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RAMS

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- | The Prognostic Value of Lymphatic Metastasis in Cervical Cancer
- | Educating the Healthcare Professional of the Future
- | Ciliopathies: One of the Faults in the Human System
- | Art and Science – Looking at Art to Become a Better Doctor?



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CONTACT

89 SOOS - Radboud Annals of Medical Students
Geert Grooteplein Noord 21
6525 EZ Nijmegen
www.ramsresearch.nl

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FROM THE EDITORIAL BOARD

Dear reader,

'New is always better' is one of the most characteristic statements by Barney Stinson from the popular series 'How I Met Your Mother'. In his role as a womaniser he refers to the fact that, according to him, a new girlfriend is always better than a previous one. Is new always better than old?

Even if you disagree with this statement, you will admit that there clearly is a difference between old and new and it may have a positive influence. This influence may be because of the higher quality of the person, country or drug that is new, but it may also be the freshness of something new. Take for instance our new curriculum. Is it better or worse than the old curriculum? Or is it just different? In this edition of RAMS our editors reviewed the development of the new curriculum and interviewed some of the people most involved. We also have spoken to students who were the first to experience this new way of learning. In addition to this, you can read an interesting article concerning one of the courses within the new curriculum in which medical students can become better doctors by viewing art. The main idea behind this is that students learn to systematically describe what they observe, a skill that is useful for every physician and all scientists. What does one session of this course teach you? Our own editors participated and share their experience within this edition. Lastly, all first-year students wrote an abstract on an innovative idea to improve health care. We are proud to present the winner of this 'Student Challenge' in our journal. They present an idea to decrease the amount of beeps and alarms patients with mainly intravenous therapies are doomed to experience during hospitalisation. By reading these articles I hope you will be able to decide what your opinion on the new curriculum is.

In this edition's scientific papers you will find a systematic review on the use of lymphatic metastases in cervical carcinoma. The authors show that patients with lymphatic metastasized cervical cancer have a worse 5-year survival rate than patients without positive lymph nodes. In addition to this, they found that there is a correlation between the amount of lymph nodes with malignant cells and the survival rate. In our other scientific article, the authors comprehensively discuss an interesting article and provide an overview of the most important proteins in cilia, flagella and/or basal bodies involved in ciliopathies.

Lastly, this edition will be the last one of my two and a half year long RAMS career. Time has come for a fresh wind to blow in order to remain and improve everything we have succeeded so far. Next year, most of the team will be renewed and I am confident that I will be proud of them. New may not always be better, but change is often good.

David Wolthuis
Editor-in-Chief



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THE PROGNOSTIC VALUE OF LYMPHATIC METASTASIS ON FIVE-YEAR SURVIVAL IN CERVICAL CANCER

Lynn A.C. Devilee¹, Lieke C. Heijnen¹, Jordi Lankhof¹, Lynn B. Orriëns¹, Annelieke S.M. van Velthoven¹

Corresponding Author: Lynn A.C. Devilee (lynn.devilee@hotmail.com)

¹ Bachelor Biomedical Student, Radboud University Medical Center, Nijmegen, The Netherlands

ABSTRACT:

BACKGROUND: It is generally known that the occurrence of metastases, in most types of cancer, reduces the overall survival. However, current detection methods for lymphatic metastasis are highly invasive and the accuracy is limited. Furthermore, treatment is very invasive. That is why it is essential to gain knowledge about the influence of lymphatic metastasis in patients with cervical cancer on their five-year survival.

OBJECTIVE: To study the effects of lymphatic metastasis in patients with cervical cancer on their five-year survival.

METHODS: A Pubmed and Embase library search was performed to find applicable articles. After exclusion of non-relevant articles and critical appraisal, fourteen articles were selected.

RESULTS: Among patients with cervical cancer, the five-year survival was 1.51 (95% CI 1.38;1.65) times as high in patients without lymphatic metastasis in comparison to patients with lymphatic metastasis. When comparing uni- and bilateral lymph node metastasis, in patients with unilateral metastasis the five-year survival was 1.32 (95% CI 0.92;1.88) times as high as in patients with bilateral metastasis. When analysing the prognostic significance of the number of lymph nodes involved, in patients with only one lymph node involved the five-year survival was 1.54 (95% CI 1.27;1.85) times as high as in patients with more than one lymph node involved.

CONCLUSION: The five-year survival rate in patients with cervical cancer and lymphatic metastasis is significantly worse in comparison to patients without lymphatic metastasis. Prognosis gets worse if more lymph nodes are affected. Whether metastasis occurred unilaterally or bilaterally did not have a significant effect on prognosis.

WHAT'S KNOWN: In most types of cancer metastasis can occur which reduces the overall life expectancy.

WHAT'S NEW: Cervical cancer patients without lymphatic metastasis have a five year survival rate that is 1.51 times as high as in patients with lymphatic metastasis. The five year survival is 90.6% and 60.2%, respectively. When comparing the involvement of only one lymph node and multiple lymph nodes, the five year survival is 1.54 times as high when there is only one lymph node involved.

KEYWORDS: Cervical cancer, Lymphatic metastasis, Five-year survival rate

Introduction

Cervical cancer or cervical carcinoma is a type of cancer caused by abnormal growth of squamous and/or columnar epithelial cells in the cervix. In 2012, an estimated 528,000 women were diagnosed with cervical cancer worldwide, with approximately 24,400 deaths [1]. This makes cervical cancer the 4th most common cause of cancer related deaths in females. Even though most of these deaths occur in less developed regions, where the use of screening programs is not implemented as well as in developed countries, cervical cancer can be described as an important health issue. Metastasis can occur with a prevalence of 0-20% in early stages and a prevalence of 20-92% in late stages of cervical cancer [2]. In the case of lymph-node metastasis, pelvic lymph nodes are usually first affected. However, metastasis can also occur in more cranial or caudal parts of the lymphatic system.

At the moment, there is an ongoing worldwide discussion about the detection of lymph node metastasis. Lymphatic metastasis are currently diagnosed by either using PET/CT scan or lymph node dissection. Lymph node dissection is a very invasive but highly accurate diagnostic technique. PET/CT scan is a less invasive technique, but the accuracy is limited, with a sensitivity of 75% and a specificity of 96% [3]. Treatment of cervical cancer is a very invasive procedure. Patients are treated with chemotherapy, radiation therapy and/or dissection of the affected tissue. Prognosis after treatment is likely to be influenced to great extent by FIGO-stage, lymph node status and tumour volume.

To gain understanding in the importance of the most effective approach

of detection and treatment of lymphatic metastasis, we have to gain knowledge about the influence of lymphatic metastasis in patients with cervical cancer on their five-year survival.

Methods

Search strategy and selection

We searched Pubmed and Embase to find studies on the effect of lymphatic metastasis on the five-year survival in patients with cervical cancer. Our search provided us with 4,617 articles in Pubmed and 2,075 articles in Embase. We chose to use an English language filter, because in our time frame no professional translations of other languages could be made. After removing duplicates, there were 4,659 articles left, which were then screened on title and abstract. We used the following inclusion criteria: patients with cervical cancer, lymphatic or lymph node metastasis and five-year survival rate.

We excluded systematic reviews and meta-analysis, and studies that did not perform a survival analysis, did not correct for other prognostic factors, did not have a full text available, or used a lymph node ratio to measure the size of metastases. 36 articles were found to match these criteria. We retrieved the full text of these articles and analysed if they truly matched our inclusion and exclusion criteria; 22 articles were excluded and 14 articles were included.

Critical appraisal

We used the Newcastle-Ottawa Scale critical appraisal-tool to judge the

Table 1: Critical appraisal according to Newcastle-Ottawa Scale.

Study	Study design	Criterion scores [‡]		
		Selection	Comparability	Outcome
Alcock et al., 1987 [4]	Cohort	****	*	***
Atahan et al., 2007 [5]	Cohort	***	**	**
Girardi et al., 1993 [6]	Cohort	****	**	***
Hellebrekers et al., 1999 [7]	Cohort	****	**	***
Ho et al., 2004 [8]	Cohort	***	**	**
Hopkins et al., 1993 [9]	Cohort	****	*	***
Hosaka et al., 2011 [10]	Cohort	****	**	**
Inoue et al., 1990 [11]	Cohort	****	*	***
Ishikawa et al., 1999 [12]	Cohort	****	**	**
Liu et al., 2015 [13]	Cohort	***	**	*
Macdonald et al., 2009 [14]	Cohort	***	**	***
Metindir et al., 2009 [15]	Cohort	****	**	***
Nakanishi et al., 2000 [16]	Cohort	****	**	**
Tanaka et al., 1984 [17]	Cohort	****	*	**

[‡]Star (*) indicates the score given to study according to the Newcastle-Ottawa Scale (NOS) quality assessment scale, with more stars reflecting better quality.

relevance and validity of the selected articles. The articles were ranked by their level of validity, with more stars reflecting better quality (Table 1). Critical appraisal was performed by either two or three authors.

