Adult congenital heart disease-related heart failure: challenges and opportunities in pharmacological therapies and device interventions

Neijenhuis, R.M.L.

PhD Portfolio

The PhD Trajectory – An Overview
CRediT Statement For The Chapters In This Thesis
Dissemination Table
Overview Of Completed Courses And Other Training
Dissemination, Acknowledgement, Esteem And Other Relevant Scientific Activities

The PhD Trajectory – An Overview

My PhD started in April 2022 at the Department of Cardiology of the Leiden University Medical Center and was supported by the Leiden University Medical Center research council Cardio-Vascular cluster Themes for Innovation funding obtained by Dr. Egorova. The aim was to evaluate the effects of novel HF treatments in ACHD patients. In my first year, I focused on setting up a registry infrastructure, developing study protocols, and obtaining ethical approvals. I completed an initial study evaluating SGLT2i in patients with an sRV (Chapter 3) and wrote a case series on the management of baffle leaks in this population (Chapter 8).

To expand this work, I initiated an international collaboration with Prof. Veldtman (Glasgow), Dr. Zemrak (London), and Dr. MacDonald (Cardiff). This led to three working visits, each about three weeks long, at the end of my first year. During these visits, I collected data for a first multicentre study. I wrote the manuscript at the start of my second year, and it was published in the Journal of the American College of Cardiology (Chapter 2). During this first year, I also completed several PhD courses and obtained my BROK certificate. Although my Dekker Junior Clinical Scientist grant application on this topic was unsuccessful, I received funding from Foundation 'De Drie Lichten' and an educational grant from AstraZeneca.

In my second year, I again applied for the Dekker grant but was not selected. I was awarded the KNAW Ter Meulen Grant, which supported a three-month research visit to Glasgow in December 2023. During this period, I learned and performed detailed echocardiographic analyses on patients with sRV and single ventricle physiology treated with SGLT2i (Chapters 4 and 7). In the spring of 2024, I spent two months in London to collect data on CRT in ACHD patients (Chapter 9).

In my third and fourth year, I focused on registry-based research. We established the ACHIEVE-SGLT2i registry (NCT06932081), an international multicentre registry investigating SGLT2 inhibitor use in ACHD patients. This required coordination across centres, standardised data collection, and attention to data quality. The registry now includes over 430 patients from 11 centres across Europe, the United Kingdom, and the United States. Within this framework, I conducted a study on SGLT2i therapy in patients with FCF (Chapter 6).

Building on earlier CRT work, Drs. Zwaenepoel, a cardiac implantable electronic device fellow at our centre, and I established the RECORD-CHD registry (NCT06969924). This

registry systematically collects CRT data in ACHD patients. We also conducted a systematic review and meta-analysis and a study on CRT response and predictors, which are not included in this thesis. In parallel, I published on changes in QOL following initiation of sacubitril/valsartan in sRV patients (Chapter 5), building on earlier work by my predecessor, Dr. Nederend.

To contribute to dissemination and patient engagement, I co-authored an article with a lived-experience expert for the journal of the Dutch ACHD patient association (Chapter 10). From my third year onwards, I was also involved in recruitment and data collection for the ARTORIA-R registry, focusing on outcomes in ACHD patients with end-stage HF evaluated for heart transplantation, with first results anticipated in 2026.

From a methodological perspective, I focused on improving my statistical skills, particularly in the analysis of longitudinal data using mixed-effects models. Working with repeated measurements required close collaboration with statisticians and iterative model development. Over time, I became more confident in applying these methods across projects, enabling more advanced analyses and clearer interpretation of results. During my PhD, I also started using generative artificial intelligence tools in a supportive role, for R scripting and text correction.

In addition to clinical and registry-based research, I initiated a preclinical project using an SGLT2 knock-out mouse model to investigate right ventricular fibrosis, in collaboration with Dr. Zuurbier at Dr. Weber at the Amsterdam UMC. Although not included in this thesis, this project provided translational research experience, and is being continued by my successor Drs. Tebbens.

