



Nutrition in Medical Studies: “Eat This!” - a Digital Teaching Concept as an Elective Subject for German Curricula

Piloting a Course in Cologne

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Abstract

Introduction: In Germany, nutritional medicine (NM) is underrepresented in medical studies. The lecture series *Eat This!* (German: Iss Das!) initiated by students in Cologne is an example of how this gap can be closed.

Methods: *Eat This!* comprises seven online lectures (10.5 h) on NM in the clinical part of medical studies. Before and after the course, Cologne students rated the importance of NM, the range and quality of related teaching, their perceived preparation and competence, and their learning success (n = 113). Pretest data (n = 208) were compared with n = 57 students of other medical faculties.

Results: The lectures were very well attended by up to > 300 participants. The evaluation of the importance of nutrition and NM as well as of the students' own competence and preparation for the subject increased significantly. *Eat This!* was evaluated as “good” and received a teaching award at the Cologne Medical Faculty where it was perpetuated as an elective.

Conclusions: Student initiatives can be a useful strategy to promote NM in medical studies. *Eat This!*, for example, helps to close the existing gap. It is currently extended to a national level and is undergoing a multicentre evaluation.

Keywords: nutrition, medical studies, nutritional medicine, digital teaching, interdisciplinary

Introduction

Nutrition is essential for the prevention and treatment of chronic diseases. In Germany, cases of premature death and disability due to malnutrition increased by 3.4% in the decade before 2019. Worldwide, malnutrition currently causes 8 million deaths, accompanied by enormous costs for the health care system [1]. Despite its importance, evidence-based recommendations from medical societies [2] and opportunities to induce behavioural change with health benefits [3, 4], physicians too rarely talk about nutrition in their daily routine [3, 5, 6]. Reasons may be lack of time, lack of incentives and lack of cooperation with nutrition professionals as well as professional deficits and insufficient training [5–8]. Importantly, nutrition is currently not sufficiently addressed in medical studies [9]. Medical students, however, would prefer a stronger integration of nutritional medicine (NM) into the curriculum and they see themselves in a key role in (later) creating healthy nutritional awareness in patients [10, 11].

Anglo-American studies show the need for (catching up on) nutrition topics in medical school [9, 12] and for teaching initiatives that improve competencies in nutrition counselling and NM [13, 14]. In Europe, there are studies from the UK in particular with similar results [6, 15–17]. Corresponding publications from Germany are sparse. At the University Hospital of Düsseldorf, a teaching initiative on nutrition management started as an elective subject [18]. Two studies found that questions about NM were often answered incorrectly by doctors-to-be and doctors [19, 20]. The authors advocated for more teaching about NM in medical studies. The German National Competence Based Catalogue of Learning Objectives for Undergraduate Medical Education (NKLM) emphasises the importance of nutri-

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tional basics of prevention and therapy through nutrition as well as the necessity of corresponding courses. In its current form, however, it will not be binding until 2025 at the earliest. There is still the risk that NM will be appropriated by few major disciplines instead of being integrated into the curricula as an interdisciplinary and interprofessional topic.

In 2020, the *Eat This!* project was launched at the University Hospital of Cologne as a student initiative to implement a series of lectures on nutritional medicine topics in medical studies. Within the framework of the pilot project described here, we investigated the need and acceptance from a student point of view. Surveys at the beginning and after the lecture series indicate possible (learning) effects.

Methods

The Lecture Series

The elective lecture series was designed by medical students, physicians of the University Hospital Cologne and members of the non-profit organisation PAN int. (Physicians Association for Nutrition international). With respect to the topics, it was based on Guidelines for Nutrition Therapy in Clinic and Practice (LEKuP) [2], but was supplemented by issues from the field of Public Health Nutrition, the Sustainable Development Goals of the United Nations (→ <https://sdgs.un.org/goals>) and studies of the EAT-Lancet Commission (→ <https://eatforum.org/eat-lancet-commission/>), which take into account the influence of nutrition (systems) on climate change, antimicrobial resistance and food security with their respective effects on health. Lecturers were identified, contacted and invited based upon research in publications and personal recommendations.

The lecture series was promoted by posters, emails and in social media. The lectures (60 min.) were held live via the video conferencing platform Zoom. In the subsequent discussion (30 min.), student moderators passed on the questions posed by the auditorium in the chat to the speakers.

