

Harnessing AI and Data Science in Congenital Heart Disease

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1,920 × 1,080

CHD

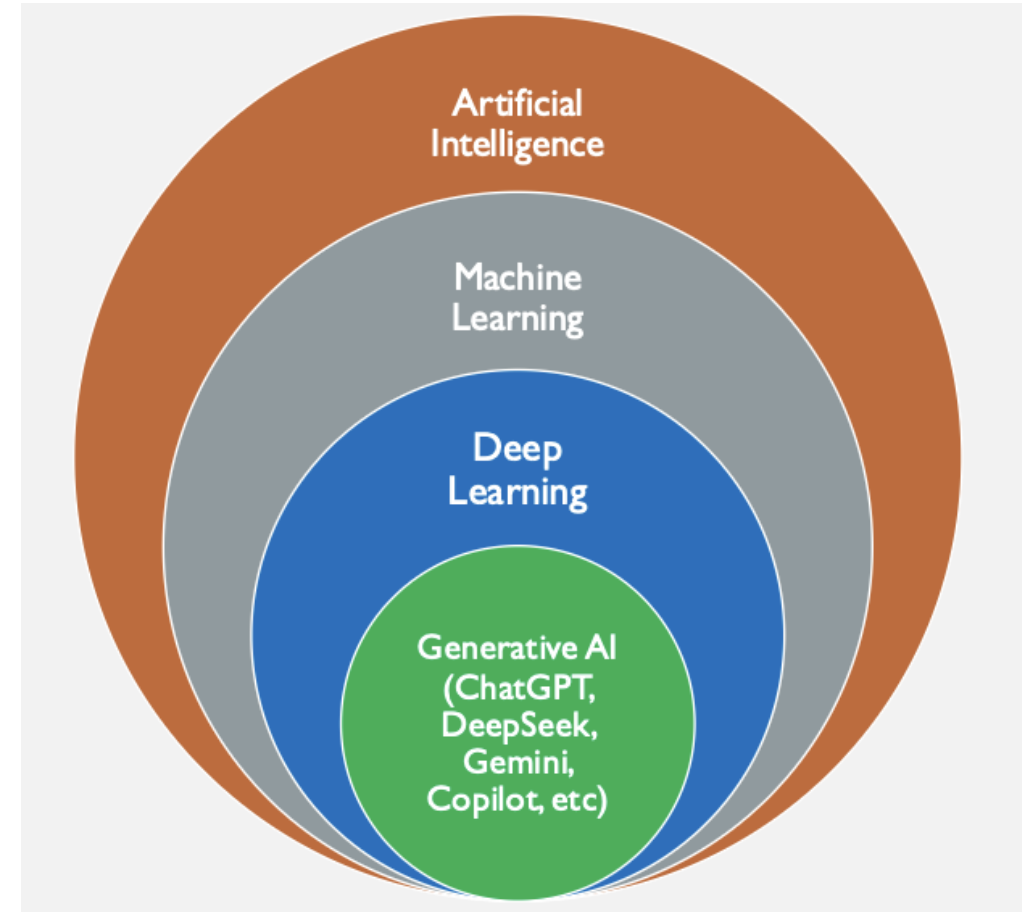
- Complex
 - Anatomy, physiology, treatment options
 - Taxonomy – diagnosis and procedure codes
- Varying severity
- Associated risk factors – prematurity, genetic syndromes
- Other
 - Team effort, multidisciplinary care
 - Time-consuming
 - Costly
 - Highly scrutinised
 - Emotionally charged

What we do in the UK

- Antenatal diagnosis  late adulthood
- 10 centres in the UK – hub and spoke model
- Managing all CHD in the 10 networks
- Invasive treatment in the tertiary centres – surgery, transcatheter
- National audit - <https://www.nicor.org.uk/national-cardiac-audit-programme/congenital-audit-nchda>
 - Started in 2000
 - Procedure-based
 - Complete, non-voluntary
 - Early survival and complications
 - Risk-stratified
 - Excellent clinical results

