual rise but in a more natural course

WHAT IS DIGITALLY ENABLED CARE?

WHAT HAVE WE DONE…WHERE DOES IT WORK?

- Infant single ventricle monitoring program (ISVMP)
- Lipid program
- Adult Congenital Heart Disease transition
- Remote consultations
- Electrophysiology
- Thrombosis

HIGHLIGHTS OF EFFECTIVE DIGITALLY ENABLED CARE

ISVMP telemedicine (TM): ~600 total visits, ~300 with digital stethoscopes (DS)

- Decreased unnecessary ED visits/admissions (~10%, pre-DS)
- Expedited needed admissions prior to further clinical decompensation (~7%, pre-DS)
- Medication management (adjustments, refills) (~23%*)
- Feeding titration (~18%*)
- Education and support (100%*)
- Equipment malfunction (8%*)
- Referral to other subspecialties/comorbidity management (~15%*)

Use of digital stethoscopes: additive in 12% of visits over TM alone in assessing need for ED visit/admission, expediting needed interventions

*** Represents % service provided during telemedicine visits**

ISVMP: MOST IMPACTFUL CASES

Patient 1	Patient 2	Patient 3
25 day old : (S,D,S) tricuspid atresia, VSD, PS	5 month-old : (S,D,D)TGA, huge VSD (common ventricle), PS s/p PDA stent	3 month old : heterotaxy, unbalanced AV canal, PA, s/p PDA stent
Expedited TM visit, with lower oxygen saturations; correlated HR via auscultation	Routine TM visit with lower oxygen saturations and increased cyanosis; correlated HR via auscultation	Routine TM visit with mild decrease in saturation; correlated HR via auscultation
Change in murmur concerning for a smaller VSD	**Change in murmur concerning for decreased flow through the PDA stent**	**Significant diminution in murmur concerning for decreased PDA stent flow**
Direct admission, with cardiac surgery for ***aortopulmonary shunt placement*** **prior to clinical deterioration**	**Urgent readmission : BDG prior to clinical deterioration.** Intraoperative inspection: ***nearly occluded PDA stent***	**Urgent readmission** : cardiac catheterization with ***PDA stent dilation, increase in proximal stent from 2 mm to 4 mm*** **prior to clinical deterioration**

HIGHLIGHTS OF EFFECTIVE DIGITALLY ENABLED CARE

Lipid telemedicine: ~2,000 visits

- Compared telemedicine (58%) to in-person (IP) visits (42%)
- **48hr cancellation decreased significantly from 25% to 8% in non-Hispanic black patients** compared to IP visits
- 3% no show rate
- Statistically significant decrease in non-HDL levels compared to IP visits, 4.6% vs 0.8%, respectively
- Provider satisfaction averaged 9.3/10

FUTURE DIRECTIONS

- Heart Failure/Transplant
- Cardiology CATCH: post discharge follow up
- Pre/post procedural evaluations
- Lymphatics
- Fontan FORWARD
- Fetal Cardiology
- Pulmonary Hypertension
- Behavioral Health
- Cardiac Rehabilitation
- Palliative Care
- International Evaluations

CURRENT TECHNOLOGY

- Digital Stethoscopes
- Remote monitoring (RPM,RTM) platforms: e.g., Epic Care Companion
- Blood pressure monitoring: older pediatric patients
- Exercise monitoring: steps, etc.
- Home ECHO machines
- Pulmonary artery pressure monitors
- Loop recorders, Holter and event monitors

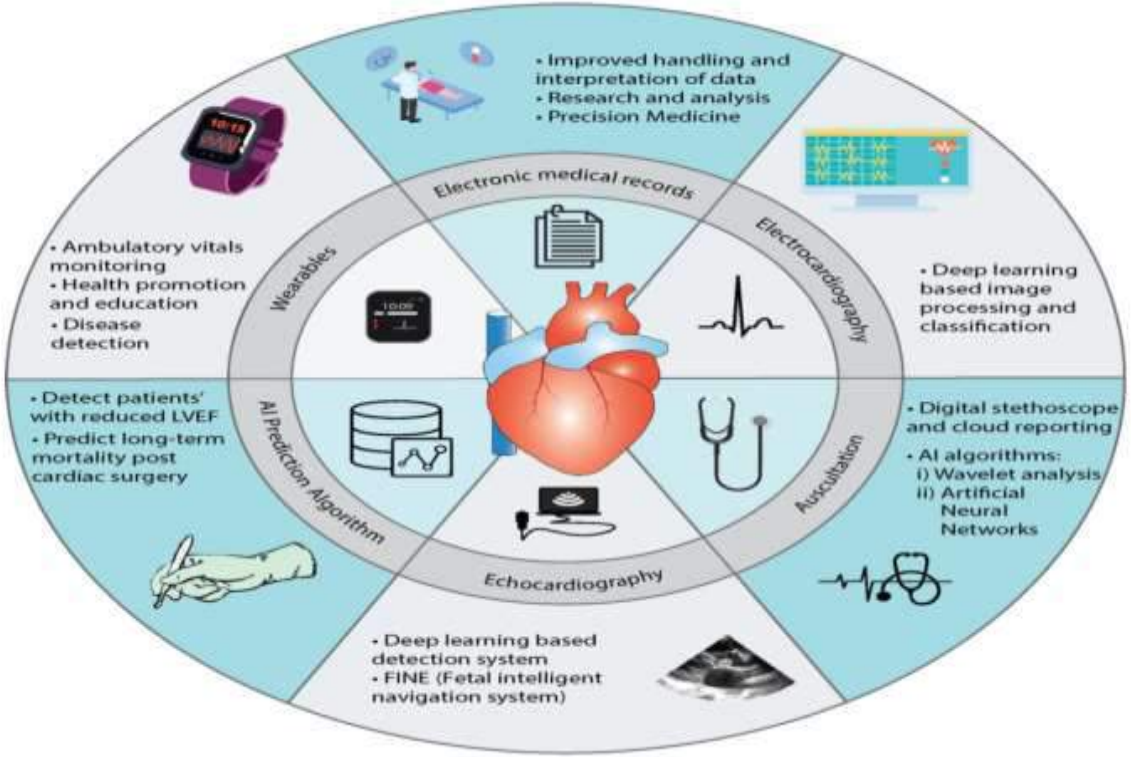
AMA BLUEPRINT FOR DIGITALLY ENABLED CARE