Alongside my research, I served as a junior editor for European Heart Journal – Case Reports, reviewing over 50 manuscripts. I also contributed to teaching by giving work groups and supervising BSc and MSc students. In addition, I was involved in academic and organizational activities, including the LUMC cardiovascular research newsletter, the departmental scientific committee, writing patient information, and national initiatives within the Netherlands Society of Cardiology (Landelijke Assistentendag Cardiologie/ Juniorkamerdag). During my PhD, I remained involved in clinical care with the post-myocardial infarction outpatient clinic. In August 2025, after just over three years of full-time research, I transitioned to full-time clinical work as a resident not in training (ANIOS), and in February 2026, I was accepted into the cardiology residency program (AIOS), which I started in June 2026.

Overall, my PhD trajectory combined clinical, translational, and methodological research, with an emphasis on international collaboration and registry-based studies. Over time, I developed independence in study design, repeated measurements analyses, and multicentre collaboration. With the enthusiasm of my successor Drs. Westdorp, and the continued support of my supervision team, I aim to further develop this research line and improve care for ACHD patients with HF.

CRediT Statement For The Chapters In This Thesis

Ch.	Type*	Short Title	Conceptualization	Data Curation	Formal Analysis	Funding Acquisition	Investigation	Methodology	Project Administration	Resources	Software	Supervision	Validation	Visualization	Writing - Original Draft	Writing - Review & Editing	Preregistered	Preprinted	Published with Peer Review
1	Introduction	1: Introduction	■				■	■	■					■	■	■	☐	☐	☐
2	PhD project chapter	2: SGLT2i in 174 ACHD patients	■	■	■	▒	■	■	■	■	■	▒	■	■	■	■	☐	☐	☑
3	PhD project chapter	3: SGLT2i in sRV failure	■	■	■		■	■	■	■	■		■	■	■	■	☐	☐	☑
4	PhD project chapter	4: SGLT2i in sRV failure - imaging	■	■	■	▒	■	■	■	■	■	▒	■	■	■	■	☐	☐	☑
5	PhD project chapter	5: ARNI in sRV failure	▒	■	■		▒	■	▒	■	■	■	■	■	■	■	☐	☐	☑
6	PhD project chapter	6: SGLT2i in Fontan failure	■	■	■	▒	■	■	■	■	■	▒	■	■	■	■	☐	☐	☑
7	PhD project chapter	7: SGLT2i in SV failure - imaging	■	■	■	▒	■	■	■	■	■	▒	■	■	■	■	☐	☐	☑
8	PhD project chapter	8: Baffle leaks in sRV failure	■	■	■		■	■	■	■	■		■	■	■	■	☐	☐	☑
9	PhD project chapter	9: CRT in ACHD	■	■	▒	▒	▒	■	■	■	■	▒	■	■	■	▒	☐	☐	☑
10	PhD project chapter	10: Patient involvement article	■				■	■	■							■	☐	☐	☐
11	Discussion	11: Discussion	■				■	■	■							■	☐	☐	☐

*PhD project chapters are the direct result of the PhD project of the PhD candidate.
Some theses also include Collaboration Chapters, to which the PhD candidate has contributed but fall outside the PhD project.

Dissemination Table

PEER REVIEWED PUBLICATIONS

1. Tsang V, Haapanen H, **Neijenhuis R.** Aortic Coarctation/Arch Hypoplasia Repair: How Small Is Too Small. Seminars in Thoracic & Cardiovascular Surgery: Pediatric Cardiac Surgery Annual. 2019;22:10-3.

Chapter in this thesis	Not in this thesis
URL	https://www.semtcvspeds.com/article/S1092-9126(18)30018-8/fulltext
DOI	10.1053/j.pcsu.2019.02.011

2. Haapanen H, Tsang V, Kempny A, **Neijenhuis R**, Kennedy F, Cullen S, et al. Grown-up Congenital Heart Surgery in 1093 Consecutive Cases: A "Hidden" Burden of Early Outcome. The Annals of Thoracic Surgery. 2020;110(5):1667-76.

