Amsterdam UMC
University Medical Centers

Understanding fetal cardiac screening planes better using ultrasound-based
3D Fetal Heart Models

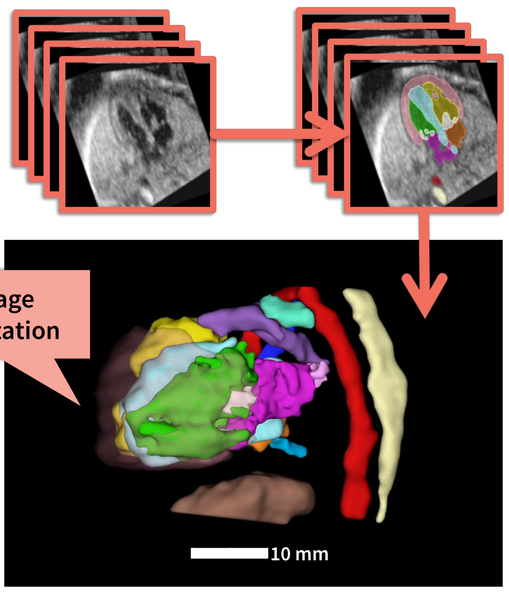
CONCLUSION
Our results show that generating ultrasound-based 3D fetal heart models for the purpose of developing a novel web-based fetal echocardiography learning tool is feasible. Developing this learning tool contributes to the global efforts to continuously improve training programs and increase prenatal detection of CHD.

WHAT'S NEW?

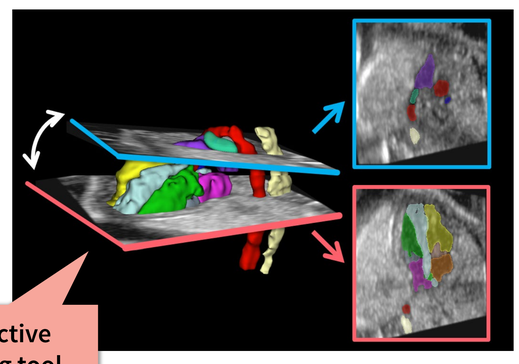
We are using fetal ultrasound imaging to create 3D heart models of normal fetal cardiac anatomy and heart defects.

This is the first educational resource specifically aimed at developing insight in 3D cardiac anatomy in ultrasound imaging.

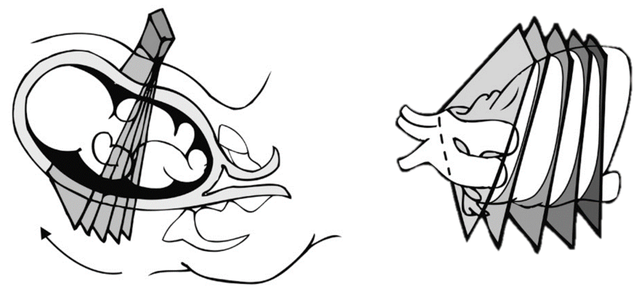
METHODS
First, we directly visualised the fetal heart by creating 3D heart models by segmenting cardiac structures in stored 3D/4D fetal cardiac ultrasound volumes. We developed models from fetuses with normal hearts and aim to include examples of all CHD categories specified in Table 1.



Second, the 3D models are used to develop a web-based learning tool to enhance interpretation of 3D anatomy based on cardiac screening planes.