Statistical analysis

Review Manager (RevMan) was used to visualise our results. We chose to use a Random Effects analysis model, because we assumed that the true effect size may vary between our included studies. As a measure of association, we used a Risk Ratio, which represents the increase of survival in the group of patients without lymph node metastasis in comparison to the group of patients with lymph node metastasis. A dichotomous outcome measure was chosen to represent our data, because our outcome measure can only take on two values; "deceased" or "alive".

Subgroup analyses

To analyse the effect of the distribution of lymphatic metastasis, either bilateral or unilateral, and the number of affected lymph nodes on the prognosis of cervical cancer, we collected data from each article containing information about these prognostic factors. When extracting data from the studies discussing the influence of the number of lymph nodes involved, we chose to differentiate between either one or more than one metastasised lymph node. Once again, RevMan was used to visualise the results, using a Random Effects model, Risk Ratio and dichotomous outcome.

Results

Critical appraisal

After validating our articles according to the Newcastle-Ottawa Scale, we found that the fourteen included studies met most of our validity criteria (Table 1). For that reason we chose to include all fourteen studies.

Lymphatic metastasis versus no lymphatic metastasis

All fourteen remaining studies reported the influence of lymph node metastases on the five-year survival of patients with cervical cancer. In all patients with lymphatic metastases the metastases were treated. All studies showed a higher five-year survival rate in patients without lymphatic metastases (Table 2) compared to patients with lymphatic metastasis. All Risk Ratios were higher in the group without lymphatic metastasis. Only one study, Metindir et al. [15], showed a 95% Confidence Interval

that contained the value 1; [0.86, 1.34]. We found a pooled Risk Ratio of 1.51 with a 95% Confidence Interval ranging from 1.38 to 1.65. A visual representation of these results can be found in the form of a Forest Plot (Figure 1).

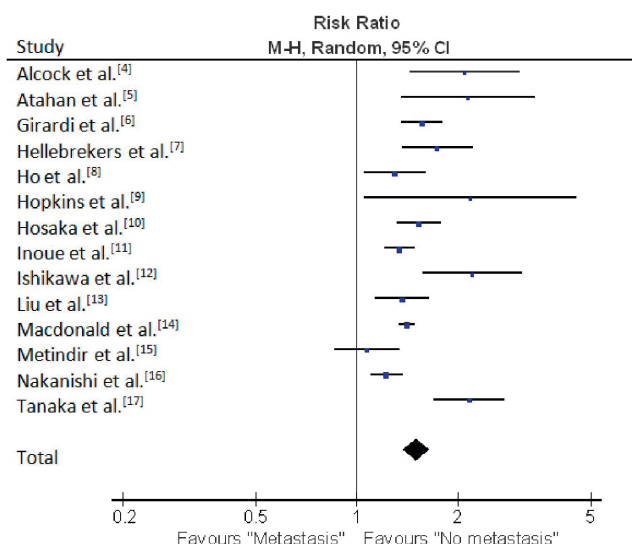


Figure 1: Forrest plot representing Risk Ratio and Confidence Interval for 5-year survival rate in patients with metastasis compared to patients without metastasis.

Unilateral lymph node metastasis versus Bilateral lymph node metastasis

Two studies reported the prognostic factors uni- and bilateral metastasis (Table 3). The overall Risk Ratio representing the effect of unilateral metastasis on the survival rate compared to the effect of bilateral metastasis was 1.32, with a 95% Confidence Interval ranging from 0.92 to 1.88. A visual representation of the results can be found in the form of a Forest Plot (Figure 2).

One lymph node involved versus more than one lymph node involved

Seven studies reported the prognostic significance of the number of lymph nodes involved (Table 4). The overall Risk Ratio in these studies was 1.54, with a 95% Confidence Interval ranging from 1.27 to 1.85. A

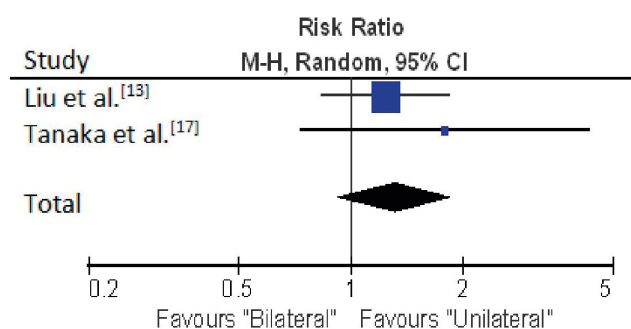


Figure 2: Forrest plot representing Risk Ratio and confidence interval for 5-year survival rate in patients with bilateral lymph node metastasis compared to patients with unilateral lymph node metastasis.

visual representation of these results can be found in the form of a Forest Plot (Figure 3). The Risk Ratios of five of the studies are mostly homogeneous, ranging from 1.13 to 1.49. However, two of the studies, Hosaka et al. [10] and Tanaka et al. [17], showed an aberrant Risk Ratio of 2.35 and 2.70 respectively. Two studies, Ho et al. [8] and Metindir et al. [15], showed a 95% Confidence Interval that contained the value 1.

Discussion

Our results show that, when comparing patients with lymphatic metastasis to patients without lymphatic metastasis, the latter had a significantly higher five-year survival rate (RR of 1.51 and 95%CI 1.38;1.65). This implies that the absence of lymphatic metastasis provides a better prognosis for patients with cervical cancer. In one study, Inoue et al. [11], patients with unresectable metastasis were included. The overall survival

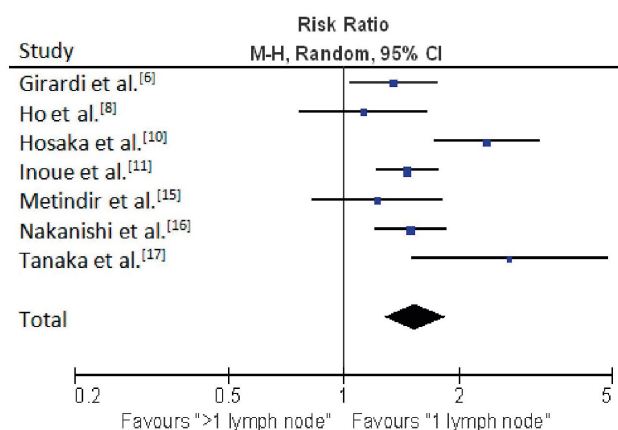


Figure 3: Forrest plot representing Risk Ratio and confidence interval for 5-year survival rate in patients with multiple lymph node metastasis compared to patients with one lymph node metastasis.

rate of these patients was 23.0%. However, the data of one study is not enough to draw a conclusion about the effect of treated or untreated lymph node metastasis on the five-year survival rate. When comparing patients with unilateral lymph node metastasis to patients with bilateral metastasis, our results show that there is no significant difference between these two groups in five-year survival rate. The Risk Ratio is 1.32, but the 95% Confidence Interval ranges from 0.92 to 1.88, so there is no significant evidence that there is a difference in Risk Ratio between the groups. It is important to keep in mind that unilateral lymph node metastasis does not imply that there is only one metastasis. Whether the metastasis are unilaterally or bilaterally distributed only indicates whether the metastases are positioned to the left or right of the median axis of the body, or on both sides. Bilateral lymph node metastasis per definition involves more than one lymph node. Therefore, this could be a

Table 2: Summary of findings.

Study	No lymph node metastasis		Lymph node metastasis		Risk Ratio [†]	Comments
	Alive (%) [‡]	Total	Alive (%) [‡]	Total		
Alcock et al. [4]	118 (84.9)	139	17 (40.5)	42	2.10 [1.44, 3.05]	Lymph node status of 33 patients unknown; 4 patients lost to follow-up
Atahan et al. [5]	57 (62.0)	92	15 (29.0)	52	2.15 [1.36, 3.39]	Lymph node status of 39 patients unknown
Girardi et al. [6]	227 (89.3)	254	95 (57.1)	166	1.56 [1.36, 1.79]	-
Hellebrekers et al. [7]	210 (91.0)	231	33 (53.0)	63	1.74 [1.37, 2.20]	14 patients excluded from the analysis of prognostic factors
Ho et al. [8]	132 (87.3)	151	31 (67.2)	46	1.30 [1.05, 1.60]	-
Hopkins et al. [9]	9 (47.0)	19	10 (21.8)	46	2.18 [1.05, 4.50]	OS [‡] only available for FIGO stage III; Low number of patients
Hosaka et al. [10]	294 (94.8)	310	67 (62.1)	108	1.53 [1.32, 1.78]	7 patients lost to follow-up
Inoue et al. [11]	552 (89.0)	620	148 (66.5)	223	1.34 [1.22, 1.48]	32 patients with unresectable metastasis (survival rate = 23.0%)
Ishikawa et al. [12]	126 (89.2)	141	21 (39.9)	52	2.21 [1.58, 3.09]	-
Liu et al. [13]	215 (91.0)	236	40 (67.0)	60	1.37 [1.14, 1.64]	-
Macdonald et al. [14]	3,381 (91.0)	3,715	546 (64.4)	848	1.41 [1.34, 1.49]	4 too many people in analysis (4563 instead of 4559)
Metindir et al. [15]	66 (89.2)	74	15 (83.3)	18	1.07 [0.86, 1.34]	Low number of patients
Nakanishi et al. [16]	410 (97.1)	422	69 (79.3)	87	1.23 [1.10, 1.37]	-
Tanaka et al. [17]	199 (91.9)	216	40 (42.1)	94	2.17 [1.71, 2.75]	-
Total	5,996 (90.6)	6,620	1,147 (60.2)	1,905	1.51 [1.38, 1.65]	

[‡]Total number of people alive after five years. [†]Risk Ratio for survival without lymph node metastasis, calculated by dividing survival rate "no lymph node metastasis" by survival rate "lymph node metastasis". [‡]OS = overall survival.