Recordings or lecture slides were made available to Cologne medical students afterwards on the ILIAS learning platform. *Eat This!* ran in April and May 2020.

Accompanying Research and Evaluation

By the second event (T0), 232 out of 325 (71%) enrolled medical students from Cologne participated in an initial survey. 208 data sets could be used for a cross-section analysis. After the last lecture (T1), 152 medical students took part in a second survey (47%). 113 data sets available at both T0 and T1 were pseudonymised and could thus be used for a longitudinal analysis. For comparison, 57 data sets from 83 students from other medical faculties were analysed.

The questionnaires at T0 and T1 were identical except for a final course evaluation. Questions on the curriculum (B1) and the teaching quality (B2) were indicators for the need for nutritional medicine teaching. Questions on the implementation of a so called "field of competence" (B3), a medical specialist (B4) and a professorship (B5) for nutritional medicine were intended to reflect the

subjective assessment of this topic in the context of medical studies. Questions on perceived preparedness (B6) and competence (B7) were taken as parameters for the perceived knowledge gained. B1–B7 also served as indicators of possible effects of *Eat This!* overall. E3, E4, E5.1–3, E6 and E14 were evaluation items (▀▀▀ section „Results“).

An interval scale was used from 0% ("strongly disagree"/"poor") through 25%, 50% and 75% to 100% ("strongly agree"/"very good") with the exception of school grades (1 to 6) for E14.

Statistics and Ethics

Analyses were done using IBM SPSS Statistics version 26.0, comparison T0 versus T1 by Wilcoxon rank test. P-values < 0.05 were considered to indicate statistically significant differences. The local ethics committee assessed the project positively (ref. 20-1189).

Results

The Series of Lectures

Eight lecturers (from universities, universities of applied sciences or certified doctor's offices) in the fields of internal medicine, pharmacology, or ecotrophology (nutritional science and home economics) some with certificate in nutritional medicine according to the German Society of Nutritional Medicine (DGEM), came from the University of Cologne (n = 3) or from outside (n = 5). The topics are shown in detail in ♦ Table 1.

On average, the lectures were attended by 211 participants, with lectures 1 and 7 reaching more than 300 participants. The student-initiated lecture series convinced the those responsible for teaching: *Eat This!* was included in the curriculum as an elective under the patronage of Clinic II for Internal Medicine.

Cologne students (♦ Table 2) were predominantly in their clinical study period, young (median 24 years), healthy (11% with chronic diseases), hardly smoked (< 2.5%) and were predominantly health-conscious: 79% exercised several times a week or even daily, > 50% drank alcohol at most once a month. More than 60% said they ate an omnivorous diet. The situation was similar among guest students (♦ Table 2), with a lower proportion of omnivores (19%) and more vegans (26% vs. 7%) or vegetarians (21% vs. 13%).