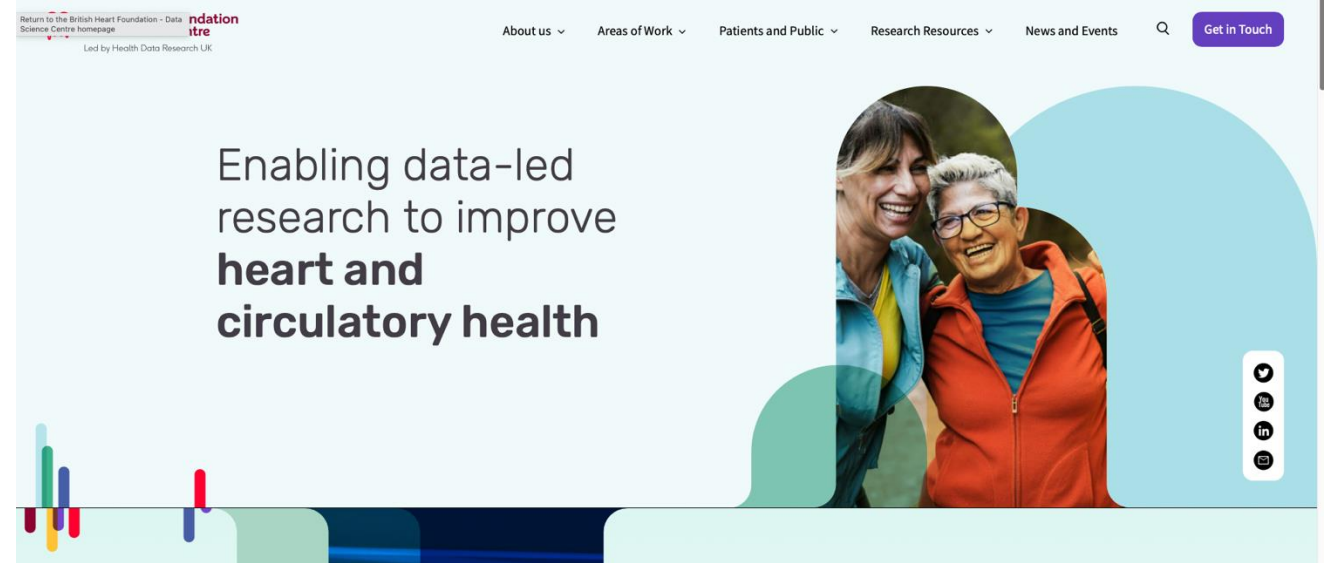
Research in CHD

- *‘Surgical research – a comic opera’*
Lancet, 1996
- Very hard to do (surgical) trials
- Registries... to... case reports
- Multimodal, complex data – a strength for AI?



Data linkage

- NCHDA
- ONS
- ICU
- HES



Open access Communication

BMJ Open The road to hell is paved with good intentions: the experience of applying for national data for linkage and suggestions for improvement

Julie A Taylor ¹, Sonya Crowe ¹, Ferran Espuny Pujol ¹,
Rodney C Franklin,² Richard G Feltbower,³ Lee J Norman,³ James Doidge ^{4,5},
Doug William Gould ⁴, Christina Pagel ¹

Hospital resource utilization in a national cohort of functionally single ventricle patients undergoing surgical treatment

Dan-Mihai Dorobantu, MD,^{a,b,c} Qi Huang, PhD,^d Ferran Espuny Pujol, PhD,^d
Katherine L. Brown, MD, MPH,^e Rodney C. Franklin, MD, FRCP,^f Maria Pufulete, PhD,^g
Deborah A. Lawlor, PhD, MSc, MBChB,^{b,h,i} Sonya Crowe, PhD,^d Christina Pagel, PhD,^d and
Serban C. Stoica, MD, FRCS^c

- BHF data science centre
- Led by HDRUK
- Sudlow report
- Continued Covid exemption for linkage
- Collaborative, open-source coding

medRxiv
THE PREPRINT SERVER FOR HEALTH SCIENCES

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Learning the natural history of human disease with generative transformers

 Artem Shmatko, Alexander Wolfgang Jung,  Kumar Gaurav,  Søren Brunak,  Laust Mortensen,
 Ewan Birney,  Tom Fitzgerald,  Moritz Gerstung

doi: <https://doi.org/10.1101/2024.06.07.24308553>

This article is a preprint and has not been peer-reviewed [what does this mean?]. It reports new medical research that has yet to be evaluated and so should not be used to guide clinical practice.

AI in CHD

- The AI bandwagon vs. (healthy) scepticism
- Multidisciplinary research – medicine, computer science, methodology, regulatory, ethics, patient-in-the-loop
- The Bristol ecosystem
- Premise – collaborative, innovative, funded
- Concepts  practical problems

Decisions, decisions, decisions...