Table 3: Results for 5-year survival rate in patients with bilateral lymph node metastasis compared to patients with unilateral lymph node metastasis.

Study	Unilateral lymph node metastasis		Bilateral lymph node metastasis		Risk Ratio [95% CI]
	Alive [‡]	Total	Alive [‡]	Total	
Liu et al. [13]	26	36	14	24	1.24 [0.83, 1.84]
Tanaka et al. [17]	19	64	5	30	1.78 [0.74, 4.31]
Total	45	100	19	54	1.32 [0.92, 1.88]
[‡] Total number of people alive after five years. Risk Ratio for survival with unilateral metastasis, calculated by dividing survival rate "unilateral lymph node metastasis" by survival rate "bilateral lymph node metastasis".					

Table 4: Results for 5-year survival rate in patients with metastasis in one lymph node compared to patients with metastasis in more than one lymph node.

Study	One lymph node involved		More than one lymph node involved		Risk Ratio [95% CI]
	Alive [‡]	Total	Alive [‡]	Total	
Girardi et al. [6]	36	52	55	107	1.35 [1.04, 1.74]
Ho et al. [8]	12	16	20	30	1.13 [0.77, 1.64]
Hosaka et al. [10]	42	45	25	63	2.35 [1.72, 3.22]
Inoue et al. [11]	79	98	69	125	1.46 [1.21, 3.22]
Metindir et al. [15]	5	5	10	13	1.22 [0.83, 1.80]
Nakanishi et al. [16]	37	38	32	49	1.49 [1.21, 1.84]
Tanaka et al. [17]	32	51	10	43	2.70 [1.51, 4.83]
Total	243	305	221	430	1.54 [1.27, 1.85]
[‡] Total number of people alive after 5 years. Risk Ratio for survival metastasis in one lymph node, calculated by dividing survival rate "one lymph node involved" by survival rate "more than one lymph node involved".					

confounding factor in our analysis. When comparing patients with only one metastasised lymph node to patients with multiple metastasised lymph nodes, our results show that the former have a significantly higher five-year survival rate (RR of 1.54 and 95%CI 1.27;1.85). This implies that the number of affected lymph nodes influences the prognosis of patients with cervical cancer.

The choices we made in our research process could have affected the outcome of this study. We used a language filter to select the studies. All studies that were not written in English were excluded, because the time span of our research was too short to get a professional translation of the texts. This filter might have introduced selection bias in our systematic review. Furthermore, there were no full texts requested when no full text was available in Pubmed or Embase (or anywhere else on the Internet). We divided the 4,659 articles that had to be screened on title and abstract in five equal parts. Each of us screened one of those parts separately on inclusion and exclusion criteria. This could have led to selection bias. The included studies all used different methods to treat and remove the lymph node metastases. We did not subdivide the different methods of treatment in our analyses. There is a possibility that the prognosis differs between methods of treatment. Additionally, the studies in our review differ in included patients and their FIGO stage. Both can partly explain the high heterogeneity (75%, calculated by RevMan) of our studies. Despite the high heterogeneity we chose to calculate an overall risk ratio. This choice is based on the observation that all studies present a Risk Ratio in favour of the group without lymphatic metastasis. Finally, the critical appraisal was performed by two groups of either two or three people. Each group critically appraised half of the studies. They did not verify each other's work, which may have induced a misjudgement in the risk of bias.

In the studies 'Lymphatic metastasis versus no lymphatic metastasis', there are patients lost to follow-up. However, the number of patients lost to follow-up is small enough, in comparison to the number of patients included in these studies, to ensure that the outcome is not significantly affected by the missing data. The same goes for the study of Macdonald et al. [14], where four too many people were included in the analysis.

In the article of Hopkins et al. [9], the overall survival was only given for patients in FIGO stage III, while in the other articles overall survival was collectively given for multiple stages. This probably affected the number of patients alive after five years, because people in late stages of cancer are less likely to survive for a longer period of time.

Conclusion

The five-year survival rate in patients with cervical cancer and lymphatic metastasis is significantly worse in comparison to patients without lymphatic metastasis. We can also conclude that prognosis gets worse if more lymph node metastases are present. Therefore, it is essential to improve the diagnostic tools and treatment of lymph node metastases. Bilateral lymph node metastasis, in comparison to unilateral metastasis, seems to have a negative effect on the five-year survival rate of patients. However, this effect is not significant.

Further research is needed to elucidate the role of the location of the lymphatic metastases on the survival rate. This could be examined by carrying out a cohort study including patients with either unilateral or bilateral lymphatic metastasis.

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EXAM QUESTIONS

As RAMS aims to enlighten both students and professionals, we would like to present you the exam questions. They have been taken from exams from different bachelor modules. Find out if you can remember what you learned during the bachelor! The right answers and the number of students who answered correctly can be found further on in this journal.

We challenge you!

Question 1: In which renal segment is the cell pictured to the right located?

- A.

The proximal tubule
- B.

The thick ascending limb of the loop of Henle
- C.

The distal convoluted tubule
- D.

The collecting duct

(Module Metabolism, water and mineral homeostasis)

Question 2: Which ECG interval changes in patients with atrioventricular block?

- A.

The P wave is broader
- B.

The PQ interval is prolonged
- C.

The QRS complex is wider
- D.

The QT interval is prolonged

(Module Circulation and respiration I)

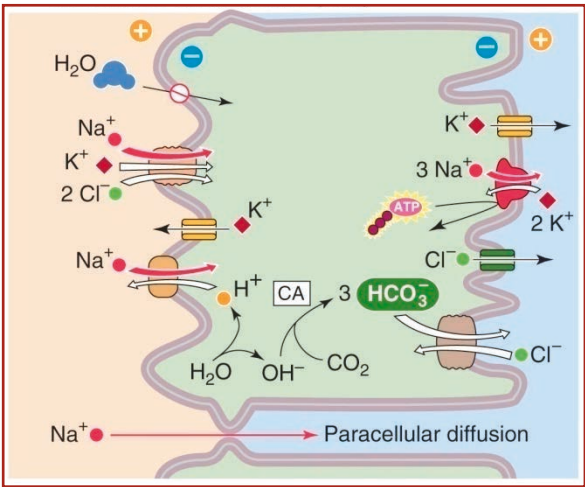


Figure 1: A tubular epithelial cell.

The answers to these questions can be found on page 18 in this journal.



EDUCATING THE HEALTHCARE PROFESSIONAL OF THE FUTURE:

RADBOUD'S NEW CURRICULUM

Jules M. Janssen Daalen¹ and Bas ten Elzen¹

¹ Bachelor Medical Student, Radboud University Medical Center, Nijmegen, The Netherlands

It had been long-awaited and aspired and in 2015 it finally became reality: a whole new curriculum for the two educational programmes at the medical faculty of Nijmegen. More than 6 months after the overwhelming opening congress, it is now time to look back at the first experiences of students and professors/teachers, as well as to consider the view of the developers. How do you design an entire new curriculum? What criteria should it meet?

The role of a physician within the medical profession is changing rapidly. Future physicians will not be solely in charge of the treatment of a patient. Instead, the patient will have more authority, meaning he or she will be part of the medical team, and together they will set-up a treatment plan. The specialist therefore only uses his or her knowledge to make sure the patient is sufficiently informed about their disease and its treatment options, so they can subsequently make their own choice. In this sense the patient is the specialist in having their own disease.

The entire medical world is innovating fast. Portable healthcare data, social media, sensational new research discoveries, global online collaboration, cutting-edge technology, personalised medicine, and so on – the pace of medical change is breath-taking, and is certainly not slowing down. Future scientists and physicians should therefore not just be prepared for the future, but instead, hence the Radboudumc motto, they have to be part of it. Future physicians should think about ways to optimise healthcare, and as a result collaborate more intensely with scientists. Biomedical scientists, on the other hand, will increasingly consider patient care, meaning their research will be more focused on patients' demands. For this reason, a strong collaboration between biomedical scientists and physicians is crucial. They absolutely need each other.

Designing a new curriculum

All these changes in the medical world have been taken into account in the development of the new curriculum. Due to the complexity of designing a concept for a new curriculum, it has taken years before it was ready to be applied. So called X-teams were established, consisting of physicians, researchers, learning scientists, patients, students and even health care insurers. Together, they discussed essential matters and from this the most important themes were defined. Eventually, based on scientific articles on the best and most effective way of studying, four main concepts were defined forming the core of the new curriculum: self-directed, active, practice-oriented and collaborative learning.

