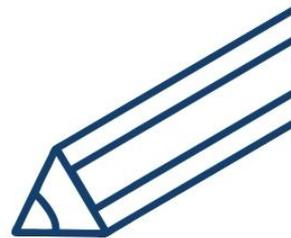


SOOS

Research  
Minor  
Gids

2022 - 2023



## Preface

Dear Student,

It is time to choose courses for in the beginning of the third year of your bachelor (Q9 and Q10). To help you with this choice, the faculty will organise a market with all minors to present themselves. To help you even further with this choice and to present the students opinion about the minors to you, SOOS (students organisation of education and study) made a Minor Guide with all sorts of information. In this guide, all minors are presented with a general description, but also with students' opinions including pros and cons. The choice you have to make is quite an important one, considering the minors have a span of 20 weeks and will take a big proportion of your third year (12EC for medicine, 27EC for BMS). Therefore, it is important to make a deliberate choice. The minors are intended to give you more insight in the subjects that are appealing to you or to give more insight in what you want with your future. Do not be afraid of a minor that is called high-demanding. Every course is designed for third year students, therefore it should be do-able for everyone. So, choose something of your interest! For more information about the examination, learning goals and schedules of the minors, consult the Radboudumc website (go to education > students > bachelor Biomedical Sciences or Medicine > application minors / 3EC courses.) To make this guide, students' feedback is essential. Therefore, we would like to thank all students, who filled in the questionnaires last year. We hope you will help us too next year, by filling in the questionnaire during the minors, all to make a new edition again.

Good luck and enjoy making your choice!

On behalf of the 33rd SOOS board, Lode Busselman, Bram Saleming, Hilde Onstenk, Sèphora Reina, Trix de Vries & Sander Driessen

## Overview Research Minors

Code	Title	When
MED-MIN01	Efficacy and Safety of Drugs	Mon/Tue
MED-MIN02	Visualizing Health and Disease: from Molecule to Man	Mon/Tue
MED-MIN03	Translational Cardiovascular Research	Thu/Fri
MED-MIN04	Cancer Mechanisms and Immune Defense	Mon/Tue
MED-MIN05	Moving Questions: an introduction to Clinical Human Movement Science	Mon/Tue
MED-MIN06	Global Health & Infectious Diseases	Mon/Tue
MED-MIN08	State-of-the-art research technologies in cancer, immunology & diagnostics	Thu/Fri
MED-MIN10	Diagnostics and molecular research in kidney disease	Thu/Fri
MED-MIN12	Assessment of Surgical Innovation	Thu/Fri
MED-MIN13	Medical Biotechnology towards Clinical Practice	Thu/Fri
MED-MIN14	Neuroscience of stress-related psychopathology	Mon/Tue
MED-MIN16	Translational Neuroscience	Thu/Fri
MED-MIN17	Biomedical research methods – <i>Only for pre-master students</i>	Thu/Fri
MED-MIN18	Hemato-Oncology – From concept to cure	Mon/Tue
MED-MIN19	Clinical exercise physiology	Thu/Fri
MED-MIN21	Breast cancer; biology, treatment, patient	Thu/Fri
MED-MIN22	Hemostasis, a delicate balance!	Mon/Tue
MED-MIN23	Pediatric Infectious Diseases and Immunity	Mon/Tue
MED-MIN25	Sustainable Healthcare improvement: principles and practice	Thu/Fri
MED-MIN27	Genomics research – from molecule to population	Mon/Tue
MED-MIN28	Human embryology in perspective	Thu/Fri

Code	Title	When
MED-MIN29	Control of Infectious Diseases	Thu/Fri
MED-MIN29	Effectively handling the challenges of a future healthy healthcare system	Mon/Tue

## Overview Wednesday Courses

*For Biomedical students only.*

Code	Title	When
MED-B3KOB	Advanced data analysis and programming: How to make more of your results?	Q9
MED-B3KOE	Science in action, philosophy and the dynamics of science	Q9
MED-B3KOF	From mice to men: translating animal research into clinical benefit	Q9
MED-B3KOG	Popular Science Writing	Q9
MED-B3KOH	Consultancy	Q9
MED-B3WI	Thinking critically about science	Q10 (Mandatory)

## General Information

It is important to know that the choice of the minor is different for medicine or biomedical science students. Notice the following: Medicine students only need to choose one minor. Depending on your cluster, you can choose a Monday/Tuesday minor (together with Cluster C/D) or a Thursday/Friday minor (together with Cluster A/B). Remaining days in your schedule are filled with the continuation of the lines KVS, KVH and PPG. Biomedical sciences students need to choose one of each type of minors, one Monday/Tuesday, one Wednesday and one Thursday/Friday minor.

### **External minors**

It is also possible to do an external minor, this means a minor that is not in your curriculum (usually outside the medical faculty in Nijmegen). You could do a minor at the Radboudumc, Radboud University or another institution with academic education at the level of a university.

If you would like to do this, a few rules are applicable:

- Only academic education is a possibility (only 2nd and 3rd years courses);
- The minor needs to be approved by the board of examiners beforehand;
- The content of the external minor needs to contribute to your personal journey in a more in-depth or broadening manner in the field of biomedical sciences;
- You can choose an existing minor (12 EC) or make a package of courses.

If you choose the latter one, a mentor must guarantee your study plan via a signature. Your mentor also needs to make sure that there is cohesion and no overlap between courses and between the curriculum (a special form is available on the website).

For biomedical premaster students, popular minors are MIN01, MIN02, MIN04, MIN05, MIN14 and MIN27 because they connect well to the HBO programme.

# Monday & Tuesday

## Minors

## MED-MIN01 – Efficacy and Safety of Drugs

### General information

Name coordinator: dr. S. van Heemsker  
E-mail coordinator: Suzanne.heemskerk@radboudumc.nl  
Grade: 7.4

### Description

In this minor you will deepen and broaden your understanding of how drugs act, by familiarizing yourself with the principles that underlie the rational and safe application of drugs in patients. You will address the challenges associated with drug treatment of special patient populations (pregnancy, pediatrics, geriatrics), while also examining various scientific approaches to study effects of drugs on a molecular, organ and patient and population level. You will examine the nature of side-effects of medical drugs, and familiarize yourself with various aspects of market approval, pharmacovigilance and possible withdrawal of drugs from the market due to adverse effects. Finally, we will study and evaluate the medical effects and societal impact of drugs of abuse.

### Student opinion

This minor has a great balance between self-study assignments and lectures. It is focused on research and the clinic, this makes it interesting for both medicine and biomedical science students. The examination is first formative and then summative, the grading will consist of seven parts. But the material does not always match with the examination. The minor is well organized, with a clear schedule. However you have to enrol for some projects and it is sometimes unclear what we had to do for the projects. There are a lot of group projects in this minor. The teachers are all very enthusiastic and they always want to help you.

### Strengths:

- Many interesting and different excursions and subjects.
- Enthusiastic and very helpful teachers.
- Views from different perspectives.

### Limitations:

- Every group project is in another group.
- There are a lot of deadlines and different feedback moments.
- The organization can seem a bit chaotic.

# MED-MIN02 – Visualizing Health and Disease: from Molecule to Man

## General information

Name coordinator: prof. dr. A. Cambi  
E-mail coordinator: alessandra.cambi@radboudumc.nl  
Grade: 7.2

## Description

How can we visualize single molecules in cells? How can we follow the growth and metastasis of tumors? How can we track the migration of immune cells through the body? Imaging in biomedical sciences is vital for research, diagnosis and visualization of health and disease. Rapid technological developments in the imaging field are increasing our capabilities to address important biomedical questions. This Minor provides an in-depth and hands-on introduction to the various imaging modalities used both in preclinical and clinical settings. Going from molecule to man, this Minor will allow the students to understand and operate several key imaging techniques, including those at the molecular/cellular level (e.g.: fluorescence and electron microscopy), at the tissue/animal level (immunohistochemistry and intravital imaging) and at the whole-body level (X-ray/CT, ultrasound, MRI and PET/SPECT). In addition, students will practice how to perform a basic analysis on the images generated by these techniques and will get a first glimpse on the application of artificial intelligence for image analysis. During these practical courses, the students will also gain hands-on experience with basic techniques required for preparation of samples for the different imaging modalities, such as immunolabeling with antibodies. After this Minor, students will be able to design experiments involving imaging, with an understanding of the advantages and disadvantages of each modality. This Minor builds on prior molecular, cell biological, genetic and immunological knowledge provided in the Bachelor's programs for Biomedical Sciences and Medicine.