Chapter in this thesis	Not in this thesis
URL	https://www.annalsthoracicsurgery.org/article/S0003-4975(20)30338-6/fulltext
DOI	10.1016/j.athoracsur.2020.01.071

3. Mustafa MR*, **Neijenhuis RML***, Furci B, Tsang VT. Neck cannulation for bypass in redo sternotomy in children and adults with congenital heart disease. Interactive CardioVascular and Thoracic Surgery. 2020;31(1):108-12.

Chapter in this thesis	Not in this thesis
URL	https://academic.oup.com/icvts/article/31/1/108/5814885
DOI	10.1093/icvts/ivaa045

4. Tsang VT, **Neijenhuis RML**. Commentary: The Location of the Conduction System in Atrioventricular Septal Defect—Will It Alter the Way We Operate? Seminars in Thoracic and Cardiovascular Surgery. 2020;32(4):971-2.

Chapter in this thesis	Not in this thesis
URL	https://www.semthorcardiovascsurg.com/article/S1043-0679(20)30117-9/fulltext
DOI	10.1053/j.semtcvs.2020.04.007

5. **Neijenhuis RML**, Tsang VT, Marek J, Issitt R, Bonello B, Von Klemperer K, et al. Cone reconstruction for Ebstein anomaly: Late biventricular function and possible remodeling. J Thorac Cardiovasc Surg. 2021;161(3):1097-108.

Chapter in this thesis	Not in this thesis
Conference contributions	Oral presentation at the 100th annual meeting of the American Association for Thoracic Surgery (AATS) 2020
Pediheart podcast #164 by Dr. Robert Pass	https://open.spotify.com/episode/2MHdfIrAxMA6L3ml37dM5z?si=7877fcb723904fad
URL	https://www.jtcvs.org/article/S0022-5223(20)33049-X/fulltext
DOI	10.1016/j.jtcvs.2020.10.124

6. **Neijenhuis RML**, Regeer MV, van der Kley F, Vliegen HW, Jongbloed MRM, Kiès P, et al. Contemporary Management Strategies of Baffle Leaks in Adults with a Failing Systemic Right Ventricle Late after Atrial Switch: A Case Series and Literature Overview. J Cardiovasc Dev Dis. 2023;10(3).

Chapter in this thesis	8
URL	https://www.mdpi.com/2308-3425/10/3/129
DOI	10.3390/jcdd10030129

7. Acem I, van Praag VM, Mostert CQ, van der Wal RJ, **Neijenhuis RML**, Verhoef C, et al. Noninvasive detection of soft tissue sarcoma using volatile organic compounds in exhaled breath: a pilot study. Future Oncology. 2023;19(10):697-704.

Chapter in this thesis	Not in this thesis
URL	https://www.tandfonline.com/doi/full/10.2217/fon-2022-1122
DOI	10.2217/fon-2022-1122

8. **Neijenhuis RML**, Nederend M, Jongbloed MRM, Kiès P, Rotmans JI, Vliegen HW, et al. The potential of sodium-glucose cotransporter 2 inhibitors for the treatment of systemic right ventricular failure in adults with congenital heart disease. Front Cardiovasc Med. 2023;10:1093201.

Chapter in this thesis	3
Conference contributions	Poster presentation at EuroACHD 2023
URL	https://www.frontiersin.org/journals/cardiovascular-medicine/articles/10.3389/fcvm.2023.1093201/full
DOI	10.3389/fcvm.2023.1093201

9. **Neijenhuis RML**, MacDonald ST, Zemrak F, Mertens BJA, Dinsdale A, Hunter A, et al. Effect of Sodium-Glucose Cotransporter 2 Inhibitors in Adults With Congenital Heart Disease. Journal of the American College of Cardiology. 2024;83(15):1403-14.