What is different?

It is not as if these aspects were absent in the old curriculum. In fact, they all existed, but not in an effective way. The problem was the superfluous structure offered to students, which is ineffective when you have to gain the right competences to operate in a rapidly changing medical world. Students received lectures in which subjects were taught passively, they had readers that contained self-assignments in which specific books and their relevant page numbers were given to them. Subsequently, the bottlenecks of the assignments were covered in response lectures, almost like in high school. Students were not far from having to stand in

the corner if they had not properly finished their homework. This way of work is not continued in the new curriculum as students have less of a framework; instead they are given greater independence using a method called self-directed learning. Students now make e-learning modules about a specific medical subject, and they consequently should be triggered to dig deeper in that subject. The way they want to approach the matter is up to the students to decide for themselves. Surely using this form of learning they will not be assigned page numbers from which they can gather the necessary information.

Structure of learning trajectories

The curriculum contains continuous learning trajectories (see table 1). The basic (bio)medical knowledge is acquired in Mechanisms of Health and Disease (MGZ), clinical practical and communication skills are mastered in Practice and Principles of Medicine (PPG, only for medical students), and students are offered to gain some experience in medical practice in Student Meets Patient (SMP). Context, Science and Innovation (CSI) and Research (only for BMS students) will be described later in this article. Furthermore, the curriculum contains a coaching trajectory which will be elaborately discussed later in this article. Finally, college years are subdivided in quarters in which the learning trajectories are intertwined. Each quarter covers a specific theme; for example, Q2 is called Nature and Nurture and covers subjects such as genetics and cell biology.

CSI: a trajectory in which future scientists and physicians unite

The extent to which BMS and medicine should be united was an important consideration during the curriculum development. We now know that this has resulted in a strong collaboration, which is one of the major innovations of the new curriculum. This collaboration between scientists and physicians becomes apparent right from the start of the first year; with a brand new learning trajectory called Context, Science and Innovation (CSI). The main goal is to broaden students' view of healthcare and it embraces almost every skill needed for doing research. Students get the opportunity to achieve knowledge in any field of medical research and to learn how to analyse important health issues. Cooperation skills are trained by working together in groups on projects with other medical and biomedical students. Furthermore, BMS students master the requisite knowledge on specific research methodology, such as statistical skills, in their own Research trajectory. Whereas future physicians, on the other hand, acquire the needed practical skills in their Practice and Principles of Medicine course. CSI can therefore be considered as a central point where physicians and researchers complement each other to gain resplendent insights that boost future healthcare.

The essential question, though, is how is the new curriculum perceived by students, and have the teachers been satisfied? Also, has the organi-

Table 1: Overview of the propaedeutic phase of the new curriculum.

Mechanisms of Health and Disease			
Q1 Amazement	Q2 Nature and Nurture	Q3 Homeostasis	Q4 Attack and Defense
Projects and integrative assignments			
Coaching			
Practice and Principles of Medicine / Research			
Context, Science and Innovation (CSI)			

sation of the course worked? To answer these questions, we interviewed Marjolein van de Pol (Principal Lecturer), who has been of great value for the development of the curriculum and functions as coordinator of the first quarter of the propaedeutic phase (Table 1). We also spoke with Professor Joost Hoenderop (Principal Educator), who plays an important role in the CSI trajectory and the Research trajectory of BMS. Lastly, we spoke to a first-year medical student called Milan Plantaz (18 years, Figure 1), one of the eight students in Joost Hoenderop’s coach group.

The transition from high school

As was expected, the new curriculum has faced a number of teething problems, as it is almost impossible for the transition to a whole new way of working to occur without any trouble. One such problem was the transition from the structured high-school way of learning to the ‘freedom’ of the new curriculum. ‘We have paid less attention to the complete new structure of education for students. Next year we could, for example, use some of the time during the opening congress to provide students with information on how to succeed in the new way of studying’, according to Van de Pol. Milan agreed with this point: ‘The shift was immense, from working in a completely defined, structured and almost bureaucratic system, to complete freedom with especially a lot more self-tuition. I must admit this was very difficult, especially in the beginning.’

Decentralised selection as an introduction to the new curriculum

For students, the selection of universities and studies starts at open days. For BMS and medicine, decentralised selection functions as selection, too. During this tailored selection programme, students are challenged to show why they are suited to this particular study (with its unique curriculum) at this university. For example, they are required to produce an assignment in which they are expected to explain why they fit in this particular curriculum. Obviously, important competences of the physician and scientist are tested too, which makes for a decentralised selection that will only accept students with high potential, passion and motivation in the field of medical sciences.

Despite this, Milan was still not aware that so much was to be changed in the (bio)medical curriculum. ‘It was not specifically mentioned during the open day of the medical faculty, so when I applied in January, I did not know that a new curriculum was coming. It could be me, but I am not the only one with this thought; some fellow students mentioned

they were not aware as well.’ He first noticed that the curriculum would change when he made the assignment on the learning trajectories. He read something about the existence of MGZ, CSI and the great attention to professionalism, but he did not investigate these any further, so what these components really meant were not totally clear.

An ‘amazing’ start

The new curriculum was introduced by a big opening congress that was mainly focussed on the theme of ‘Amazement’, and this was therefore the title of the first quarter (Q1). On the almost symbolic location between the hospital and the study centre, a gigantic tent was placed. It was up to inspiring speakers to further increase the motivation of students and to excite them with major future issues within health and medical care. Although some students have good memories of the event, the congress was seriously criticised. Most students were hoping to receive some indication about the forthcoming curriculum and about what their days were going to look like. Instead, students were immersed in talks and workshops on many different subjects like major health problems and accompanying health innovations, without clear information about the structure and planning of the new curriculum. Fortunately, this problem was successfully tackled in later quarters by providing students with additional information when needed or asked for. The coordination team heeded the criticisms from students and the student representatives very well. Instead of forcing the curriculum down their throats, they used their feedback and directed it towards improving not only the concerning quarter, but also the following quarters.

Q1 was an introduction to everything, ‘the goal was to touch lightly on the subjects of Q2-6’, according to Van de Pol. In contrast to the following years, during these quarters (the first one and a half years) the curriculum and its education system will not alter significantly. It seems that this kick-off quarter succeeded: ‘Q1 had been a strong introduction to the aspects that returned later’, states Van de Pol. The fact that it was just a brief introduction to various subjects, was coupled with a lack of immersion in these subjects. For students it seemed like a collection of loose subjects. Fortunately, Q1 outlined a framework that was expanded in later quarters, where knowledge gaps are filled in. Sadly, not only the content of the quarter was slightly cryptic: ‘You had to figure out everything by yourself, especially organisationally’, according to Milan. ‘Honestly, I had to get used to creating my own study plan, I needed clarity on what is expected from me.’ However, over the course of the first year, Milan increasingly got used to the system and he appreciated the adjustments that were made in later quarters: ‘Teachers provided us more with a framework, which was nice and helpful. I also notice that I am really getting used to this new way of studying.’

The new curriculum triggered some tension

Especially in the beginning there was a lot of tension amongst students: ‘There was a kind of preoccupation with the curriculum failing in which students encouraged each other’, states Van de Pol. This was further enhanced by first year students consulting senior students and then comparing between the subjects that were covered in the old curriculum and what they were now being taught. ‘For example, in the old curriculum, in the second month a subject called ‘main functional morphology’ was covered, which was entirely focused on anatomy. When first year students learnt this from senior students, they became unnecessarily worried about whether their anatomical knowledge would fall short. But that is not fair, because anatomy is now more spread over the

bachelor years. The structure is just entirely different.' Milan does understand this: 'I do not allow myself to be guided by these rumours. I see that our curriculum is just very different and not comparable.' But he does make a related critical comment: 'I wonder if all these hours that we spend on new components, like Student Meets Patient and learning communities (LC), go at the expense of the development of mechanistic knowledge about diseases (Mechanisms of Health and Disease, MGZ). Where do all these hours go? In the old curriculum these matters were addressed less: the main focus laid on theory.' Milan put this question to one of the important teachers of Q2, but Milan stated he was not able to give him a satisfactory answer. However, according to Van de Pol, the significance of these activities became clearer in the course of the year. Especially during Q3, which has been appreciated by most students.

Choosing your own education

The renewed (bio)medical curriculum consists for a significant part of elective education. Every quarter, students get the opportunity to choose modules based on their own interests or shortcomings. In total, students must have earned four ECTS in their propaedeutic phase. It is up to the student to determine in what way these points will be gained. Departments of the clinic and sometimes the university (mostly language courses) organise in-depth modules through Blackboard, but students are free to be open-minded and creative and look for courses in other less related faculties or even follow a MOOC (massive open online course). Milan has a special interest in psychiatry and clinical genetics and, fortunately for him, these modules are organised by the respective departments. For example, the psychiatry department organises a very positively reviewed Meet the Expert course, in which psychiatrists share their clinical stories with interested students. Regrettably, other students beat Milan to registration, so he chose a module about health law. Although this was not his first choice, he admits he enjoys the subject more than he expected.