## Examination

- Assessment consists of five parts (each must be graded at least 5.5 or 'Pass' to pass the course):
- Written Midterm Exam (individual; weight 25%)
- Practical course (individual, pass/fail; weight 0%)
- Group assignments (group; weight 20%)
- Portfolio (individual; weight 15%)
- Written Final exam (individual; weight 40%)

## Student opinion

There is a difference between medical students and BMW students in the way the course and its difficulty level is perceived. Medicine students had difficulty with the topics and the type of examination, whereas BMW students had no problems with that. In general all students appreciated the teachers, the topics and the types of learning activities. Students are satisfied about the organization and quality of the education and provided very useful feedback for the new academic year to further enhance the biomedical aspect.

## Strengths:

- Course meets expectations.
- Knowledgeable lecturers, good presentations, clear slides.
- Clear structure of the course.
- Mini review assignment was well received.

## Limitations:

- The practicals in the first half are slightly chaotic.
- Medicine students: course did not connect well to prior knowledge or interests.

## MED-MIN04 – Cancer mechanisms and immune defence

### General information

Name coordinator: ing. J.M. Pots  
E-mail coordinator: jeanette.pots@radboudumc.nl  
Grade: 7.1

### Description

Cancer is still an increasing problem as the number of cancer patients is predicted to increase by 70% over the next two decades according to the World Health Organization. Insight in cancer development, therapies, and prevention is rapidly increasing making cancer research a leading field in biomedical life sciences. This Minor deals with all aspects of cancer from a molecular/cellular, clinical and population point of view with focus on the translation from bench to bedside. Themes that are included in this Minor are: molecular basis of cancer, anti-tumor immune responses, cancer diagnostics and screening, epidemiology, and treatment modalities.

An essential part of the educational format of the Minor will be in the form of small workgroups (consisting of 3-5 students) that will design, perform and present scientific cancer research. The module offers personalized education through multiple possibilities to select your own preferences (i.e. focus on more molecular, clinical, and/or epidemiological cancer topics). The students will be challenged to come up with ideas that may improve research. This Minor will provide basic insight in scientific knowledge and tools in cancer research, thus preparing a solid basis for the Bachelor internship in Pathobiology, Toxicology, Human Genetics, Tumor Immunology and Epidemiology.

### Student opinion

The enthusiastic teachers contributed to the development of many skills in a positive way, for instance for the research internship or the theoretical knowledge in a broader perspective. The balance between focussing on different specific subjects regarding cancer and immunology is experienced differently by students. Medicine students also mention they have a gap in their research knowledge compared to Biomedical students, which meant they had to better prepare the practicals and understanding the techniques.

### Strengths:

- This minor provides a very solid basis (both theoretical and practical) for the research internship.
- The lab practicals are very informative, and they provide the possibility to obtain multiple lab skills. Also, the guidance from the teachers is very good. The processing of the experiments in lab journal entries a part of the portfolio provides insight in why you do things, what the goal is and how you can apply the techniques in other settings.
- Great balance between theory and applicability in more complex assignments.
- Lots of variation (lectures, presentations, practicals, working groups, examination, etc.) and versatility in subjects with specific people from the work field.
- Clear layout in brightspace.

### Limitations:

- High workload (more than 14 hours per week). The coordinators will adjust this.
- There was no clear cohesion in the first 3 weeks.
- There was a need for more communication regarding the analysis of experimental data and the lab reports.

# MED-MIN05 – Moving questions: an introduction to Clinical Human Movement Science

## General information

Name coordinator: prof. dr. E.J.M. Tanck  
E-mail coordinator: esther.tanck@radboudumc.nl  
Grade: 7.8

## Description

Research in the field of Clinical Human Movement covers a broad range of patient problems. Physically moving seems to be the best possible way to stay healthy and the best medicine for most patients. It is, therefore, very important to keep patients active as good and as long as possible. How to assess and ameliorate impaired movement is our motivation and we like to know: Which of the following questions moves you?

How much physical activity is needed to stay healthy? What happens in the human body while exercising? How can human movement be quantified? What techniques are available? How do patients with a neurological disorder move? What are the differences with healthy controls? How to predict the clinical performance of an implant? How to assess pathological gait? Are you fascinated by human movement and do you want to contribute to our understanding of its secrets? Then this minor perfectly suits you.

This research minor is an introduction to clinical human movement sciences. You will study and learn fundamental theory to understand how the skeletal, muscular, nervous, cardiovascular, and respiratory systems play an important role in human movement. If one of the systems fails, it immediately influences the other systems. Hence, the systems are connected and integrated and form the human movement system. Impaired movement is often the result of the failure of one system. You will learn basic skills to calculate, analyze, interpret and report the relationship between a clinical diagnosis and a movement problem, making use of different approaches within Clinical Human Movement Sciences (CHMS). During this minor, you will perform a small scale research project to optimally prepare you for the Bachelor internship in the field of CHMS. This minor is strongly advised for students who are interested in biomedical research and would like to do a specialization in Human Movement Sciences. It should also be mentioned that you will use your knowledge on physics and mathematics that you learned in high school.

## Student opinion

- Interesting and good introduction to clinical human movement science.
- The exams were divided over the whole course, which was nice because they did not come close to each other.
- The dissection days were a good addition and very 'real' and interesting.
- Good opportunity to practice with executing a research and writing a scientific report.
- Much coherence with the bachelor, especially biomedical sciences. For the medical students it was quite a lot research-targeted and more difficult.
- Enough for two days per week. Good distribution and enough self-study assignments.
- Contact hours at the beginning were a lot and intensive, but very interesting.
- Enough time to complete the research project.
- Spread over ten weeks: very nice and not too close to each other. It did not coincide with the KVS exams.

## MED-MIN06 – Global Health and Infectious Diseases

### General information

Name coördinator: prof. dr. R.M.P.M. Baltussen  
E-mail coördinator: rob.baltussen@radboudumc.nl  
Grade: 8.0

### Description

Globalization affects every corner of the world, forcing us to approach important health issues more and more from a global perspective. The interest in global health and infectious diseases is therefore increasing. It provokes a great deal of media, student, and faculty interest, has driven the establishment of several academic programs, is supported by governments as a crucial component of foreign policy, and has become a major philanthropic target. Global health is the health of populations in a global context and it goes beyond the perspectives and concerns of individual countries. Global health is about the prevention and control of infectious diseases, such as HIV/AIDS, tuberculosis, malaria and dengue, as well as non-communicable diseases such as diabetes and cancer, as well as about health system research and universal health coverage.

As a Biomedical Sciences or Medical student, studying global health and infectious diseases is relevant. Challenges of global health are at the intersect of molecular, clinical, epidemiological, economic and other socio-behavioural sciences. The present Minor reflects this multidisciplinary nature and offers you a broad scope of methods, instruments and techniques stemming from the different disciplines. The course is designed for you to acquire theoretical knowledge, practical insights and hands-on skills, e.g., through lab courses and literature review exercises. You will also learn how to translate scientific knowledge into policy recommendations and to deliver these in writing and through oral presentations in English.

In week 1 you will be introduced to global health and infectious diseases. Throughout the course you will gradually expand your view and breadth of analysis, from a molecular perspective (week 2-5), and patient and clinical perspective (weeks 6-12), to a health systems and policy perspective (week 13-20). From week 15 onwards, you will work on your Global Health in Action project, a parallel group project for which you will study in-depth a highly relevant issue in global health. During the minor you will engage with leading researchers at Radboudumc and meet professionals working in Global Health and Infectious Diseases at public health institutions, knowledge institutions, and non-governmental organizations. If possible, this minor includes one visit outside of Nijmegen. In week 20 of the minor, a Study Tour will take place during which organisation(s) working in the field of Global Health will be visited and you will present the results of your Global Health in Action project and receive feedback from experts.