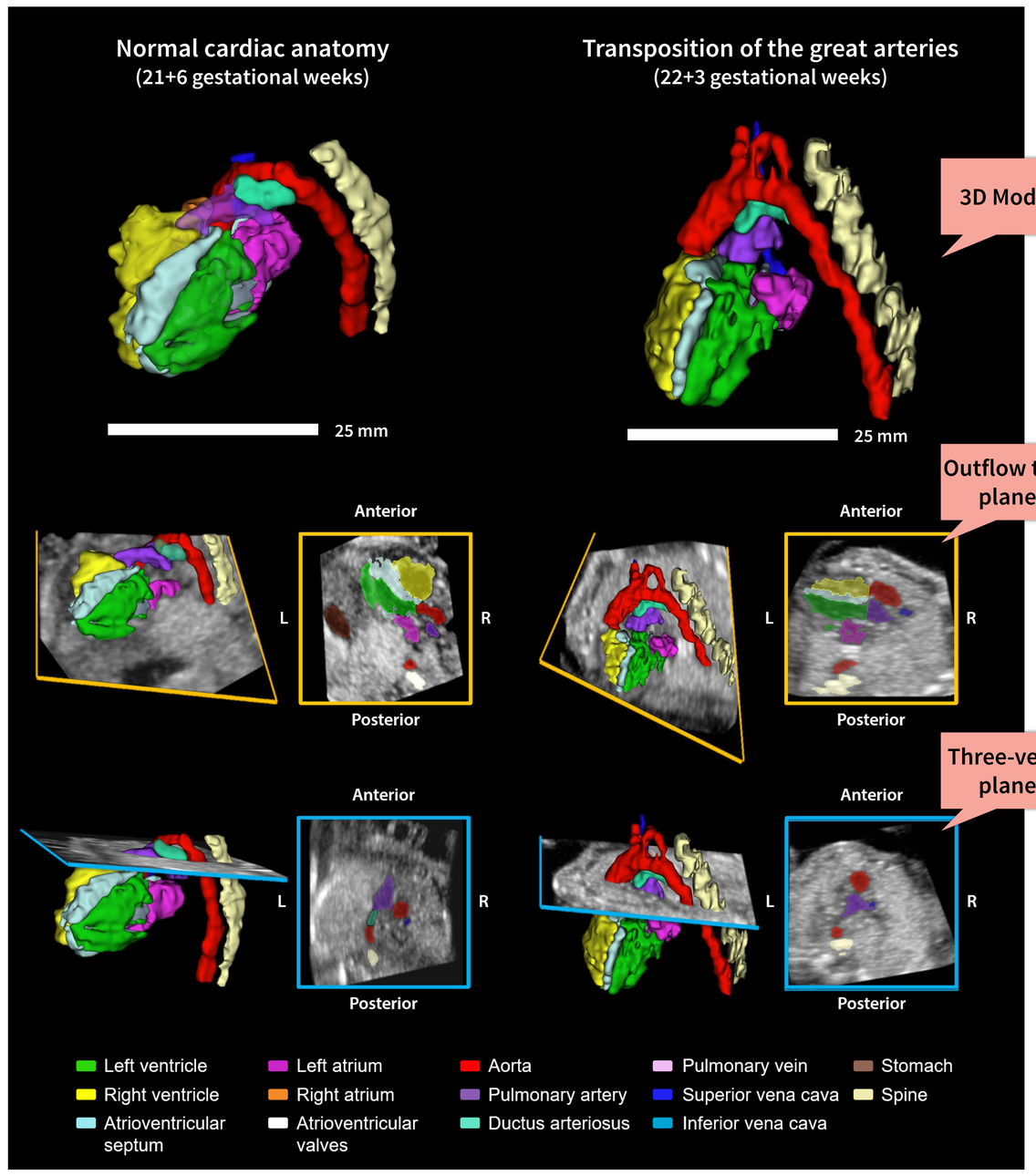
BACKGROUND & AIM
Understanding 3D cardiac anatomy based on ultrasound screening planes is fundamental to recognition of congenital heart defects (CHD). Through this study, we aim to develop an open-access learning tool to help develop this skill.



RESULTS
We have created 18 3D fetal heart models which cover 7/9 CHD categories (table 1). Collect-ion and 3D image segmentation of additional ultrasound volumes is ongoing. A preliminary version of the web-based learning tool is available for testing. Try it now or sign up via the QR code!

CHD category	Cases
1. Normal heart	*4*
*2. Septal defect **	*3*
3. Valvular defect, biventricular heart †	*2*
4. Venous return anomaly ‡	*2*
5. Aortic arch anomaly §	*2*
*6. Outflow tract anomaly ***	*4*
7. Hypoplastic right heart syndrome††	*1*
8. Hypoplastic left heart syndrome	*0*
9. Other univentricular anomaly	*0*
10. Complex anomaly ‡‡	*1*
Total	*18*

Table 1 | Specification of CHD categories and number (n) of available 3D models per category.
* Atrioventicular septal defect (n=3)
† Ebstein's anomaly (n=1)
‡ Persistent left vena cava superior (n=2)
§ Vascular ring (n=2)
** Tetralogy of Fallot (n=1); Transposition of the 00 great arteries (n=3)
†† Critical pulmonary stenosis (n=1)
‡‡ Complex double outlet right ventricle (n=1)



Poster presentation
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Fetal echocardiography-based 3D heart models
Creating a web-based application as a new learning tool

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Connect with Marieke Buijtendijk for more details and a discussion of this study

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