Six pillars to achieve optimized digitally enabled care:

1. Build for patients and clinicians
2. Design with an equity lens
3. Recenter care around the patient-physician relationship
4. Improve and adopt payment models that incentivize high-value care
5. Create technologies and policies that reduce fragmentation
6. Scale evidence-based models quickly

WHAT IS ON THE HORIZON?

DIAGNOSTIC AND PROGNOSTIC APPLICATIONS OF AI IN PEDIATRIC CARDIOLOGY



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LIMITATIONS

Health care system–level factors:

- Health care equity: SDOH: access to internet/technology, language barriers, specific digital assistance, e.g. setting up & linking home-monitoring devices
- Existence and maintenance of digital infrastructure within health care settings
- Sufficient staffing (and staff training) to support new workflows, protected practitioner time

Governmental factors:

- Legal: medical licensing and jurisdiction
- Regulatory: privacy and data protection
- Reimbursement: Pediatric RPM currently not reimbursed in PA and many states

PREDICTIONS FOR TELEHEALTH EVOLUTION

- Telehealth will continue to ***evolve*** into something that's easier to use
- The field will see steps toward aggregated, all-in-one technology
- Chronic disease management will see strides
- Government funding and regulation for telehealth will continue to be a hot topic
- More capital will flow to innovators in the digital health care arena

As telehealth *evolves* in Pediatric Cardiology, the impact on medical care will in fact be *revolutionary*!

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  - Thrombosis: Therese Giglia MD (Director)
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  - Bimal Desai, MD, MBI, Assistant Vice President and Chief Health Informatics Officer
  - John Chuo, MD, Co-Director, Digital Health Innovation Core, CHPS, Research Institute
  - Kate Fuller, Digital Health Portfolio Leader (TM)
  - Sarah Hadley, MBA, RN, Digital Health Portfolio Leader (RPM)

Questions / Discussion

KEY ELEMENTS FOR SUCCESS

- What is the question/concern you are trying to address?
- How does it fit into the overall institutional strategy?
- Do you have buy-in from the clinical care team and operations who will monitor and manage the data? Support from caregiver?
- What is the demand, what is the volume? What is the impact? Need to weigh volume, impact, potential benefit (ISVMP : small volume but huge impact)
- User-friendly systems. Voice based conversational AI can bypass digital health access and literacy enhancing engagement

LESSONS LEARNED FROM THE COVID 19 PANDEMIC

"Never let a good crisis go to waste"

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- Meet regularly as a leadership team: identify challenges and create innovative solutions. Roles clearly delineated , problems identified, priorities set, teams organized, timelines declared. Take decisive action to provide patients access to care: communication devices
- Make hospital throughput a priority
- Implement innovative workforce strategies
- Prioritize provider safety and wellness
- Advocate for social justice

ISVMP: MOST IMPACTFUL CASES

Case 1

- 25 day old with (s,d,s)tricuspid atresia, VSD, PS
- During an expedited scheduled TM visit, noted to have lower oxygen saturations; correlated heart rate via auscultation with Eko digital stethoscope
- Appreciated change in murmur via Eko digital stethoscope concerning for a smaller VSD
- Direct admission, infant required cardiac surgery for aortopulmonary shunt placement without further clinical deterioration

Case 2

- 5-month-old with single ventricle heart disease palliated as neonate with a PDA stent
- During a routine scheduled TM visit, noted to have lower oxygen saturations and increased cyanosis; correlated heart rate via auscultation with Eko digital stethoscope
- Appreciated change in murmur via Eko digital stethoscope concerning for less flow through the PDA stent
- Directed to clinic and ultimately urgent readmission with cardiac surgery for cavopulmonary anastomosis without further clinical deterioration
- Intraoperative inspection demonstrated a nearly occluded PDA stent