### Strengths:

- Diversity in subjects.
- Construction of the minor, in brightspace as well.
- Clear minor guide, this was a great addition with background information on learning goals, plannings, examination data etc.
- Enthusiastic teachers with presentations of good quality.
- At theme E – G it was fun to do assignments were you took another person's seat.

### Limitations:

- It was not always clear which things were graded and which were not.
- It was not very clear what would be in the exam.
- The group assignments were not always considered for the eventual grading.
- Sometimes it was hard to sit through presentations at the end of a long day.

## MED-MIN14 – Neuroscience of stress-related psychopathology

### General information

Name coördinator: dr. E.J. Hermans  
E-mail coördinator: erno.hermans@radboudumc.nl  
Grade: 8.2

### Description

Stress is a pervasive phenomenon in our lives that can have severe consequences at levels of organization ranging from molecule to population. This course explains the cognitive and neural (dys)functions underlying the development of stress-related psychopathology. It will provide an overview of relevant disorders such as major depression, anxiety disorders, and addiction. The course will explain how symptomatology observed across these disorders can be mapped onto neural systems supporting cognitive functions such as emotion and mood regulation, attention, motivation, and social cognition. Disease development will be discussed within a theoretical framework of gene- environment interaction, which assumes that psychopathology results from a complex interplay of genetic risk factors and environmental stressors. The course has a broad interdisciplinary and translational character: it will explain how animal models for stress-related disorders are developed in molecular and behavioral neuroscience, how (dys)functions of relevant neural systems are investigated using neuroimaging methods in humans, and how knowledge gained from this research is applied to advance treatment.

### Student opinion

Students said they gained a lot of knowledge in in neuroscience, which is a relatively new area in the bachelor. The transition to online classes was done very well. Not much prior knowledge is needed and teachers explain this new knowledge very good.

### Strengths:

- The minor was very versatile.
- The writing and presenting of the research proposals and the guidance of the mentors were received very well.
- The study work load is not too high and not too low.
- Organisation was good.

### Limitations:

- The format of the discussion workshops after the lectures did not work very well in an online setting, which caused the session to be too long.
- There was some overlap between a few classes.

# MED-MIN18 – Hemato-Oncology: From Concept to Cure

## General information

Name coördinator: dr. A.B. van der Waart  
E-mail coördinator: anniek.vanderwaart@radboudumc.nl  
Grade: 7.9

## Description

The therapeutic field of hemato-oncology is a combination of clinical, molecular and immunological aspects, and is rapidly evolving. On one hand, new insights on the molecular-biological causes of the malignant cells can be used to develop new therapeutical targets. On the other hand, hematological malignancies are excellent targets for cellular immune therapy.

In this minor, the deregulated pathways, clinical aspects, diagnostic and (up-coming) therapeutic strategies are discussed according to the four main groups of hemato-oncological disorders: leukemia's, myeloproliferative disorders, plasma cell disorders, and lymphoma's. Here, both the molecular and immunological aspects are discussed from pathobiology and diagnosis to (molecular & immune) therapy. The knowledge gained in this first part of the minor will be tested by an written exam.

Development of new therapies against hematological malignancies requires (bench-based) research as well as (bedside-based) clinical trials. In the 2nd part of this minor, the gained knowledge will be used to develop a clinical protocol for the development and testing of a new therapy. This will be performed in small work groups (2-4 students ) and will be via examined via a report and oral presentation.

Combined, this minor will give you insight in the pathobiological, clinical, diagnostic and therapeutic field of hematological malignancies, which you will use to develop a new clinical trial to improve patient outcome in hemato-oncological disorders.

## Facts on MED-MIN18

- Understand affected molecular processes in major malignant blood cell disorders
- Use small molecules to correct abnormal cancer cell pathways.
- Learn how immune cells can be trained and modified to specifically kill cancer cells.
- A clinical perspective with molecular and immunological perceptions.
- Design clinical trials to improve patient outcome using precision medicine – pick your own topic!
- ~30% face-to-face education, ~70% self-study and group work.
- Practical on flow cytometry
- Interviews with patients with a hematological malignancy.
- Training your presentation skills.
- Training your writing skills.
- Practicing explaining your clinical trial in a patient (=teacher) – physician (=student) setting.
- Formative exams.
- Very active participation of enthusiastic teachers (clinicians and biologists that in real life team up to design and execute clinical trials).
- Appreciated by both medicine as well as (pre-master) biomedical science students.

## Examination

The assessment of the minor consists of 4 parts:

- 2 Written examinations (weight 2 x 0.25)
- Report Clinical protocol (weight 0.4)
- Presentation Clinical protocol (weight 0.1)

All components must be graded 5.5 or higher to pass the course.

### **Student opinion**

The minor Hemato-Oncology: from concept to cure\* is a well-organized minor where well qualified and enthusiastic teachers take you along in the world of hematological malignancies: from clinical symptoms and diagnostics to personalized targeted and immunological therapies. Within the different educational activities (work groups and writing of a clinical protocol) there is freedom to focus on your own (sub)topic. In the beginning, the course can be experienced as fairly busy or difficult compared to other minors by part of the students, as pre-knowledge on hematology is limited. Overall, the in-dept knowledge gained during this minor is very valuable for both medicine and (pre-master) biomedical science students.

### **Strengths:**

- Well organized course
- Enthusiastic teachers with interactive (even online) well-prepared lectures
- In-depth knowledge, learning new concepts in cancer development and precision medicine
- Prompts students to do their own research and study by themselves
- Opportunity to focus on individual interests, within this field

### **Limitations:**

- The first weeks of the course can be experienced rather full and stressful (for next year we adapted the schedule)
- Lots of new information as Hematology is limited in the rest of the Bachelor (this is also seen as a positive aspect)

## MED-MIN22 – Hemostasis, a delicate balance!

### General information

Name coördinator: dr. B.A.P. Laros- van Gorkom  
E-mail coördinator: britta.laros-vangorkom@radboudumc.nl  
Grade: 7.9

### Description

Regulation of Hemostasis is an essential part of daily clinical practice. Nowadays, more than 50% of the hospitalized patients are treated to prevent thrombotic complications. Most life-threatening complications derive from thrombotic or bleeding events, and searching for the right balance can be a major challenge both for in-hospital and out-patient practice. Thrombosis and hemostasis is an area of continuing innovation and development.

In our minor we provide a translational approach for you to get involved in the magic world of hemostasis. You will get possibilities to integrate your newly acquired knowledge in practice by patient interviewing together with hand-on laboratory diagnostics. Training and coaching in personal presentation skills will be an integral part of the course.

You will be introduced to other stakeholders, like pharmaceutical industries and patient organizations broadening your view. Finally, the course will challenge you to think out of the box with respect to the current therapeutic options; what to do with the giant possibilities with respect to genetics and personalized medicine?

### Strengths:

- The clinical aspects of the minor made it very interesting and easy to follow.
- The teachers were enthusiastic and created an open atmosphere which made it easy to ask questions.
- The structure was good, and the brightspace course was user-friendly. Communication was good as well.
- The virtual patient assignments were nice.
- The presentations and protocols that the students needed to make provided in-depth knowledge of the subjects, which was useful for the exam.

### Limitations:

- The minor is especially tailored toward the medical students and less toward the biomedical students.
- Sometimes it was hard to follow all the presentations for a long time.
- The online classes were not always recorded, which was inconvenient when students had other responsibilities like prof.

## MED-MIN23 – Pediatric Infectious Diseases and Immunity

### General information

Name coordinator: dr. S. van Selm  
E-mail coordinator: Saskia.vanselm@radboudumc.nl  
Grade: 7.9

### Description

The discipline of pediatric infectious diseases covers a broad range of infections. Incidence and manifestations of infections are influenced by the development of the child and the associated maturation and shaping of the immune system, especially in newborns and infants.

Pediatric infectious diseases have been a very fruitful area of science, leading to major new insights and improvements in medical care worldwide. The development of preventive interventions of childhood diseases like diphtheria, measles, polio and pertussis has made a major contribution to the improvement of health worldwide.