The human microbiome: a fascinating example

Professor Hoenderop and the department of Physiology offer a couple of modules, one of them being an introduction to a quite topical issue: the microbiome. Students that attend this course learn how and in what way the bacteria in our intestines alter the uptake of nutrients and how this may affect well-known disease outcomes. Diabetes and rheumatoid arthritis are examples of illnesses that are associated with alterations or differences in microbiome. Obviously, these discoveries make way for new treatment options, like changing the microbiome by faecal transplantation. Much research has been done on this treatment in inflammatory diseases, nosocomial infections by *Clostridium difficile* being a nice example.

Ion transport in mineral homeostasis

Hoenderop also guides a module about the significance of ion channels in kidney diseases, one of his specialties. How do genetic effects in a protein that is part of an ion channel have an impact on the mineral balance in the human body? Students will go on a 'journey' of exploration with Hoenderop and will discuss this fascinating puzzle. The Professor is extremely pleased by the possibilities of this curriculum. 'It is so much nicer to inspire students with issues and questions of my daily practice and relate those issues to the mechanistic theory that is essential in solid (bio)medical education, instead of just telling them the well-known knowledge.'

Student Meets Patient

In their first year, students are already confronted with contact with patients so they can learn in a practical setting, which is one of the funda-

ments of this new curriculum. Fortunately, students are very enthusiastic about these contacts. Milan can only agree with this statement: he enjoys the course Student Meets Patient the most and thinks it really adds to his eagerness to learn more and more. During SMP, students are guided by a doctor and have conversations with patients in the clinic. 'I like that we first talk with the patient about his or her illness and that the doctor joins the conversation and explains the mechanism afterwards. A nice example of how this works practically is a discussion with a patient that suffers from the very rare factor VII deficiency. The cascade of blood clotting is quite complicated, but after the fascinating story of the patient, the doctor explained the entire pathophysiology of this haematological condition.'

In the early days of the new curriculum, students were very enthusiastic about these contacts, but the link between patient and disease mechanisms was not so clear. Nowadays, these two trajectories are integrated so students can apply their knowledge of mechanisms of health and disease in the clinic with patients. Unfortunately, despite this strong practical and theoretical link with patients, there are some disadvantages. The attendance of students at SMP is still low, although many students do sign up for the course. The aforementioned "student allocator" allows them to sign in for SMP or not: it is only mandatory if you sign up. That upsets and disheartens lecturers and patients, but more importantly, to lecturers and curriculum developers, it is an example of unprofessional behaviour. Because this curriculum halted the systematic attendance screening of students, it is hard to call on individuals to evaluate their behaviour. For this reason, tackling this problem is very hard but, as we speak, developers are thinking of solutions which we hope will not reintroduce systematic attendance screening.

Communication skills are obviously indispensable for future doctors and researchers. Not only is the biopsychosocial model explained, students are also challenged to work with people pretending to be complex patients ('simulated patients'). In this way, Milan learned to show understanding during a consultation and how to handle emotions and, as a result, improved his professional communication before the start of his rotations.

Coaching: a guide through personal development

Prior to introducing these new aspects, developers had realised that students in this curriculum, full of self-directed learning, would need professional support to guarantee their progress. For this reason, coaching groups have been brought to life (Figure 1). These group sessions are led by lecturers that have been trained extensively in coaching students and they still have the possibility to do so in (non-mandatory) meetings where they exchange experiences. This lecturer supervises eight students from either Medicine or Biomedical Sciences in becoming a professional and guides them through the virtually endless road of possibilities this curriculum has to offer. Students also discuss the difficulties they encounter and learn to reflect on each other and become skilful medical professionals, especially in the field of communication. They also have an individual talk with their coach, which they have to prepare by registration of subjects they would like to discuss. Although students have a lot of freedom, eventually a reflection is needed to assess their learning curves. Milan addressed his problems concentrating, because he was easily distracted. After a good talk with Professor Hoenderop, Milan agreed to visit the University Library (UB) more often and he now admits this worked really well. This simple example demonstrates the importance and added value of coaching: problems are identified early and tackled effectively.



Figure 1: Joost Hoenderop's coach group. Left: Milan Plantaz.

Cooperation skills: a key quality of success in healthcare

One of the four cornerstones of the curriculum considers studying together. This not only involves intradisciplinary cooperation, but now also interdisciplinary coaction. As previously stated, these different fields will need each other more than ever in the future. Students from both Medicine and Biomedical Sciences (BMS) have disciplinary courses – Practice and Principles of Medicine for medical and Research for BMS students. Ideally, these groups exchange their disciplinary knowledge so they can complement each other by bringing in knowledge from the clinic and the dynamic research field. Unfortunately, to date this cooperation does not run very smoothly as there is quite a strong absence of blending between coaching groups from Medicine and Biomedical Sciences, which is also observed by Milan. This may be caused by the fact that coaching groups become stable groups of friends that would rather do assignments in safe, known surroundings. Another explanation could be that some Biomedical Sciences students are still looking for their place within their year cohort and, even worse, some may have the feeling they do not belong within the group at all. We will not speak of an identity crisis, but there have been many occasions where the whole year cohort is described as ‘future doctors’, while there are in fact plenty of biomedical students in the audience, which certainly does not promote cohesion between these students. One must also note that in the first phase of their studies, Medicine and Biomedical Sciences have levelled out quite intensively: the smaller group of biomedical students (± 100) have many courses in common with the larger group of medical students (± 300). Until this day, maintaining the identity of biomedical students is still a subject of discussion, but much effort is being made to assess the problem and to come up with appropriate solutions.

In the larger meetings, referred to as learning communities (LC), this is visible too. These groups contain three coaching groups from Medicine and one from Biomedical Sciences and are meant to enhance discussi-

ons. Besides, the LC are becoming more and more significant. In the first months, there was no explicit agenda for the LC and students had the feeling they could use their time more effectively. However, an agenda has now been added to the LC, which provides both students and lecturers with more guidance during this meeting.

Attention to the key trend in healthcare: innovation

Innovation is a hot topic in healthcare right now. As a completely new element, this broad field is now added to the (bio)medical curriculum. By means of several projects, one of which being the Radboud Student Challenge, students are stimulated to come up with solutions to the largest problems in the future of healthcare. The Radboud Student Challenge was a competition organised as a spectacular ending to the first quarter of the new curriculum. In groups, students competed with each other, going through several rounds before ending up in the final, which was organised as a big event in the canteen of the preclinic with a podium, music, a jury and a large audience. The jury consisted of patients, students and lecturers that reviewed the pitches from the finalists. Eventually, the IV-silencer, an alternative to the beeping noise of the IV-pump, won the competition. Further on in this journal, an extensive description of the invention can be found, which will be developed together with the innovation company REshape. The Radboud Student Challenge will be followed up by a couple of projects in later quarters, so students will continue to think about the major health problems we are confronted with. At a gradually improving level with more and more scientific back-up, students will be able to combine gained knowledge in other courses with their innovative mind-set. These health futurists of today will become the leaders of tomorrow.

A promising future

After a start that was complicated by organisational problems, we can conclude that increasingly more positive opinions dominate the atmosphere in our study centre. New problems will occur, but these are inevitable when creating an entirely new curriculum. By all means, lecturers and developers are very open to suggestions, improvements and progression and therefore, we are convinced that new complications will be tackled immediately.

After our conversation with Milan, he added that he thinks the content of the education is very extensive and broad and that he now has a real feeling his knowledge expands every day. We believe that students will enjoy the endless possibilities of the new curriculum and that they will develop to become great communicators, practically oriented professionals, great researchers and great doctors, focussed on the needs of the patient. We are looking forward to the new generation of (bio)medical professionals that will head up innovation in research and healthcare. Because together, we are stronger. Together, we can achieve the motto of our Radboudumc. Together, we have a significant impact on healthcare.



CILIOPATHIES: ONE OF THE FAULTS IN THE HUMAN SYSTEM

Vera M. Kho¹ and Rosalie W.M. Kempkes¹

Corresponding Author: Rosalie W.M. Kempkes (rosalie.kempkes@gmail.com)

¹ Bachelor Biomedical Sciences student, Radboud University Medical Center, Nijmegen, The Netherlands

ABSTRACT:

This comment reviews the article by Li et al, published in 2004, whom compiled a dataset of proteins that presumably have a function in the cilia, flagella and/or basal bodies or its assembly. The purpose of this comment is to summarise their findings and put them into context. It is interesting to see how research was done about a decade ago and how science has grown since then. New techniques have been developed since 2004, which can facilitate further research. This comment is meant to inform the scientific community and inspire them to do more research on this subject.

KEYWORDS: Ciliopathies, Genetics, Proteins

The cilium is a very small organelle, mostly present on the cell membrane of quiescent or differentiated cells [1]. The basal body, derived from modified centrioles, forms the site where the cilium attaches to the cell [2, 3]. The cilia have a sensory function and transduce signals from the environment to the cell, like an antenna. Some cilia are important in tasks where motion is required. An organelle that slightly differs from the cilia is the flagella, which is also important for movement of the cell. The flagella also originates from the basal body. These functions of the cilia and flagella also play an important role in embryogenesis [1, 4]. A disease in which the cilia, flagella and/or basal bodies dysfunction is called a ciliopathy. Ciliopathies can lead to a vast range of phenotypes in multiple organs, because cilia are common across the human body. We will refer to the cilia, flagella and/or basal bodies as CFB.