Chapter in this thesis	2
Conference contributions	Oral presentation at American College of Cardiology (ACC) 73rd Annual Scientific Session & Expo 2024 • Coordinated simultaneous publication in the Journal of the American College of Cardiology (JACC) • Abstract URL: https://www.jacc.org/doi/10.1016/S0735-1097%2824%2903568-X Poster presentation at Congenital Heart Disease in the Adult (ACHD) Annual Conference - Skamania 2024 Oral presentation at the Czech Cardiovascular Research and Innovation Days 2024
Editorial Comment by Dr. Luke Burchill, Dr. Chales Jain, and Dr. William Miranda	https://www.jacc.org/doi/10.1016/j.jacc.2024.03.002
JACC podcast by Dr. Valentin Fuster	https://www.jacc.org/digital-content/podcast/effect-sodium-glucose-cotransporter-2-inhibitors-adults-congenital-heart-disease
Pediheart Podcast #293 by Dr. Robert Pass	https://open.spotify.com/episode/0mhq1ANmjlHrSwjlssUrQs?si=caacf349c9fc4107
ACC Expert Analysis by Dr. William Marshall and Dr. Curtis Daniels	https://www.acc.org/Latest-in-Cardiology/Articles/2024/06/03/12/45/An-Update-on-Sodium-Glucose-Cotransporter-2-Inhibitors-in-Adults-With-CHD
Medscape Medical News	https://www.medscape.com/viewarticle/sglt2-inhibitors-safe-hf-congenital-heart-disease-2024a10006ih
URL	https://www.jacc.org/doi/10.1016/j.jacc.2024.02.017
DOI	10.1016/j.jacc.2024.02.017

10. **Neijenhuis RML**, Nederend M, van Groningen AE, Jongbloed MRM, Vliegen HW, Jukema JW, et al. Sacubitril/valsartan is associated with improvements in quality of life in adult congenital heart disease patients with systemic right ventricular failure. Open Heart. 2025;12(1).

Chapter in this thesis	5
URL	https://openheart.bmj.com/content/12/1/e003009
DOI	10.1136/openhrt-2024-003009

11. **Neijenhuis RML**, Regeer MV, Walker NL, Mertens BJ, Hunter A, Kiès P, et al. Effect of sodium-glucose cotransporter 2 inhibitors on ventricular function in systemic right ventricular failure. Open Heart. 2025;12(2).

Chapter in this thesis	4
Conference contributions	Oral presentation at EuroACHD 2025
URL	https://openheart.bmj.com/content/12/2/e003445
DOI	10.1136/openhrt-2025-003445

12. **Neijenhuis RML**, Regeer MV, Walker NL, Hunter A, Kiès P, Holman ER, et al. Echocardiographic Effects of Sodium-Glucose Cotransporter 2 Inhibitors in Single Ventricle Circulatory Failure. International Journal of Cardiology Congenital Heart Disease. 2025:100603.

Chapter in this thesis	7
Conference contributions	Oral presentation at the 9th DCVA-NLHI Translational Cardiovascular Research Meeting and moderated poster presentation at ESC 2025
URL	https://www.sciencedirect.com/science/article/pii/S2666668525000394
DOI	10.1016/j.ijcchd.2025.100603

13. Zwaenepoel BAC, **Neijenhuis RML**, Veldtman G, Blom NA, Jukema JW, Jongbloed MRM, et al. Effectiveness of Cardiac Resynchronization Therapy in Adult Congenital Heart Disease: A Meta-Analysis of Biventricular and Conduction System Pacing Outcomes. Heart Rhythm. 2026;23(4):e624-e35.

Chapter in this thesis	Not in this thesis
URL	https://www.heartrhythmjournal.com/article/S1547-5271(26)00019-6/fulltext
DOI	10.1016/j.hrthm.2026.01.004

14. **Neijenhuis RML***, Zwaenepoel BAC*, Jansen TD, Ezzat V, van Erven L, Lowe M, et al. Effects of cardiac resynchronization therapy in adults with congenital heart disease. BMC Cardiovasc Disord. 2026;26(1).

Chapter in this thesis	*9*
Conference contributions	Poster presentation at EuroACHD 2026
URL	https://link.springer.com/article/10.1186/s12872-026-05818-5
DOI	10.1186/s12872-026-05818-5

15. **Neijenhuis RML**, Cedars AM, Zaidi A, Torres-Viera G, Mazurek R, Walker NL, et al. Real-world experience with sodium-glucose cotransporter 2 inhibitors in adults with Fontan circulatory failure. Front Cardiovasc Med. 2026;13:1771868.