In this elective course the student will learn more about the scientific process and principles, while increasing knowledge on pediatric infectious diseases, the developing immune system, immunodeficiency's and vaccines. Understanding of the interplay between the causative agents, pathogenesis and the immune system is an essential step in achieving control and elimination of disease. The course aims to further educate on the scientific process in the medical sciences. You will be able to be inspired by participation in a clinical round, an interactive lab tour and research meetings, and to be in close contact to experts in the field for reflection on the assignments.

### Student opinion

This minor is well organized. It has more self-study assignments than lectures. There is a lot of casuistry and practical work in this minor, this makes it sometimes too clinical for the biomedical science students. The study load is well distributed. The assessment of the minor consists of 3 parts.

### Strengths:

- Interesting lectures
- As a student you learn good, scientific English
- Enthusiastic and helpful teachers
- A tour in the hospital to see your knowledge in practice

### Limitations:

- Less research-based than the other minors
- It is not always clear how much you have to learn for the exams
- Sometimes you are expected to know more than you already do

## MED-MIN27 – Genomics research – from molecule to population

### General information

Name coördinator: dr. ir. D.R.H. de Bruijn  
E-mail coördinator: [diederik.debruijn@radboudumc.nl](mailto:diederik.debruijn@radboudumc.nl)  
Grade: 6.8

### Description

It is safe to say that genome variation contributes to every human disease, except perhaps trauma-related injuries. The relation between genome structure, function, variation and disease-related phenotypes can be studied using genetic, epidemiological, and bioinformatic tools. These tools encompass the whole field from molecular (in vitro, in vivo), in silico, to population-based studies. It is likely that any (bio)medical researcher will encounter or use these tools in his/her own research activities. This minor focuses on the application of such tools to (bio)medicine. In other words: To use the information contained within the genome of patients to understand and diagnose diseases, and (when possible) define strategies for prevention, treatment and/or curing these diseases.

### Student opinion

The different ways of testing in this minor is very nice. In the 5th week there is a written exam, halfway the minor a literature assignment and at the end a second written exam and an integrative assignment. The minor is very well organised and has a good build-up of theory. There are only a few teachers in this minor, who are very approachable and have a lot of knowledge. The bioinformatics part of this minor may be quite hard for Medicine students, since the Biomedical students have already had some bioinformatics previously in their Bachelor.

### Strengths

- Good build-up of theory
- Broad range of subjects with 1 theme in general
- A lot of different techniques
- Assignments were very well related to the lessons
- Approachable and enthusiastic teachers
- Different ways of testing

### Limitations

- Sometimes the theory was not explained properly
- Test at the end of the minor was very long
- Bioinformatics hard for medical students since they have never had this in the rest of the Bachelor. Whereas Biomedical students have had some bioinformatics.
- Sometimes quite some detailed information, which can be hard

## MED-MIN30 – Effectively handling the challenges of a future healthy healthcare system

### General information

Name coördinator: Prof. dr. P.P.T. Jeurissen  
E-mail coördinator: patrick.jeurissen@radboudumc.nl

### Description

For you as a future (bio)medical professional it is increasingly important to understand the basic concepts of how healthcare systems work (governance, models of care and models of business) and how its institutions are organized (financing, regulations, policies, decision making). Not only as a practitioner but also in future research, you should be able to positively embed your working goals within the wider healthcare system that comes with all kinds of specific constraints. Furthermore, you will find jobs ranging across a broad spectrum that range from consultants to surgeons. In these roles you also will have to manage 'business' aspects of healthcare provision, such as financial sustainability or the development of new models of care. A good understanding of these topics is therefore essential for (bio)medical students.

This minor will give you the opportunity to gain a better understanding of healthcare systems and finance, but in a practical way. It will do this by forming a learning community of future practitioners and researchers. Learning how to tackle common institutional constraints for innovative approaches from a (bio)medical perspective is what makes this minor unique. Thus, a truly interdisciplinary approach – bridging medicine and biomedical sciences with its social context - is at the forefront of this minor.

At the start of the minor you assimilate yourselves with relevant trends in different healthcare fields that might spur the development of new models of care: chronic diseases, public health, and elective care. Established expert staff from Radboudumc will guide you to main process innovations such as care networks, digital health, minimal invasive surgery, hospital at home and possible effective models of care needed in order to effectively implement these innovations. At the end of the minor you have written a case report on what these changes would demand of specific transitions of the health care system.

### Student opinion

This is a brand-new minor, therefore there is no information concerning last years edition yet.

# Wednesday Courses

## MED-B3KOB – Advanced data analysis and programming

### General information

Name coordinator: dr. A.M.A. Pistorius  
E-mail coordinator: Arthur.pistorius@radboudumc.nl  
Grade: 7.8

### Description

In many areas of the biomedical sciences you, as a researcher have the task to discover relevant parameters in sometimes large data sets or to match experimental data with a theoretical model. It appears not easy to make a choice from a wealth of specialized, user-friendly, commercial software and to remain critical with respect to the method and the outcome, when using these packages. In order to prevent scientific errors and to improve reusability of data and software, data-analysis is often carried out using e.g. MATLAB, R or Image-J. Although the latter two open source programs are more specialized for statistics and image analysis respectively, these all-purpose programs are available for several computer platforms and might be considered as standard programs for tackling all kinds of data-acquisition, analysis, and visualization of scientific data in many fields of science. By virtue of their open character, you are free to adapt its functionality and to design new functionality to tailor the program to your own needs.

In this practical course, you will develop experience in the use of MATLAB as an example of one of the most important scientific software suites. Training in the use of such a program may prove advantageous in later stages of your study or career when research data have to be analyzed or when literature data have to be critically assessed. Moreover, armed with this experience, you are able to understand and to adapt programs or scripts in other programming languages when needed. MATLAB will be introduced as an all-round, full-fledged programming environment. Elements of the syntax and the use of function M-files are treated and applied to research questions from the biomedical sciences (data analysis, statistics and graphical presentation) which you will elaborate with a fellow-student. Case studies are selected from biochemistry, bioinformatics, cell biology, pharmacology, neurosciences, physiology, hematology and cardio-vascular studies. You are invited to work on research projects of your own choice.

### Student opinion

Every wednesday starts with an introduction lecture which can be very in-depth very soon, which makes it hard to follow sometimes. After this, you will make the practise assignments in pairs of two. In the afternoon there are practicals based on biomedical literature, these are the most interesting part of the day. They were mostly on campus and were combined with peer feedback. The exam was hard, but aligned with the learning objectives and was very doable.

### Strengths:

- All the activities fit in the daily schedule, so not much extra work.
- Possibility to propose subjects of own interest.
- The introduction in data analysis and programming is very applicable.

### Limitations:

- Last minute schedule changes.
- Sometimes there was a lack of background information.
- Too little assistance during the practicals.

## MED-B3KOE – Science in action, philosophy & the dynamics of science

### General information

Name coordinator: dr. A.J.M. Oerlemans  
E-mail coordinator: anke.oerlemans@radboudumc.nl  
Grade: 8.0

### Description

Science was long regarded as an isolated practice of small groups of experts, completely separate from “the real world”, whose products eventually trickled down into society. In the 20<sup>th</sup> century, this sharp divide vanished. Many now consider science a social phenomenon, which takes shape in a context with many different influences. Scientists, policymakers, interest groups, patients, political forces and societal developments all shape scientific thinking and the products of science.

In this course we will look at this social phenomenon through the eyes of different philosophical and sociological theories. We will use different case studies – HIV/AIDS, sickle cell anemia, ADHD, among others – to consider the different actors and contextual factors that influence biomedical science. Throughout the course we will look at the influence of societal developments, technology, political activism, external sponsors, the institutional context and the role of the scientists themselves. You will work on a report, in which you apply the different theories and perspectives to one specific case study (disease).

After completing this course, you will be able to take a broader perspective towards scientific practice and reflect on the context that influences biomedical science and its products.

### Student opinion

In this course, you will learn about different science-related issues which will broaden your perspective on science. The course is well organized and divided in some interesting themes that are logically scheduled. On the basis of working groups and SSAs the themes will be sufficiently discussed. There are enough opportunities to ask questions or additional explanation. Besides, a report has to be written where pairs can delve into their own topic of interest.