An example of a ciliopathy is the Bardet-Biedl syndrome (BBS), a serious, but not well-known, rare, autosomal recessive disorder, from which symptoms occur before the age of 10 [5]. The disease is characterized by obesity, polydactyly, retinopathy, hypogonadism and cognitive impairment. In adulthood, patients with BBS will inevitably become blind, experience loss of hearing and often present themselves with Diabetes Mellitus type II [6, 7, 8]. The prevalence of BBS ranges from 1 in 100,000 to 1 in 175,000. [6, 7]. Another example is situs inversus, in which the major organs are reversed or mirrored.

Li et al. wanted to find the proteins that are involved in the assembly and function of CFB found in many eukaryotic organisms. In the paper, these proteins are referred to as the flagellar apparatus-basal body (FABB) proteome. To identify these proteins, and genes coding for these proteins, Li et al. used a comparative genomics approach, which means they compared the genomes and proteins of multiple organisms, by using in silico, in vitro and in vivo studies. Using WU-BLASTP, an algorithm used in bioinformatics to compare biological sequence information, like amino-acid sequences or DNA sequences, a dataset was compiled of the FABB proteins present in both *Chlamydomonas reinhardtii* and *Homo sapiens*, two organisms which are known to have cilia and basal bodies. Next, the proteins that were also present in *Arabidopsis*, an organism without cilia and basal bodies, were dismissed from the dataset that now assumably only contains proteins associated with cilia and basal bodies, because organisms that have lost CFB will also have lost the genes coding for them and their regulators [9, 2].

To determine whether the dataset of the FABB proteome indeed contained proteins involved in the CFB, Li et al. set the following five criteria that should be met: (1) the FABB proteome should contain genes coding for proteins that are known to be associated with CFB; (2) the characteris-

tics of the domains in the FABB proteome should be like known domains of CFB; (3) after deflagellation a certain amount of genes should be up-regulated; (4) interfering with the transcript of these genes should cause certain phenotypes; and finally, (5) there should be novel genes present involved in disorders of the human CFB in the FABB proteome.

Li et al. have met all five criteria. To begin with, 52 genes that encode for proteins that are associated with CFB were also found in the FABB proteome. Secondly, the paper found domains in proteins, with the algorithm Pfam, in the FABB proteome. The Pfam algorithm detects functional regions named domains in DNA sequences of proteins. Identifying a domain can lead to insight into the function of a protein. Those domains were virtually exclusively present in genes known to be associated with CFB. Furthermore, upregulation of several genes in the FABB protein followed deflagellation. This makes it likely these encoded proteins have a part in function and/or assembly of the flagella. Additionally, the genes that were not upregulated after deflagellation were impaired using RNA interference to investigate whether these genes coding for proteins in the FABB proteome were false positives or not. The authors found that the interference lead to a range of phenotypes: the flagella became malformed, dysfunctional or disorganized, dependent on the amount of interference. The gene expression of the impaired genes was measured using RT-PCR. Finally, Li et al. found a novel gene, BBS5, in which mutations in humans lead to the Bardet-Biedl syndrome. Further exploration of the BBS5 gene found that the gene and protein is truly part of the function/assembly of CFB. This means that there are possibly more genes in the FABB-proteome that, when mutated, lead to disorders in the human CFB.

There are many people who would benefit from research like Li et al's, e.g. individuals who suffer from diseases caused by dysfunctional CFB, their doctors and their family. Research on CFB may find clues on how to diagnose patients better and sooner, but also give them a more realistic prognosis. Besides, successfully understanding an organelle can give information about the cells or interactions with the environment. The paper also provided a way of investigating other organelles like the endoplasmic reticulum, which is suspected to have a part in Alzheimer's disease [10]. Also, this study could be relevant to cancer research, since tumors have often lost the ability to form cilia [11].

A few techniques that are used in the paper are WU-BLASTP, the Pfam algorithm, RNA interference and RT-PCR. Since this paper's release in 2004, 12 years ago, some of these techniques have become obsolete and others have been improved. WU-BLASTP, for example, was taken over by AB-BLAST and other BLAST databases exist as well. Today, databases contain much more information, which means more knowledge

can be used and compared. For example, in 2004 scientists assumed the human genome contained 30,000 genes, but now it is clear there are only 19,000, which means that proteins could be doubly represented [12]. Also, in the times this paper was written there was not much insight in the 3D structure of proteins, which diminishes the understanding of the complete assembly process, protein-protein interaction and cellular functions in the CFB.

New techniques have been developed as well. In the paper all experiments were done in lab conditions. Nowadays we can simulate an environment more similar to in vivo conditions, like with a kidney on a chip. [13]. This leads to a better translation of the outcomes to the clinic. Besides that, mass spectrometry can be particularly useful in the identification of proteins, among other things in protein complexes, resulting to a more thorough insight in the FABB proteome.

Since the release of Li et al.'s paper in 2004, the possibilities to do research have grown vastly. This means it has become easier to explore the causes of ciliopathies and develop new techniques to treat patients, like genetic modification, a technique focused on repairing faulty genes. Compared with 12 years ago, the amount of scientific knowledge has advanced greatly. Nevertheless, further research on new techniques and ciliopathies is still required to enable doctors to help their patients in a way they desire the most.

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ACHALASIA WITH MEGAOESOPHAGUS

Shelley Dalloyaux¹

¹ Bachelor Medical Student, Radboud University Medical Center, Nijmegen, The Netherlands

When you look at the picture to the right you can immediately see that something is wrong. What you see here are the radiograph images (figure 1) of a 63-year-old man with a ten-year history of dysphagia to solid foods and liquids. It is clear that his oesophagus has grown and has become very big. But what caused it to dilate this much?

The patient was diagnosed with achalasia, which explains the development of the megaesophagus. In a patient suffering from achalasia, the nerve supply of the lower part of the oesophagus is insufficient, which causes less movement of the muscles of the oesophageal wall and on-going constriction of the lower oesophageal sphincter. This constriction induces difficulties in the movement of food towards the stomach, resulting in an accumulation of food in the oesophagus and causing dilation if not treated.

So next time you see a similar image with a megaesophagus, think about achalasia [1].

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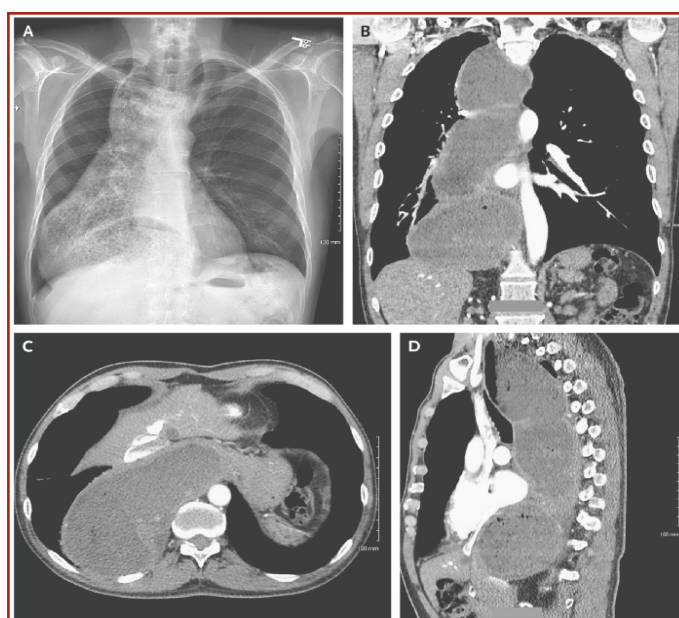


Figure 1: A: X-Thorax; B: Thoracal CT-scan, C: Transverse section, D: Sagittal section.



ART AND SCIENCE - LOOKING AT ART TO BECOME A BETTER DOCTOR?

Anna M. van Boekel¹ and Cas M. van der Made¹

¹Master Medical Student, Radboud University Medical Center, Nijmegen, The Netherlands

Medical science and art; at first they do not seem to have much in common. However, the speakers at the annual meeting of The Dutch Journal of Medicine, which this year featured art and science ('Kunst en Kunde') as its theme, will disagree. One of these speakers was Prof. Dr. Keunen, ophthalmologist and head of the art committee of the Radboudumc. He presented results from different studies that showed an improvement in pattern recognition by medical students after studying art. After attending art classes and looking at various paintings, medical students actually became better at recognising different dermatological diseases. But it is not only pattern recognition that art may improve. If we are to believe the speakers at the annual meeting of The Dutch Journal of Medicine, we, the medical students, will in fact also be more empathetic and better at seeing the bigger picture just by looking at art.