Chapter in this thesis	*6*
Conference contributions	Oral presentation at the 9th DCVA-NLHI Translational Cardiovascular Research Meeting, EuroACHD 2026, and moderated poster presentation at ESC 2025
URL	https://www.frontiersin.org/journals/cardiovascular-medicine/articles/10.3389/fcvm.2026.1771868/full
DOI	10.3389/fcvm.2026.1771868

NON-PEER REVIEWED PUBLICATIONS

1. **Neijenhuis RML**. Hot Line session 3 – RESPAHE-HF2, MATTERHORN, Tri.fr. London, 31 August 2024. Netherlands Heart Journal ESC Supplement, Volume 23, Supplement 1, November 2024

Chapter in this thesis	Not in this thesis
URL	Not available
DOI	Not available
ISSN	1569-643X

2. **Neijenhuis R**, Dahlmans M, Egorova A. Behandelopties voor hartfalen bij patiënten met een systemische rechterkamer. Sinus. 2025 Juni 2025:18-20.

Chapter in this thesis	10
URL	LinkedIn post with PDF to article: https://www.linkedin.com/posts/ralph-neijenhuis_artikel-sinus-activity-7346879848063098883-CveL?utm_source=share&utm_medium=member_desktop&rcm=ACoAACut4FgBRFcShLkegyKZwnCLgWS6ZYZOruM
DOI	Not available

Overview Of Completed Courses And Other Training

Month/year	Title/description	Hours
Mandatory courses		
05/2022	Joint UL-LUMC PhD Introductory Meeting	5
07/2022	Scientific Conduct for PhDs (LUMC)	5
09/2022	Boerhaave 'Basic Methods and Reasoning in Biostatistics'	42
03/2023	Basic course for clinical investigators (BROK®)	42
Other courses		
10/2022	Dutch Heart Foundation Cardiovascular Course: Cardiac Function & Adaptation	40
06/2023	Abbott echo course 'Reis door het falende hart'	8
04/2024	ACHD Academy Echo Imaging Course: 3rd Echocardiography Imaging Course in Adult Congenital Heart Disease	8
04/2024	Hands-on course morphology of univentricular heart disease	12
06/2024	Boerhaave course 'Analysis of Repeated Measurements'	42
11/2024	Medtronic CRT training	16
10/2025	HFA clinical trials in heart failure course	16
Teaching activities		
02/2023	BSc medicine working groups on physiological concepts	4
09/2023 – 01/2024	Supervision of MSc Thesis (wetenschapsstage) Thomas Jansen	56
11/2023	BSc medicine working groups on physiological concepts	4
05/2024	BSc medicine working groups on chest pain	4
12/2024	BSc medicine working groups on cardiovascular interaction	4

Dissemination, Acknowledgement, Esteem And Other Relevant Scientific Activities

Month/year	Title/description	Linked to chapter(s)
Conference presentations		
09/2022	London ACHD 2022 Advanced Symposium, London, UK *Oral presentation*	2
11/2022	CCH Groningen 75 years symposium, Groningen, NL *Poster presentation*	2
11/2022	13th Rembrandt symposium 2022, Noordwijkerhout, NL *Oral presentation*	2
04/2023	EuroACHD 2023, Paris, France *Poster presentation*	3
05/2023	Heart Failure 2023, Prague, Czech Republic Moderated *Poster presentation*	2
11/2023	NVVC najaarscongres 2023, Papendal, NL *Oral presentation*	2
04/2024	ACC.24, Atlanta, US *Oral presentation*	2
05/2024	Skamania ACHD, Portland, US *Poster presentation*	2
11/2024	Czech Cardiovascular Research and Innovation Days 2024, Prague, Czech Republic *Oral presentation*	2
04/2025	EuroACHD 2025, Naples, Italy *Oral presentation*	4
06/2025	9th DCVA-NLHI Translational Cardiovascular Research Meeting, Utrecht, NL *Oral presentation*	6,7
08/2025	ESC 2025, Madrid, Spain *Moderated poster presentation*	6,7
04/2026	EuroACHD 2026, Madrid, Spain *Oral presentation & poster presentation*	6,9