### Strengths:

- Interesting study materials, different from the rest of the bachelor’s programme.
- Good and enthusiastic teachers.
- Interactive and small scaled lectures.
- Clear structure.

### Limitations:

- Some of the preparation texts were very complex and thus hard to read.
- Some students missed guidance during the last assignment.

## MED-B3KOF – From mice to men: translating animal research into clinical benefit

### General information

Name coordinator: dr. K.E. Wever  
E-mail coordinator: Kim.wever@radboudumc.nl  
Grade: 7.2

### Description

In this course you will gain a deep understanding of the impact of animal research on human health(care). The role of animal research in e.g. drug development and toxicology is controversial: it is both championed as essential and criticised as unethical and ineffective. Bear in mind that the ethical justification of animal studies critically relies on their expected contribution to improving human health; an expectation which is often unmet. Most therapies showing promising results in animals fail to translate to patients in terms of efficacy or safety. For instance, despite successful testing in animals, up to 85% of early clinical trials for novel drugs fail! Thus, translating animal data to humans is apparently not an easy task. How can the value of necessary animal studies be maximized?

In this course you will investigate the possible causes of translational failure when translating results from animal studies to humans. You will learn how to signal and prevent a variety of important limitations, biases and systematic failures in the use of animals as models for human disease. We will cover aspects of construct validity, internal validity, external validity, reporting quality, meta-research and we will discuss non-animal alternatives to animal models. You will work on case studies from disease areas such as stroke, Alzheimer's disease, spinal cord injury, renal failure, MI and cancer. After this course you will be equipped to assess the quality and robustness of an individual animal study, as well as a set of animal studies. Furthermore, you will have the knowledge needed to optimize the experimental setup of future animal studies.

### Student opinion

This minor gives you an introduction into animal research. Different topics regarding the translational problems involved in animal research are covered. Due to the fact that this topic is not part of the regular program of Biomedical Sciences it is very useful for students interested in performing animal studies. During the minor you will work on a topic of your choice, and describe the translational issues in the study of that specific disease. This assignment gives you the opportunity to directly incorporate the knowledge you have learned during the lectures.

### Strengths:

- Speed dates with people of the Animal Welfare Body and animal scientists
- In depth assignment on a specific topic of choice
- Gives you a clear overview of the pros and cons of animal studies
- 

### Limitations:

- Organisation could be chaotic sometimes
- Most lectures were presented in Dutch

## MED-B3KOG: Popular science writing

### General information

Name coordinator: L.H. Faulds, MA  
E-mail coordinator: Lorraine.Faulds@radboudumc.nl  
Grade: 8.1

### Description

Academics are increasingly expected not only to be able to write research papers for a specialist audience, but also to have the ability to communicate important findings and the relevance of their research to the general public. In this course, participants develop their English writing skills and learn to write texts on scientific topics aimed at general audiences.

Participants will work in groups to create a popular science magazine containing a variety of different popular scientific texts. Each student will write one article about a recent scientific paper or finding that conveys the relevance of this research to a lay audience. In addition, students will collaborate on an interview article which introduces a scientist and their work to the broader public. These assignments will then be put together in a final publication, which may also include other short articles and features to attract their chosen reader.

Students will be graded on the style, coherence and appeal of their individual article and their contribution to the group assignments.

### Student opinion

Very informative course about for writing articles – both popular and scientific!

### Strengths:

- Enthusiastic teachers with good feedback
- Clear lectures which use both good and bad examples from our own texts
- Small group with a lot of interaction
- Concepts that were taught (such as structure and word usage) were not only helpful for popular science writing, but also for other assignments.

### Limitations:

- Sometimes we wanted to spend more time giving peer feedback
- As classes are entirely in English, this made tasks a little more difficult on occasion, as you do not always know how to word something in English.
- Homework tasks were not always clear

## MED-B3KOH: Consultancy

### General information

Name coordinator: dr. ir. R.P.B. Reuzel  
E-mail coordinator: rob.reuzel@radboudumc.nl  
Grade: 8.6

### Description

'Consultancy' is one of three career profiles students of Biomedical Sciences can choose in their master's program. It has been developed for those who aspire to assume a role as an advisor, i.e. someone who on the basis of his or her scientific background can determine what are effective solutions to biomedical problems, but also has the communicative skills to manage the possibly different views and stakes of persons involved. The latter requires that, apart from a solid scientific background, analytical skills, and creativity, you have developed competencies such as listening, maintaining a client focus, negotiating, and managing resistance. And this, in turn, requires that you have a clear view on who you are, understand what are your signature strengths, and can use these to manage yourself in interaction with others. This course offers an introduction to consultancy and the required communicative skills. It has been developed for those who already know that their future is in consultancy, as well as for those who wish to discover whether consultancy suits them.

This is a matter of learning by doing. You and your peers will constitute your own learning lab and engage in a series of workshops that will have your personality and signature strengths surface. On the basis of feedback you will reflect on your behavior and its effectiveness, and experiment with alternatives. Very importantly, you should understand that essentially this is about you. You should participate only if you feel comfortable being approached personally and sharing your thoughts and feelings with your peers.

### Student opinion

This course is very good for both your self-knowledge as your personal development. This course is more about the student him/herself than the study material!

### Strengths:

- Student appreciate the personal attention from the teachers for their development. The safety in the group makes it possible to be yourself and show a more vulnerable side. There is a positive accent on talents instead of learning goals.
- The guest lecturers were appreciated very much.
- Students were enthusiastic about the three-day mini-advisory trajectory based on a real client case.

### Limitations:

- Students would like to see more theory of consultancy.

# Thursday & Friday

## Minors

## MED-MIN03 – Cardiovascular science; nothing beats the heart

**Disclaimer; major changes have been made to this minor, compared to last year.**

### General information

Name coordinator: prof. dr. D.H.J. Thijssen  
E-mail coordinator: dick.thijssen@radboudumc.nl  
Grade: 6.3

### Description

In this minor, a group of dedicated (pre)clinical investigators will introduce you to the field of Cardiovascular Science. Cardiovascular disease remains the world's leading cause of death, which highlights the importance of understanding the regulation of the cardiovascular system and how to prevent the development or progression of cardiovascular disease. Arguably, prevention of cardiovascular disease starts before birth, and should remain a central focus of contemporary medicine throughout the rest of one's life. For this reason, we have structured this minor around the themes of primary (i.e. development of atherosclerosis), secondary (i.e. care around acute events) and tertiary (i.e. development of heart failure and associated pathology) prevention of cardiovascular disease. By better understanding of the underlying pathologies, insight into state-of-the-art technology to evaluate cardiovascular health, and discussion of future opportunities, we will provide a comprehensive overview of the cutting-edge research and innovations in the field of cardiovascular science.

In short, you will first learn about the pathophysiology of atherosclerosis, the novel insights into the role of inflammation in atherosclerosis progression, and its impact on the function of structure of the heart (Part A). Subsequently, we will focus on the moment when it all goes wrong; a myocardial infarction, the need for (immediate) surgery, rhythm problems, and pathologies of the heart valves (Part B). Finally, we learn about the longer-term impact of abnormalities of the heart, often leading to heart failure and its complex, multi-organ and multi-factorial aetiology (Part C). A cross-cutting theme in this minor is the translation of preclinical and population research findings to humans in vivo in order to improve health care and outcome of patients (Part D). For this reason, you will collaborate in research teams of 3-4 students to design your own research project. Within this group-based work, you will acquire specific skills around presenting (infographics, pitch-type presentations, figures) and writing (grants, papers).

### Student opinion

This minor was well received by biomedical science students as by medicine students, even though the minor focusses on research. The teachers are very enthusiastic and know a lot about their field of expertise. The practical's are very informative and were explained properly. The minor goes deep into the subject of matter, which is sometimes experienced as too difficult.