Topic	Content	Qualifications of the lecturers
Nutrition Basics	<p>macronutrients: reference values, energy/nutrient density, glycaemic index, food insulin index, second meal effect, amino acid profiles, inflammation & growth (mTOR, IGF-1), (un)healthy fats</p> <p>micronutrients: Reference values, deficiencies</p> <p>food groups: (un-)healthy food components (salt, TMAO etc.)</p> <p>public health nutrition: GBD study, Blue Zones, healthy diets, NCDs & Western Diet, global aspects</p>	Ass. Physician (4th year), paediatrics, nutritional medicine ^a , PAN int.
Climate & nutrition	<p>recommendations: e.g. DGE, Canadian Food Guide, EAT-Lancet Commission</p> <p>relationship between nutrition, climate, health: CO₂ balances, ecological & health consequences of global warming, UN Sustainable Development Goals</p> <p>sustainability concepts: e.g. healthy nutrition in big cities</p> <p>“climate consultation”: case studies & discussion with patients</p>	General medicine specialist, psychiatry specialist, MD
Healthy Ageing	<p>demographic & historical development: (healthy) lifespan, diseases of civilisation</p> <p>ageing: cell ageing/stress, caloric restriction</p> <p>mediterranean diet</p>	Internal medicine specialist, Prof. MD/PhD
Pharmacology & Nutrition	<p>nutritional physiology: (nutritional) effects on the digestive system.</p> <p>interactions: e.g. vegetables containing Vitamin K, antidiabetics, chemotherapeutics, alcohol, fruit juices</p> <p>influence of medicines: Taste disturbances, loss of appetite, metabolism</p> <p>nutritional effects: Pharmacokinetics, pharmacodynamics</p> <p>pharmaconutrition</p>	Pharmacology specialist, assoc. Prof., MD
Microbiome^b	<p>Microbiome: definition, probiotics, prebiotics, intestinal dysbiosis, gut-brain axis, stool transplants, IBD</p>	Internal Medicine Specialist, infectiousology Prof., MD
Malnutrition in Elderly	<p>malnutrition in geriatrics: definition, epidemiology, assessments</p> <p>(par-)enteral nutrition: basics, indications, energy requirements</p> <p>wound healing: essential nutrients</p> <p>chronic renal failure: Protein-Energy Wasting</p> <p>sarcopenia, frailty: definition, prevention</p>	Internal Medicine Specialist, gastroenterology, Prof., MD, nutritional medicine ^b
„Do vegans live healthier?“	<p>nutrient supply: Mixed diet vs. vegetarian & vegan diet (e.g. vitamin B₁₂, vitamin D, iodide and calcium)</p> <p>prevention through vegetarian & vegan nutrition: prospective cohort studies (e.g. EPIC Oxford, Adventist Health Study I & II, PREDIMED), diabetes type 2, CVD, cancer prevention</p>	ecotrophology, Prof., PhD
Nutritional psychology	<p>systemic eating counselling: definition, history, basics</p> <p>eating and relationship: physiological and emotional hunger, pleasure, community, table talk</p> <p>practical implementation: therapeutic instruments, search for causes of obesity & eating disorders</p>	ecotrophology, systemic family therapy

Tab. 1: Lecture topics

IBD = inflammatory bowel disease; CVD = cardiovascular disease; DGE = German Nutrition Society; GBD = Global Burden of Disease; IGF-1 = insulin-like growth-factor 1; mTOR = mechanistic Target of Rapamycin; NCDs = non-communicable diseases; TMAO = trimethylamine-N-oxide

^a nutritional medicine as certified by the German Society of Nutritional Medicine (DGEM)

^b cancelled due to cancellation of the speaker at short notice



Nutritional Medicine Courses: Evaluation and Needs

At the beginning, Cologne students and guest students rated the range and the quality of existing lectures as insufficient (♦ Figure 1). The situation was similar when it came to rating their own preparation and competence with regard to NM. The support for the implementation of a specialist or professorships in the field of nutritional medicine was rather moderate among Cologne students,

while guest students were mostly in favour of this. With regard to the "field of competence", a lecture format specific to the Cologne model study programme (interdisciplinary series of lectures with a scope of approx. 8 h), Cologne students again voted clearly in favour of such a format for the topic of NM.

Characteristic	Specification	Cologne	Guests
participants n (%) [*]		208 (64)	57 (69)
gender n (%)	female	125 (60)	39 (68)
	male	66 (32)	11 (19)
	diverse	1 (0.5)	0 (0)
	not specified	16 (8)	7 (12)
duration of study	semester ^{**}	6 (3)	7 (7)
age	years ^{**}	24 (4)	24.5 (4,3)
height	cm ^{***}	175 (9)	173 (8)
weight	kg ^{**}	66.5 (20)	65 (15)
BMI	kg/m ^{2**}	21.8 (3,9)	21.6 (3)
chronic diseases n (%)	yes	23 (11)	3 (5)
	no	165 (79)	47 (83)
	not specified	20 (10)	7 (12)
smoking n (%)	yes	5 (2)	0 (0)
	no	183 (88)	50 (88)
	not specified	20 (10)	7 (12)
alcohol consumption n (%)	not at all	28 (14)	11 (19)
	1 x per month	81 (39)	21 (37)
	1 x per week	54 (26)	13 (23)
	several times per week	25 (12)	5 (9)
	daily	0 (0)	0 (0)
	not specified	20 (10)	7 (12)
physical activity n (%)	not at all	2 (1)	0 (0)
	1 x per month	3 (2)	0 (0)
	1 x per week	19 (9)	1 (2)
	several times per week	120 (58)	31 (54)
	daily	44 (21)	18 (32)
	not specified	20 (10)	7 (12)
diet n (%)	omnivore	134 (64)	11 (19)
	vegetarian	26 (13)	12 (21)
	vegan	14 (7)	15 (26)
	low-carb	8 (4)	0 (0)
	pescatarian	15 (7)	3 (5)
	other	11 (5)	11 (19)
	not specified	0 (0)	5 (9)