Therefore, Prof. Dr. Keunen is developing a course to teach medical students about art with the aim of eventually making them better doctors. Also involved are Drs. Geerling, art curator of Radboudumc, and Dr. Koksma, a philosopher who also participated in the development of the new medicine curriculum that started this year. They have already carried out a small pilot with professors and staff members of Radboudumc, with surprising results. When a group of experienced doctors looked at 'The Potato Eaters' ('De Aardappeleters') by Vincent van Gogh, they only focused on the details, forgetting the overall bigger picture.

At the end of the annual meeting we were able to speak with Prof. Dr. Keunen, Drs. Geerling and Dr. Koksma to discuss their view on art, science and the new medical curriculum.

The idea of introducing art classes in a medical curriculum is surprising and unexpected. How did you come up with this idea?

Prof. Dr. Keunen: An article in the Dutch Journal of Medicine (NTvG) [1] about medical students improving their pattern recognition by studying art was an eye-opener for me. Also, I noticed that more and more people were telling me they thought that the Radboudumc arts committee was something elitist. So we decided we needed to change and that we needed a new perspective of art. A new art curator was needed and Drs. Geerling seemed most suited for that job.

Drs. Geerling: Dr. Koksma, who is really involved in the development of the new curriculum, joined in later.

How are you going to introduce art in the medical curriculum?

Dr. Koksma: This year we will have a pilot with masterclasses which are open for anyone; students but maybe also doctors and patients. Eventually we want to develop a minor for third year medical students.

Drs. Geerling: The workshops are going to be taught by very different artists such as a food designer, a landscape architect and filmmakers. However, what they have in common is that they will illuminate the different aspects of observing; listening, tasting, smelling but also analytical thinking and conceptualization.

A statement of Hans Aarsman, photographer and writer, is that medical students are blind with their eyes open. Could you explain?

Prof. Dr. Keunen: Yes, to a certain degree at least. Not only medical students but doctors also appear to be blind. As mentioned before, we as doctors are apparently very focused on the details and therefore we miss a lot of information.

Dr. Koksma: Doctors learn to think convergent; you receive a lot of information which you have to formulate into a diagnosis. We would like to teach students to think more divergent and to fight blindness.

Your idea is really innovative but as yet it is not very concrete. Students will want to know what they can learn from an arts class and

how they can apply it to daily practice. So what is the main goal of these classes? Do you aim to improve pattern recognition as described in the American studies, or is it more focused on improving empathy and broadening the view of students?

Dr. Koksma: I think both. Although they might seem to be very contrasting; a 'hard' medical skill and a more 'soft' competence, this is not necessarily the case. It is important to be conscious of the way you look at things. It is of great value to learn how to look in a different way and to talk about these differences.

Prof. Dr. Keunen: And that you, as a doctor, are aware of how hard it is to observe well. Even experienced doctors are apparently so focused on the details that they forget the bigger picture. I recognise it myself; when a patient comes with a certain complaint I usually know where it will go and I push the patient towards it, not noticing the context of the story.

"Even experienced doctors are apparently so focused on the details that they forget the bigger picture."

Dr. Koksma: We tend to forget the context; and this is what we can improve. Certainly now, with more and more chronically ill patients, doctors have a more profound relationship with their patients, so it is worth investing in it. The natural sciences are indispensable but we might have a too scientific curriculum for this real 'people-job'. I think this will be a great opportunity to create a bridge between the scientific and the soft side of medicine.

Drs. Geerling: Art is always about a story, it is never just an image. It is about a certain way of conceptualisation, another way of thinking and looking.

But are you going to test whether students improve in pattern recognition?

Prof. Dr. Keunen: What I find fascinating is that Dr. Koksma and Drs. Geerling do not want to have a final exam at all.

Dr. Koksma: I do want to have a final exam, but it should be a completely free examination. I want people to show us what they have learned

during the masterclasses. Testing pattern recognition could be a part of it. However for scientific research the group needs to be much bigger.

An exam at the end of the minor might suit the traditional way of education better, whilst a free assignment probably goes better with the new curriculum?

Prof. Dr. Keunen: Exactly! The reason I preferred an exam is so we are able to show that it works, that it is effective. Many of my colleagues are still sceptical about art observation in a medical curriculum. But we are going to improve students' pattern recognition, which is crucial.

Dr. Koksma: An occasional test is fine, but the problem is that more testing could be seen as the legitimization of art, whereas I do not think art needs a reason to exist in the first place, it does not need to be legitimated. Art is about the intrinsic value of working with people and a way to immunise medicine against its one-sided way of thinking.

Drs. Geerling: But it also works the other way around. Artists also have their own one-sided way of thinking.

During this interview we have focused on what the medical profession can learn from the artists' mindset. Let us change perspective. Do you believe that the participating artists will be able to learn from the medical world as well?

Drs. Geerling: As far as I am concerned yes. Art and artists should come out of their museums and art galleries and contribute to society in different ways. This is also what Minister Bussemakers (Minister of Education, Culture and Science) is aiming for. It is a huge step for artists, however there are already artists doing just that. A prime example of this is the artist Hans Aarsman, who is also member of the national cold case homicide team.

Prof. Dr. Keunen: Moreover, the artists we work with see this program as an enrichment of their profession as well. It is an eye-opener that they are able to help doctors and medical students.

"It is an eye-opener that artists are able to help doctors and medical students."

Dr. Koksma: The image of the artist as a lonely genius working on his creations needs to change.

Drs. Geerling: Programs like this also create obligations to artists.

The Pilot

The pilot of art and sciences classes has started and RAMS was invited to join the first out of seven masterclasses. So on a Saturday morning we waited for the bus that took us to the location of the first masterclass; museum MORE in Gorssel. The participants, medical and biomedical students, were all excited about what the day would bring and it almost felt like an old fashioned school trip.

The workshop

The first masterclass was given by Hans Aarsman and Roy Villevoe, respectively photographer and visual artist, whom observing is their second nature. After a short introduction the masterclass began. The first assignment of the day was to look at a painting of a garden by Pyke Koch for ten minutes and to write down what you saw. Ten minutes might sound like a long period of time to look at just one painting, however most participants felt it was not enough; the longer you looked the more you saw. Interestingly, although many details were observed almost no one had noticed the frame of the painting and only a few had written down what was being depicted. After doing the same task with a photograph

Art classes at other universities

The ideas about art classes in a medical curriculum are innovative and new, but the Radboudumc is not the only one interested in bringing medical science and art together. Tim van de Grift, doctor and researcher at the University of Amsterdam, has already introduced a minor in which medical, psychology and arts students are brought together to solve medical problems by combining art and science.

In Amsterdam you have designed a course that combines medicine and art. What do the students think of it?

In Amsterdam it is an elective class for which students have to apply. It is highly appreciated which might be partly due to the selection of students. The students who choose this class are often the 'crazy students'; the students that want to do something besides medicine. They are looking for a way to integrate things, they want a broader outlook on things.

Could you be more specific as to why students like it?

In these classes students are presented with a problem and then they are given complete freedom to work out how to solve it. Students get the opportunity to discover how things work for themselves, contrary to ordinary lessons in which the professor tells them how it works and students just have to learn symptoms, diagnosis and treatment. In these classes students are responsible for their own learning principles.

The class is for medical, art and psychology students?

And students of social sciences. Students from the different areas of study have a different approach to the problem. Medical and psychology students often have similar problem solving methods, whilst the art students have a completely different way of looking at the problem. Most medical students do not realise beforehand that there are different ways of perceiving a problem.

Some say that art classes improve empathy. Do you think art will improve the competences of a doctor?

The designers taught me to place myself in someone else's shoes, to imagine what the needs of that person are. This helps you to come up with new ideas. So yes, I do think it could be a complementary skill for a doctor.

Do you therefore think art should be a compulsory course for every medical student?

I am, of course, prejudiced. It might not be appreciated by all, but to empathise with their patients and to use different tools in order to better understand and help patients. If you have these qualities every modern doctor should have, then it should be a mandatory class. Also, the role of the doctor is changing. We have to teach students more than just the symptoms, diagnosis and treatment.



Figure 1: Participants, organisation and artists of the first workshop.



Figure 2: Sorting out photographs of wooden shields by tribe.

an interesting discussion followed about the observations that had been made and its implications for the work of a doctor. Are we as doctors focused so much on the details that we forget the bigger picture? Do we focus so much on symptoms and signs that we forget the patient we are dealing with? And do we have time for a more holistic vision? Next we were challenged by Roy Villevoe to sort photographs of wooden shields made by four different tribes in Papua. Each tribe has their own specific style of wooden shields and by searching for subtle (and less subtle) differences in style we were able to sort them out by tribe. The last part of the day featured a lecture in which Hans Aarsman explained using a few photographs that not everything is at first sight what it seems to be. Photographs are a snapshot which are sometimes hard to interpret as depth and size are not well read. In his work as a 'photo detective' Hans Aarsman is continuously zooming in and out, looking for details but keeping in mind the bigger picture and trying to recognise patterns and searching for things that do not fit in the picture.