### Strengths:

- Much in-depth knowledge
- Lots of practical work
- Enthusiastic teachers

### Limitations:

- Long days with many contact hours
- Sometimes unclear what is expected for the exam
- The different parts of the minor seem to be uncoherent of each other

## MED-MIN08 – State-of-the-art research technologies in cancer, immunology and diagnostics

### General information

Name coordinator: dr. ir. W.F. Daamen  
E-mail coordinator: willeke.daamen@radboudumc.nl  
Grade: 7.0

### Description

This minor focusses on molecular and biomedical technologies and strategies used in modern laboratories all over the world. Focus is on contemporary challenges in cancer, immunology and diagnostics. The minor has a strong emphasis on practical skills, and prepares students for their traineeships in pathobiological, toxicological and biomedical research. The technologies practiced are all firmly embedded in current medical challenges such as cancer, inflammation, biomarkers and toxicological issues. Technologies that will be addressed include molecular-biological techniques for DNA/RNA/protein analyses, mass spectrometry, (immune)histological/cell-based techniques, and bioinformatics. Hands-on (lab) activities with the aforementioned techniques constitute a major part of the minor. In addition, ample training will be given to rationally apply technologies to design research strategies, and to be able to communicate data/designs in a comprehensive way. The minor will be capped by a mini-symposium in which the student will be given the opportunity to present a self-designed research strategy focused on a biomedical issue of her/his own choice.

### Student opinion

The minor was very educational, we learned a lot. The intention of the practicals was to do as much by yourself as possible (or with a partner), which is very valuable. The subjects are very diverse and in-depth. The teachers are enthusiastic and they are motivated to give their lectures as good as possible.

### Strengths:

- Enthusiastic and motivating teachers.
- Almost all modern biomedical techniques were considered, both in theory and practise.
- Lots of practising and the techniques were embedded in challenging biomedical topics.
- 

### Limitations:

- Sometimes feedback on written reports took a long time.

## MED-MIN10 – Diagnostics and molecular research in kidney disease

### General information

Name coordinator: prof. dr. D. Swinkels  
E-mail coordinator: dorine.swinkels@radboudumc.nl  
Grade: 7.7

### Description

Each day, 180 liters of plasma is filtered by your kidneys to remove waste products from the circulation and maintain volume homeostasis. Around 99% of this filtrate/pro-urine is reabsorbed within the kidney via various transport processes, making the kidney a true hub of activity. A vast number of factors governs transport in the kidney, many of which are still largely unknown to us.

This is where you come in! In this minor, you will adopt the role of a renal researcher, attempting to answer questions like: Can we come up with alternatives to kidney transplants? What is the link between hypertension and kidney disease? Which cells are involved in scar-formation in focal segmental glomerulosclerosis? How does the kidney regulate excretion of magnesium and calcium, even though dietary intake varies wildly? How accurate and precise are the diagnostic tools that we currently have, and can we improve them?

In addition, there will be multiple opportunities to discuss the impact of renal disease with patients suffering from kidney diseases. What is it like to receive a renal transplant? What is the impact of having to travel to the dialysis ward almost every day?

This will provide you with the framework you need to set up and conduct your very own experiments at the one of the Radboudumc departments with ongoing ground-breaking renal research programs.

Over the course of several weeks, you will function as a PhD student at such a department, and hopefully add exciting new knowledge on renal disease mechanisms and associated leads for novel diagnostic tools or treatment targets kidney. You will present your newly found data to the other researchers at the department and in a scientific article.

Taken together, this minor introduces you to current topics in renal disease, using a bench-to-bedside approach. A variety of lab, diagnostics, clinical and social experiences will help you gain a better understanding of the connection between fundamental kidney research and clinical practice. And will let you experience top-notch research first-hand to prepare you for your bachelor internship.

### Student opinion

Interesting and varied minor given by enthusiastic experts and supervisors who know how to fascinate you with their experience from the daily Radboudumc practice. We had the opportunity to get to know new aspects of the clinic and diagnostics of kidney disease and to really dive deep into a nephrological research topic.

### Strengths:

- Enthusiastic, helpful and specialist teachers.
- Diverse and interesting with much room for more in-depth knowledge compared to the bachelor.
- Very doable in the given time and the exams match with the study materials

### Limitations:

- The weight of the different exam topics does not reflect the study work load completely.
- Organisation was not always perfect.

## MED-MIN12 – Assessment of Surgical Innovation

### General information

Name coordinator: dr. M.J.G.M. Tummers  
E-mail coordinator: Marcia.tummers@radboudumc.nl  
Grade: 8.2

### Description

This minor is for those who want to improve surgical care by ensuring that innovative interventions match the needs of patients, physicians, and other stakeholders. Therefore we need to look at surgical practice from the perspectives of all relevant stakeholders and understand what working mechanisms contribute to problems in the field. We need to understand which working mechanisms (biological, social, political) contribute to problems, and identify new interventions to solve them. We also need to employ mechanism- and evidence-based approaches to evaluate the interventions. This all helps to understand the value of interventions, identify barriers and facilitators to implementation, and recognize possibilities for improvement.

You will learn basic methods of problem structuring (interviewing, qualitative research, interactive evaluation), and health technology assessment (outcome measurement, economic analysis and decision modeling). This minor involves practice-based learning, you and others working with stakeholders on real problems in the field of surgery.

### Student opinion

Students are really enthusiastic about the projects, and the opportunity to work on it in this clinical environment. The project was very realistic, and was an addition to their methodological knowledge and their personal development.

### Strengths:

- You get the chance to work on a big project which is clinically-based and actually relevant.
- In the projects there is a lot of communication with the involved patients, doctors, HTA-experts and other people.
- Much guidance of teachers and attention to the process.
- The theoretical lectures were tailored to the needs of the students.

### Limitations:

- The examination was not always clear.
- Some teachers were not very accessible.

## MED-MIN13 – Medical Biotechnology towards Clinical Practice

### General information

Name coordinator: dr. R. Wansink  
E-mail coordinator: rick.wansink@radboudumc.nl  
Grade: 7.8

### Description

Medical biotechnology comprises the application of living cells or cell material in the development or generation of products to prevent, diagnose or treat human disease. Historical examples of biotechnology in support of medicine are the development of vaccines against smallpox and the production of antibiotics or human insulin by bacteria or yeast. Exciting 21st century developments are genetic engineering with CRISPR/Cas (Nobel Prize in Chemistry 2020), gene therapy, mRNA vaccines against COVID-19 and stem cell-based regenerative medicine. Medical biotechnology is a fascinating and rapidly evolving field, integrating molecular, cell biological, genetic and immunological research areas.

The first part of this Minor runs together with the course NWI-MOL104 Medical Biotechnology for students from the Faculty of Science from the RU and provides an overview of how interdisciplinary efforts help shaping modern healthcare by developing biotechnological diagnostics and therapeutics for precision medicine. Principles and concepts of medical biotechnology will be discussed in a scientific and medical context, including legal, societal and ethical considerations. Together with students from different life sciences disciplines you will write a medical biotechnological research proposal and present this at a mini-symposium.

In the second half of the Minor you will carry out experiments in four different projects in the lab. These include molecular diagnostics (e.g., PCR, sequencing), recombinant DNA techniques, recombinant protein production, cell culture and adhesion assays, and cell transfection experiments mimicking gene therapy.

Altogether, Medical Biotechnology towards Clinical Practice presents an excellent practical and theoretical course for students interested in molecular life sciences and in biotechnological innovations for patient care.

### Examination

Assessment consists of eight parts (each must be graded at least 5.5 to pass the course):

- Written exam Q9 (midterm; individual; weight 20%)
- Performance during research proposal writing (individual; weight 5%)
- Written mini-review and research proposal (group; weight 20%)
- Oral presentation of research proposal (group; weight 5%)
- Oral presentation of lab project (individual; weight 7.5%)
- Three written lab project reports (individual; total weight 30%)
- Performance during lab practicals (individual; weight 5%)
- Written exam Q10 (final; individual; weight 7.5%)

### Student opinion

This minor will prepare you well for your internship, the broadest way possible. The first nine weeks are only dedicated to theory and the writing of a research proposal together with FNWI students. The last eleven weeks comprise four different lab projects in which a lot of experimental skills are obtained.

"Most teachers were very enthusiastic, knowledgeable and approachable"

"The study load was quite high, but the assignments were very informative."

"I liked the practicals. I learn more in practice than only from a book or literature."