Tab. 2: Characteristics of the students in the first survey (pre-test, T0)

* response rate; ** median (interquartile range); *** mean value (standard deviation)

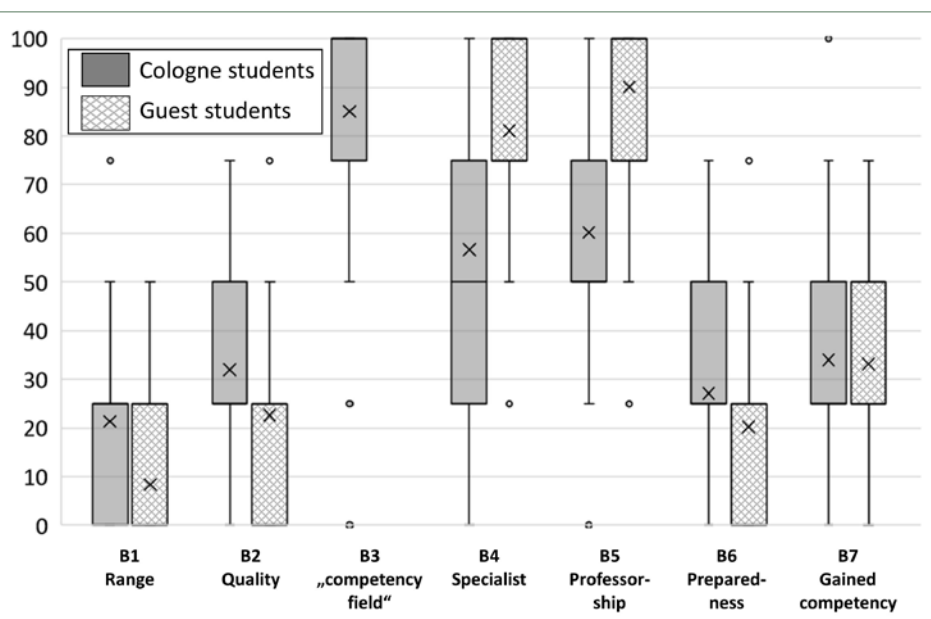


Fig. 1: Teaching nutritional medicine – evaluation and needs

Data from Cologne students and guest students on an interval scale from 0 ("do not agree at all"/"poor") to 100 ("agree completely"/"very good")

Acceptance and Evaluation

On average, Cologne medical students attended five of the seven lectures (item E4). Relevance for knowledge gained, the interest- ingness of the content, motivation for the topic and structure with regard to the topics (E3, E5.1–3) were predominantly rated as good to very good (median 75% on a scale of 0–100%). The learning progress was felt to be rather moderate (E6; 50%). Overall, *Eat This!* was given a median grade of 2 (E14). While at the beginning (April 2020) the digital format was considered to be equivalent to traditional classroom teaching, the students rated the online format much more positively as the course progressed.

Effects

Against the background of the lecture series, the evaluation of the range (B1) and the quality (B2) of the nutritional medicine lectures increased significantly ($Z = -5.9$ and -6.9 respectively; ♦ Figure 2). In the end, full or predominant agreement was given by 12 instead of 1 or 40 instead of 10 students.

The implementation of a medical specialist or professorship for NM was also now advocated significantly more often (full or predominant agreement: 63 vs. 47 or 70 vs. 59; $Z = -3.2$ or -3.1). The support for the idea of implementing nutritional medicine as a "field of competence" into the Cologne curriculum, which was already pronounced at the beginning, increased further ($Z = 1.96$; $p < 0.05$). The proportion of students who felt poorly or rather poorly prepared for NM topics halved during the lecture series from 89 to 45 ($Z = -6.9$; $p < 0.001$). The effect on the perceived competence with regard to NM topics was even more pronounced: the proportion of those who considered themselves as competent or rather competent tripled (40 vs. 14; $Z = -6.4$; $p < 0.001$).