Representing research at different type of meetings

11/2022	Netherlands Heart Institute LUMC site visit	2, 3
11/2022	SGLT2i research pitch at the ACHD work group meeting of the Dutch Society of Cardiology (NVVC)	2, 3, 4, 6, 7

Awards and prizes

10/2022	Dutch Heart Foundation Cardiovascular Course: Cardiac Function & Adaptation *Audience prize for best poster*	2
09/2022	London ACHD 2022 Advanced Symposium, London, UK *Best abstract presentation prize*	2
04/2025	EuroACHD 2025, Naples, Italy *Best abstract presentation prize*	4

Grant applications

10/2022	Stichting 'De Drie Lichten' grant € 5.500,-	2, 4, 6, 7
11/2022	AstraZeneca Educational Grant € 2.900,-	2, 4, 6, 7
06/2023	KNAW Ter Meulen Grant € 6.400,-	4, 6, 7

Unsuccessful

07/2022	Dutch Heart Foundation Dekkerbeurs Junior Clinical Scientist	
07/2023	Dutch Heart Foundation Dekkerbeurs Junior Clinical Scientist	
03/2024	Heart4data open call data-linkage	

Appendix

Acknowledgements

Curriculum Vitae

Acknowledgements

Onderzoek, zeker in het geval van zeldzame aangeboren hartafwijkingen, kan niet zonder samenwerking. Ik wil dan ook graag iedereen bedanken die direct of indirect een rol heeft gespeeld in de totstandkoming van dit proefschrift. Een aantal personen wil ik in het bijzonder bedanken.

Allereerst mijn promotoren Prof. Dr. J. Wouter Jukema, Prof. Dr. Monique R.M. Jongbloed en copromotor Dr. Anastasia D. Egorova.

Beste Wouter, ik ben enorm dankbaar voor jouw steun en betrokkenheid de afgelopen jaren. Naast het belang van sociale cohesie heb ik van je geleerd dat zo lang je er zelf vol voor gaat, alles mogelijk is.

Beste Monique, het is een eer dat ik onder jouw supervisie heb morgen werken en van jouw expertise heb kunnen leren. Jouw fundamentele interesse in de anatomie en embryologie van aangeboren hartafwijkingen vormt een inspiratie voor me.

Beste Anastasia, bedankt voor jouw eindeloze steun en enthousiasme de afgelopen jaren. Ik vind jouw motivatie bewonderenswaardig en kijk uit naar onze toekomstige samenwerkingen.

Dear Gruschen, you have been a core member of the "SGLT2i team" from the start, and this thesis would not have been possible without your dedication. You and your whole family have made me feel at home during the dark months in Glasgow, and I cannot thank you enough for that.

Dear Filip and Simon, I am truly grateful for your early support and the time I could spend at your centres in London and Cardiff. Those working visits have formed the foundation of our successful ACHIEVE-SGLT2i registry.

A huge thanks to all other collaborators in the ACHIEVE-SGLT2i and RECORD-CHD registries, from many centres in Europe, the United Kingdom, and the United States. With our work, I believe that we can make a real impact for ACHD patients suffering from HF.

Uiteindelijk gaat het om onze patiënten. Daarom wil ik ook alle patiënten die hebben bijgedragen aan het onderzoek, de Patiëntenvereniging Aangeboren Hartafwijkingen en Marianne Dahlmans, medeauteur van hoofdstuk 10, bedanken.

Philippine, Hubert, Madelien en Philippe, als congenitale vakgroep heb ik in de afgelopen jaren veel van jullie geleerd. Madelien, je hebt mijn enthousiasme voor beeldvorming echt aangewakkerd. Ook veel dank aan alle andere collega's van de afdeling hartziekten. Ik heb een hele goede tijd gehad als ANIOS en kijk er naar uit weer terug te keren in het LUMC.