Navigating the future of pediatric cardiovascular surgery: Insights and innovation powered by Chat Generative Pre-Trained Transformer (ChatGPT)

Rittal Mehta, MPH, BDS, Justus G. Reitz, MD, Alyssia Venna, MBS, Arif Selcuk, MD,
Bishakha Dhamala, MS, Jennifer Klein, MD, Christine Sawda, MD, Mitchell Haverty, MS,
Can Yerebakan, MD, Aybala Tongut, MD, Manan Desai, MD, and Yves d'Udekem, MD

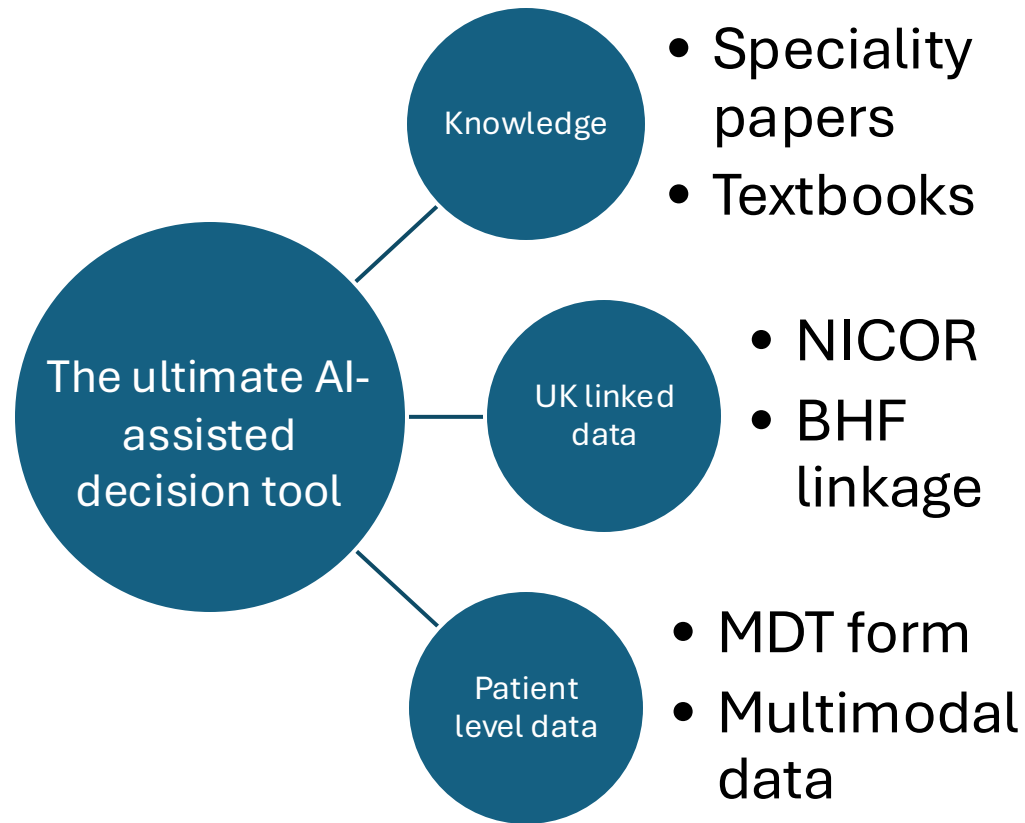
ChatGPT can be used as an augmentative tool for surgical conferences to systematically summarize large amounts of patient data from electronic health records and clinical notes in seconds. In addition, our study points out the potential of ChatGPT as an AI-based decision support tool in surgery, particularly for less-complex cases. The discrepancy, particularly in complex cases, emphasizes on the need for caution when using ChatGPT in decision-making for the complex cases in pediatric cardiovascular surgery. **There is little doubt that the public will soon use this comparative tool.** (J Thorac Cardiovasc Surg 2025;-:1-5)

What next?

- Patients ARE using it
- From **large language** to **large reasoning** models – ChatGPT prompt:

You are running a congenital MDT and we are showing an individual case with their relevant information. Simulate a discussion between three experts in cardiology, surgery and imaging. And show us your reasoning for the recommended course of action.

Can we shape this agenda?



- AI-assisted decision making
- Inform complex discussions
- Research design
- Patient, clinician and researcher-in-the-loop
- Challenges – data sources and generalizability, copyright and IP, data governance, validation, adoption etc.

Thank you