**Strengths:**

- Enthusiastic, approachable, knowledgeable teachers
- Interesting and innovative topics
- Well organized minor (lectures, self study, response course)
- Great practicals, which prepare for wet lab internship
- Writing of research proposal in teams with students from Science Faculty
- Writing of research lab reports was very educational
- Fills life sciences knowledge gaps from bachelor.

**Limitations:**

- High study load
- A lot of theory and different topics
- Ambitious, sometimes difficult lectures

## MED-MIN16 – Translational neuroscience

### General information

Name coordinator: dr. D. Schubert  
E-mail coordinator: d.schubert@donders.ru.nl  
Grade: 7.7

### Description

Why are there currently still no cures even for intensively studied neurodevelopmental and movement disorders, such as autism spectrum disorders? Starting from this basic question you are going to set a frame in this interfaculty minor “Translational Neuroscience” and draw upon the following topics: What is nowadays known about the neurobiological mechanisms underlying these disorders – and what is not known? What state of the art scientific tools do we currently have to investigate these disorders? Where is preclinical and clinical research now and are there new treatments and therapies in sight? The problems clinicians and researchers nowadays face with neurodevelopmental and movement disorders range from diagnostics, neurobiology, genetics and choosing suitable research methodologies to therapy.

Aim of this course is to enable you to apply the current knowledge in neurobiology to propose translational research strategies that will help to either better understand the etiology of neurological disorders or their potential treatments. The course has been found very valuable by students of medicine, biomedical sciences, biology and molecular life sciences that want to learn about clinical neuroscience and neurobiology - and - how to bridge between these two disciplines: that is *Translational Neuroscience*.

A core element of the minor is that during its entire length you will work in groups of three students in order to produce together a translational research proposal for studying a particular neurological or movement disorder. During this project you will carry out a systematic review of the scientific literature complementary to the information that has been taught in the course modules. Each group will be supported by a “personal tutor”, who is an expert scientist or clinician in the respective field.

For a short information slide presentation about MED-MIN16, please also visit: [www.schubert-neurolab.org/med-min16.html](http://www.schubert-neurolab.org/med-min16.html)

Content wise, we will first introduce the clinical problem settings. Partially using patient demonstrations, clinicians, who have hands-on experience on the respective disorders, will introduce the clinical aspects of selected relevant neurological and movement disorders. Subsequently researchers will provide you with the fundamental knowledge of neurobiological and genetic processes as well as state of the art methodologies (including (lab) practical(s)), at a level where you can appreciate the mechanisms that (potentially) underlie neurological disorders. Finally, we will explain and illustrate the current applications of various methodologies in translational and clinical research as well as in therapy and diagnostics. Towards the end of the course, you will have two times the chance to spend 1.5 days either in a lab or in a clinical department and to get hands on experience in translational research.

Taken together you will learn about the applicability, advantages and disadvantages of the experimental methodological approaches that are currently available to study the animal and human brain and how to integrate all this in your translational research proposal project.

### Student opinion

" Very interesting! Learned a lot, and I would choose it again:)"

"I was a bit hesitant to start, seeing as it was not my main choice. But the subjects that were treated were very interesting."

"I improved a lot. Other neuroscience courses became much easier after this minor. It increased my interest in neuroscience even more! Thank you!"

"The teachers seem thrilled to teach about this topic and the enthusiasm is contagious. ..."

"Coordinator very enthusiastic, lots of clear guidelines. Some potentially interesting education was scrapped because of corona, but adequate alternatives were found."

"... I just hoped to have learned more about the diseases in depth."

"I think the proposal writing was the most instructive (and then I mean the entire process from the mini-review to the presentation). It's really good practice. .... It's really nice to be able to pick a subject in this situation and be guided along while writing the proposal. I really think I learned a lot here."

#### **Strengths:**

- Broad range of subjects
- Interesting topic
- Great build-up throughout the module.
- The brain dissection was one of the major highlights.
- Bootcamps
- Very good communication
- Free choice in topic for presentation and proposal
- Different from other neuroscience courses
- Lot of variation in teaching methods, lectures, practicals, presentations, exercises.
- Interactive lectures.
- 

#### **Limitations:**

- Discussions and student interaction reduced (due to covid)
- Not all lectures were recorded
- The topics for the exams were not quite clear due to broad topical coverage.
- In particular in the beginning not all students were aware of the how and what of writing a proposal.

## MED-MIN17 – Biomedical Research Methods (PRE-MASTER)

### Only for Pre-master students!

#### General information

Name coordinator: dr. I.S.L.M. van Rooij  
E-mail coordinator: iris.vanrooij@radboudumc.nl  
Grade: 7.3

#### Description

The minor Biomedical Research Methods is specifically designed for premaster students of Biomedical Sciences. In this minor students will learn most of the research content that regular BMS bachelor students learned during their first 1,5 years of study. It is about human-based research in populations. Research methods and practice starting from formulating a research question to reporting about results will be taught, including finding literature, data collection methods, study designs, sources of bias, and statistical analyses. Besides epidemiology and statistics, ethical concerns in scientific research will be discussed and students will learn to build and use models to study dynamic biomedical processes and to make predictions based on these models. Students will get practical experience with the program SPSS in this minor and will actively work on the design of a study for pregnancy outcomes and on analyzing data to explore causal factors for bladder cancer or diabetes mellitus.

#### Student opinion

A very instructive minor to receive education in research methodology, statistics and modelling as a pre-master BMW from higher vocational education or another university bachelor's degree.

#### Strengths:

- Enthusiastic and involved teachers.
- Contact hours and self-study assignments are divided well over the weeks.
- The minor really connects to the HBO.
- Logical structure of the minor and the distribution of the tests is good.
- It is nice to gain practical experience based on the theory of research methods and statistics.

#### Limitations:

- There should be more personal guidance instead of group guidance in the "short report" section.
- The teaching of the "Modeling" component does not tie in very well with the test.

## MED-MIN19 – Clinical Exercise Physiology

### General information

Name coordinator: dr. T.M.H. Eijsvogels  
E-mail coordinator: thijs.eijsvogels@radboudumc.nl  
Grade: 8.9

### Description

Knowledge about exercise physiology is getting more and more important in clinical practice. Exercise tests are often used to diagnose patients and regular exercise has been proven to be vital in primary/secondary prevention and treatment of several diseases. In the Biomedical Sciences and Medicine curriculum there is limited attention for the physiological changes that occur in response to acute and chronic exercise. The relevance of this knowledge for medical sciences is only minimally addressed as well. Therefore, the purpose of this minor is to focus on clinical exercise physiology by offering a 20 week program developed to gain all knowledge needed to apply the principles of exercise physiology in (medical) practice and in a scientific context.

The first part of the minor (week 1 - 10) starts with a recap of the general physiology followed by in-depth discussion of the respiratory, circulatory and muscular systems, which are the primary organ systems in exercise physiology. For each system you will learn the physiology at rest, in response to acute exercise, and of adaptations following long-term exercise exposure. The lectures, working groups and practical work meetings will be based on a combination of patient cases and observations in athletes.

The second part of the minor (week 11 – 20) will focus on practical application of your exercise physiology knowledge. For example, you will learn to perform and interpret exercise tests and use the outcomes of the test to diagnose abnormalities in patients. We will visit National Sports Centre Papendal to observe how scientific knowledge is implemented in (clinical) practice. You will also learn the principles of training physiology and apply this knowledge by developing a training program for an athlete or patient. Finally, you will also get acquainted with pre- peri- and post-treatment exercise programs in oncology and the cardiac and pulmonary rehabilitation programs of the Radboudumc.

The minor is highly recommended for biomedical sciences students with interest in the field of human movement sciences, and/or medical students interested in physiology and in specializations using the clinical application of exercise testing (i.e. oncology, cardiology, lung disease, (neuro)muscular disorders, sports medicine, etc).

### Student opinion

Interesting and in-depth minor for anyone who has an affinity, passion or ambition for sports and exercise. A very valuable addition to the core curriculum for both medicine and biomedical sciences students.

### Strengths:

- Enthusiastic teachers, great communication and well-adjusted to corona.
- Interesting study materials, useful lectures/working groups, challenging practicals.
- There was variation in examination, and the self study assignments were scheduled in mytimetable, which was very nice

### Limitations:

- The first 10 weeks were very busy.
- Students had to get used to all the classes being in English.