Daarnaast kunnen mijn collega's uit de Tuin niet ontbreken. Van samen lunchen, religieus om 12:00 uur, tot alle congressen en uitstapjes; het was een onvergetelijke tijd. Natuurlijk verdienen 'The ACHD Kids' Marieke, Diederick, Justin, Mette, Walid en Björn en ook Bert een aparte vermelding. Als congenitale onderzoekers kunnen we altijd op elkaar rekenen. Marieke, het was niet gemakkelijk om iemand die zo gedreven is als jij op te volgen. Bert, ik heb veel van je geleerd over devices en genoten van onze samenwerking. Björn, heel veel succes met het voortzetten van de onderzoekslijn. Ik heb er het volste vertrouwen in.

Al mijn clubgenoten van Helios, door de jaren heen hebben jullie ervoor gezorgd dat het zonnetje genoeg bleef schijnen. Huisgenoten van De Lepelaer, ook jullie hebben gezorgd voor de nodige afleiding de afgelopen jaren. Boris en Tjerk, van onze eerste dagen als geneeskundestudenten tot onze start als PhD'ers aan de woonkamertafel in de Theresiastraat tijdens de lockdown hebben we onze academische carrières gedeeld. Ik ben dan ook dankbaar dat jij, Boris, naast me staat als paranimf. Boaz en Jerom, zonder dat ik bij jullie op de bank mocht bivakkeren in Londen was een deel van dit proefschrift misschien niet mogelijk geweest. Boaz, hoewel ik het niet van jouw medische kennis moet hebben, kan ik toch altijd op je rekenen. Het is een eer dat jij de oversteek vanuit Londen maakt om mijn paranimf te zijn. Ik mag me gelukkig prijzen met zoveel goede vrienden.

Mam en pap, dank jullie wel voor de onvoorwaardelijke steun. Zonder alle medische discussies met mam en de rationele blik van pap was ik niet geworden tot wie ik nu ben. Vera en Juliette, ik ben trots op jullie als mijn zusjes.

Tot slot kan mijn grootste steun en toeverlaat niet ontbreken. Liefste Maartje, dankjewel voor jouw eindeloze steun. Je onophoudelijke pogingen om te onthouden waar "SGLT2i" nu eigenlijk voor staat zijn niet onopgemerkt gebleven. We hebben flink wat tijd zij-aan-zij werkend aan één bureau in ons privékantoortje aan de gracht doorgebracht. We steunen elkaar door dik en dun en ik ben trots op alles wat we samen bereikt hebben. Door jou ben ik de beste versie van mezelf. Ik kijk uit naar de vele avonturen die we nog gaan beleven samen.

Curriculum Vitae

Ralph Mark Louis Neijenhuis werd op 9 juni 1997 geboren te Utrecht. Hij behaalde zijn voorbereidend wetenschappelijk onderwijs (VWO) diploma aan het Theresialyceum te Tilburg in 2015, waarna hij startte met de studie geneeskunde aan de Universiteit Leiden. Na zijn bachelor geneeskunde ving hij zijn master aan met een wetenschappelijke stage bij de congenitale cardiothoracale chirurgie in het Great Ormond Street Hospital en het Barts Heart Centre in Londen, onder begeleiding van Prof. Victor T. Tsang. Hij sloot zijn master cum laude af met een semi-artsstage bij de cardiologie in het HagaZiekenhuis. In mei 2022 startte hij vervolgens met zijn promotieonderzoek bij de afdeling cardiologie van het Leids Universitair Medisch Centrum (LUMC) onder begeleiding van zijn promotoren Prof. Dr. J. Wouter Jukema, Prof. Dr. Monique R.M. Jongbloed en copromotor Dr. Anastasia D. Egorova. Gedurende zijn promotie was hij visiting research fellow in het Golden Jubilee University National Hospital in Glasgow, Barts Heart Centre in Londen en University Hospital of Wales in Cardiff. Zijn werk en de internationale samenwerkingen hebben geleid tot de resultaten beschreven in dit proefschrift. Na ruim drie jaar onderzoek, startte hij in augustus 2025 als arts niet in opleiding tot specialist (ANIOS) bij de afdeling cardiologie in het LUMC. In februari werd hij aangenomen voor de opleiding tot cardioloog in het LUMC. Per 1 juni 2026 is hij gestart met zijn vooropleiding interne geneeskunde in het Onze Lieve Vrouwe Gasthuis (OLVG) te Amsterdam.