A better doctor by looking at art

The students participating in this pilot are somehow attracted to the idea that looking to art will help them to become a better doctor or researcher. Some participants have already been educated in arts while growing up, whereas others have almost never attended a museum. However they all believe these masterclasses are valuable; whether it is by improving pattern recognition, as stated by the American studies, or by learning how to approach a patient in a different way, by broadening their worldview or by coming out of a comfort zone. The masterclasses are, like the new curriculum, based on the principle of self directed learning and consequently the students decide themselves

what their learning objectives are. However during this first masterclass most participants did not really know yet what their learning objectives will be. Nevertheless, the masterclasses are not just organised for having a fun afternoon in a museum, and therefore the results of the masterclasses will be studied by a PhD-student to evaluate their effectiveness. Moreover the participants will discuss their observations during the masterclasses and at the end of the pilot present the results of their own learning pathway.

Conclusion

Art and biomedical sciences at first may not seem to be good combination but as said before, not everything is what it seems to be. In this pilot (bio)medical students of the Radboudumc will follow seven masterclasses given by different artists with the aim of becoming a better doctor or researcher. So even though you will not participate in these masterclasses, you might want to visit a museum a bit more frequently to broaden your worldview and to learn how to observe with an eye for detail but without forgetting the bigger picture.

In September 2017 art observation will become an elective minor within the medical curriculum.

References

1. Niels J. Elbert en Th.J. ten Cate. Kunstobservatie in het medisch curriculum een literatuuronderzoek. Ned Tijdschr Geneeskund. 2013;157.



Winner of the Radboud Student Challenge: the IV-Silencer

Bas C. Doelman¹, Romee M.A. Haenen¹, Pleun de Jong¹, Lisa Kortekaas¹, Tamar P. van der Linden¹, Siep van der Linden¹, Maud H.C.H. Steins¹, Evy A.M. van de Wiel¹

¹ Bachelor Medical Student, Radboud University Medical Center, Nijmegen, The Netherlands

The problem

Patients who have been hospitalised often get intravenous (IV) medication. This IV medication is regulated by an IV pump. If there is an occlusion in the IV line, or the medication has run out, the IV pump starts beeping very loudly. The patient then has to call the nurses, so they can locate the beeping pump and solve the underlying problem. However, this causes some issues. First of all, the beep is very annoying for the patients especially as it also beeps in the middle of the night. It disturbs the patients' sleep and the calm environment that is important for their recovery. Secondly, the beep is irritating for other patients who are in the same room and for their families when they are visiting. It can also be unnerving for the family because they do not know why the pump is beeping. Thirdly, it is not possible for the nurses to locate the beep themselves because they cannot check all the rooms, so they have to wait until the patient calls them.

Research question: Is it possible to create an alarm system on IV-pumps that does not disturb the patient but does alarm the attending nurse?

Method

Our problem analysis consisted of own experiences and experiences of nurses in the hospital. Nurses confirmed this is a big problem for them and also for the patients. Next we searched for more information about IV pumps and the working mechanisms. By talking to an expert we found out that it is possible to alter the IV pump.

The solution

We developed the IV-silencer. How does the IV-silencer work? The beeping sound will be replaced by a silent signal that will be sent directly to the phones and computers of the nurses. This signal will contain the location of the pump and the underlying problem. This way, the patient is not bothered by the beep and the nurses will instantly know where to go and can effectively solve the problem. If there is no response within a certain amount of time, the pump will start to beep anyway. The light signal that appears on the IV pump when there is a problem will not be replaced since this is not as annoying as the beep. The light signal is a control for the nurses as well.

The IV-silencer is the winning idea of the Radboud Student Challenge, a project hosted for first year (bio)medical students.

CORRECT ANSWERS TO THE EXAM QUESTIONS

Answer B (51% answered correctly)

In the thick ascending limb of the loop of Henle reabsorption of sodium takes place. The Na-K-Cl cotransporter (NKCC) is responsible for sodium reabsorption. Loop diuretics such as furosemide inhibit the NKCC. Paracellular reabsorption of magnesium and calcium takes place due to an electrochemical gradient. (Interne geneeskunde, 14e herziene druk / Stehouwer, Koopmans, Van der Meer)

Answer B (50% answered correctly)

An AV block is a disturbance of the conduction of electrical impulses from the atria to the ventricles. There are different forms of impaired conduction, which range from slowed conduction (first degree AV block without loss of atrioventricular function) to intermittent loss of AV function (second degree AV block) and ultimately a complete AV block (third degree). (Interne geneeskunde, 14e herziene druk / Stehouwer, Koopmans, Van der Meer)

The questions can be found back on page 8 in this journal.

RAMS

A Word from the Board of RAMS

These will be my last words as chair of RAMS. In the next edition, not only will there be a new chair, but also a whole new team. Most of the students who founded RAMS will now give other students an opportunity to produce the journal.

In just two and a half years what started as a simple idea has been made a reality. From the moment we established RAMS I noticed that lots of students were willing to help in their spare time. From the pilot edition until the edition you are reading right now, the improvements we have made are clearly visible.

I am very proud of the entire RAMS team. We have certainly exceeded our own and others' expectations. We have given the medical faculty a high-quality students' journal. Besides that, we have also organised master classes, a symposium and even a summer school.

My wish is that when I come back to the medical faculty in a few decades, RAMS will still be the faculty's medical journal and it will still be made by students and for students.

To all students, I would like to say the following: get inspired by RAMS. Create and discover. Your studies do not make you unique, instead it is the things you do in your spare time.

Lars Gallée
Chair

General Board

RAMS is directed by the general board, which consists of five medical students. As members of the board they frequently meet to make sure all activities run smoothly. Moreover, they are in close contact with the supervisory board and the editorial staff. If you have any questions on general, promotional or financial subjects, you can contact the general board of RAMS via vice-voorzitter.rams@ru.nl.

Editorial Board

The editorial board is responsible for the contents of the journal, from reviewing the submitted papers to their rejection or publication. Furthermore, the editorial board is in charge of writing editorials and determining the general layout. For questions concerning the content of the journal please contact the editorial staff via hoofdredactie.rams@ru.nl. To submit papers, consult the 'for authors'-section on our website or mail to submit.rams@ru.nl.

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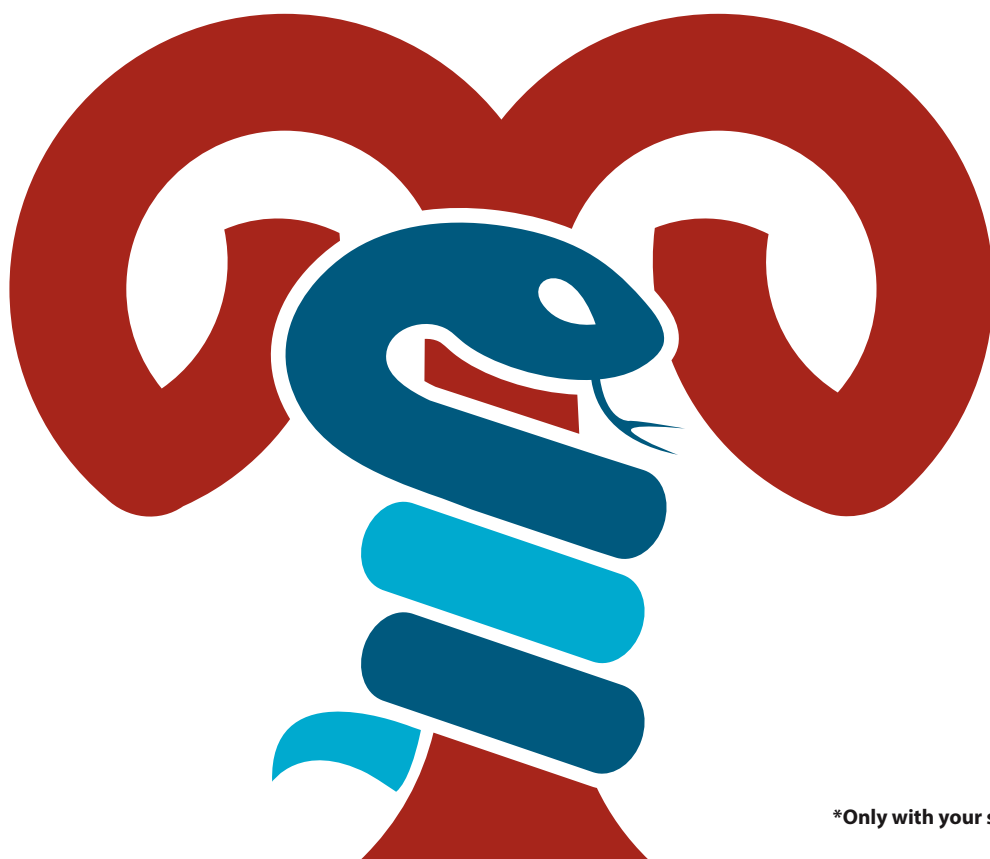
This is the largest group in our team. RAMS counts on the support of over twenty reviewers who have been trained by professors and teachers at the Radboudumc. With the help of specially developed master classes and use of their own specific knowledge, the reviewers are able to judge the submitted scientific articles.

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