## MED-MIN21 – Breast cancer; biology, treatment, patient

### General information

Name coordinator: dr. M.M.P. Zegers  
E-mail coordinator: mirjam.zegers@radboudumc.nl  
Grade: 8.3

### Description

About 14,000 women (and 100 men) are diagnosed with invasive breast cancer each year in the Netherlands, which means that 12-13% of women will develop breast cancer at any time in her life. Early detection, particularly via national breast cancer screening, combined with locoregional treatment and systemic adjuvant therapy has improved the prognosis in women with breast cancer (Breast Cancer Guideline, NABON 2012). In this minor, we will use breast cancer as example to understand the many factors that determine successful translational research on a human disease. Breast cancer is a good example for this approach as it is major cause of mortality, and a well-studied disease with various underlying molecular defects to which targeted therapies can be designed. Furthermore, breast cancer patient support and advocacy groups are relatively large and well-organized and are an important factor in research fund raising.

The main aspects covered in this minor include the following:

- The molecular mechanisms that cause the disease
- Preclinical cell and animal models to study the disease and to predict therapeutic efficacy
- Methods for diagnosis, and to design targeted and personalized treatment
- How to monitor efficacy of therapy?
- Patients-involvement in decision making?
- How to write a research proposal

### Student opinion

Interesting minor with great teachers, and the digital classes were good as well. Especially the lab work and the writing of the lab report were highly appreciated. The workload was high, but the balance between contact hours and self-study time was good.

### Strengths:

- Involvement, quality and enthusiasm of the teachers.
- Lab work and report writing, lectures.

### Limitations:

- Scheduling, too high workload at the end.
- Brightspace organization.

## MED-MIN25 – Sustainable healthcare improvement: principles and practice

### General information

Name coordinator: dr. J.C.C. Braspenning  
E-mail coordinator: joze.braspenning@radboudumc.nl  
Grade: 6.4

### Description

The aim of this minor is to deepen the understanding and teaching the skills regarding methods of quality of care management and research. The minor is structured around three themes on quality of care that is (1) healthcare (systems), (2) different stakeholder's perspectives on quality of care, and (3) designing an appropriate improvement plan (innovation and implementation). Knowledge on healthcare systems and their health outcomes shows improvement possibilities. The definition of meaningful patient outcomes is crucial in this process. Quality of care relates to various outcomes. Furthermore, patients, doctors and payers draw attention to different aspects of these outcomes. So, choosing outcomes is more or less a profession in itself, and it is basic material for the evaluation of care. Nowadays, care is often organised in care pathways (integrated care) in which different professionals need to collaborate (interprofessional collaboration). Integrated care stresses the search for meaningful outcomes even more, but raises also questions on the governance of the collaborative. Who is ideally in charge? How is information shared? These questions are addressed in the minor as well. As professionals will have to keep on track with all these changes, the development of an improvement plan to introduce changes will be at the heart of the minor. To learn how quality management takes place in clinical practice an excursion to a nursing home will be arranged.

### Student opinion

Very interesting minor that connects to current affairs. The practical experience was received very well, and the guidance was enthusiastic and of good quality. There was a lot of reading work, but it was a great addition to the rest of the bachelors programme.

### Strengths:

- From the perspective of various stakeholders (healthcare providers and patients)
- Nice practical experience in a nursing home
- Elaborated on the basis of elderly care; supplementary to other modules on elderly care
- Good enthusiastic guidance
- Clear, good planning

### Limitations:

- Prefer to collaborate more in groups; more mutual interaction
- Lots of reading
- Variation in online teaching methods could be even better.
- When developing an improvement proposal, also offer the possibility for elaboration on the basis of another subject, for example psychiatry
- Assessment of presentation

## MED-MIN28 – Human embryology in perspective

### General information

Name coordinator: dr. ir. C.J.A. Roeleveld  
E-mail coordinator: nel.roeleveld@radboudumc.nl  
Grade: 8.6

### Description

If you are fascinated by the complex process that leads from just two cells to the development of a complete human being and would like to know more about the causes and clinical aspects of birth defects, you will like this minor. It will enhance your knowledge of embryonic and fetal development of all major organ systems of the human body and will show you the variety of birth defects in these organ systems. In addition, you will get familiar with research and care involved in pregnancies complicated by birth defects and in children with birth defects. Clinical aspects, such as prenatal screening, diagnosis, treatment, prognosis and ethical issues will be addressed and discussed with clinicians working in the field. You will also acquire knowledge on the influence of several non-genetic / environmental risk factors, such as smoking or medication use during pregnancy, on embryonic and fetal development. You will apply your knowledge and skills acquired during the minor by developing a research proposal, and literature related to your topic will be discussed in a small journal club. Finally, you will get the chance to meet and collaborate with patients with a birth defect or their parents to get familiar with the social and emotional context of these disorders. During the minor, you will work individually or in small groups on different projects. Birth defects are important causes of chronic illness and disability and even prenatal or childhood mortality, whereas some birth defects may be prevented by vaccination, changes in lifestyle habits or medication, adequate food intake and/or adequate antenatal care. This minor provides insight into the work of the epidemiologist, gynaecologist, clinical geneticist, neonatologist, paediatrician, developmental biologist and others concerned with causes and consequences of birth defects and clinical care of patients with a birth defect as well as insight into the lives of patients with birth defects and their parents.

### Student opinion

The students learn a lot about embryology, the clinic and experience of congenital anomalies, as well as conducting research into these abnormalities and risk factors for their development. They think it is a varied minor with, in addition to embryological knowledge, a lot of attention for both the clinic and scientific research.

### Strengths:

The students are predominantly positive about the minor. They appreciate the variety in the type of education, the parts we organize such as the visit to the NICU, the Welearn patient participation program and the chicken egg practicum. Lecturers and guest speakers are assessed properly, as are the sequence and timing of most teaching and exams

### Limitations:

Some find the study load heavy in the first weeks. Every year a lecture changes its time due to the large number of teachers and clinicians who participate, which a few find annoying. A little more time could have been given for the research proposal, but this will be adjusted next year.

## MED-MIN29 – Control of Infectious Diseases

### General information

Name coordinator: dr. J.L.A. Hautvast  
E-mail coordinator: Jeannine.hautvast@radboudumc.nl  
Grade: 7.4

### Description

This Minor focuses on the acquisition of essential scientific knowledge and skills to contribute to the prevention, containment, rational antimicrobial treatment and control of infectious diseases in hospital and community settings. Outbreak management, comparable to what we have experienced during the coronavirus outbreak, will be discussed. This minor prepares students for a research and clinical internship in the area of infectious diseases and infection control.

The Minor uses various teaching manners, such as lectures, group work, presentations, joining a point prevalence study in the hospital, a table-top exercise on outbreak control in the hospital, a serious on outbreak control in the community a serious game, and several excursions (TB clinic, RIVM).

Evaluations from previous years show that students appreciate the enthusiasm of the teachers, the various exercises, games and excursions, and they value their acquired academic skills by performing a field study, presenting the results, and writing a scientific article.

### Student opinion

- Lots of variety, of everything, both subjects and parts (like modeling, once something different)
- There was a lot of topicality in it
- Different forms of assessment were nice / fun
- Fairly good spread of tests and reports
- Lots of substantive knowledge of teachers for in-depth questions
- Using guest professors is educational and fun
- Study load and duration of SSA was fine

### Strengths:

- The teachers are able to increase interest for the subjects. Also nice to see that the teachers really "mean" something in the infectious disease world.
- An attempt has been made to provide as many practical examples as possible.
- The interactivity and the passion of teachers were the positives.
- One Health Game. Students feel that they were put into practice here and had to learn to deal with the chaos that can sometimes occur. All facets about infectious diseases were discussed in a fun and smooth way.

### Limitations:

- In the minor guide it was explained that the minor was about population, individual and cell level. I was a little disappointed that the molecular level was limited and not profound.
- Going in-depth about a subject is always good, I felt that sometimes a bit of depth was missing in other lectures.
- The hardest thing was to combine the moments of teaching on campus with some students being at home. The so called 'hybrid' teaching made it sometimes a bit chaotic, but all students knew there was no other option.