In summary, the students considered *Eat This!* as a significant improvement in the teaching of NM topics. Their desire to place more emphasis on NM topics in teaching and practice was already

strong before the lecture series and continued to increase throughout the course. A significant increase was recorded in the perceived preparedness and competence in nutritional medicine topics.

Discussion

The student-initiated lecture series *Eat This!* deals with nutrition and nutritional medicine. It is intended to be an example of an accepted teaching offer with which these important but hitherto underrepresented topics can be integrated into medical studies with manageable effort.

The great response from students can partly be attributed to the low-threshold online format. On the other hand, it was a non-mandatory, additional teaching offer, which suggests intrinsic interest and need on the part of the students. Our findings on medical students' attitudes towards nutritional medicine during their medical studies is similar to results from other countries [9, 12]. It is also in line with the conclusions drawn from German studies, which find an insufficient level of training in nutritional medicine [18–20]. Our participants were predominantly in their clinical study period. Many previous initiatives involved only the preclinical stage or were extracurricular [16, 17, 21]. The timing of implementation, however, is an important factor [8].

It is desirable to include nutrition and EM in the compulsory curriculum. In fact, this must be done as part of the implementation of the NKLM 2.0 (see e.g. learning objective VIII.4–04.4.1: "[Graduates will be able to] explain, analyse and advise on the basics of healthy and balanced nutrition, taking into account age, gender, cultural background, personal life situation, psychological and social conditions").

Since corresponding topics are relevant for many disciplines in medical studies, many of them could be considered for implementation. From our point of view, an interdisciplinary implementation would make sense, which is supported by the upcoming German Medical Licensure Act (ÄApprO), which provides for a modularisation of the medical curriculum (see draft from 20.08.2021). Here, the introduction of "nutritional medicine" as a clinical subject of the modules in the core curriculum and specialisation area according to Annex 3 of the draft ÄApprO would be welcome, which



No.	context	variables	time	0% (strongly disagree)		25%		50%		75%		100% (strongly agree)		p-value
				%	n	%	n	%	n	%	n	%	n	
B1	need for NM	range ^k	before (T0)	41.6	47	43.4	49	14.2	16	0.9	1	0.0	0	< 0.001
			after (T1)	12.4	14	46.0	52	31.0	35	8.0	9	2.7	3	
B2	need for NM	quality ^k	before (T0)	23	26	42.5	48	25.7	29	8.8	10	0.0	0	< 0.001
			after (T1)	6.2	7	21.2	24	37.2	42	24.8	28	10.6	12	
B3	importance of NM	"competency field"	before (T0)	0.0	0	1.8	2	7.1	8	30.1	34	61.1	69	0.05
			after (T1)	0.0	0	0.0	0	6.2	7	26.5	30	67.3	76	
B4	importance of NM	specialist	before (T0)	7.1	8	16.8	19	34.5	39	15.0	17	26.5	30	0.002
			after (T1)	3.5	4	7.1	8	33.6	38	27.4	31	28.3	32	
B5	importance of NM	professorship	before (T0)	6.2	7	11.5	13	30.1	34	28.3	32	23.9	27	0.002
			after (T1)	4.4	5	6.2	7	27.4	31	24.8	28	37.2	42	
B6	learning progress	preparedness ^k	before (T0)	24.8	28	54.0	61	16.8	19	4.4	5	0.0	0	< 0.001
			after (T1)	5.3	6	34.5	39	42.5	48	17.7	20	0.0	0	
B7	learning progress	gained competency ^k	before (T0)	19.5	22	41.6	47	27.4	31	9.7	11	1.8	2	< 0.001
			after (T1)	4.4	5	16.8	19	43.4	49	32.7	37	2.7	3	

^k referring to nutritional medicine (NM) in/by medical studies at Cologne University

Fig. 2: Effects of *Eat This!* on the evaluation of the university's own courses (B1 and B2), the importance of nutritional medicine (B3–5) and the self-assessment regarding these topics (B6 and B7)

would then possibly also favour the creation of corresponding professorships.

The per se necessary adjustment of medical studies to the upcoming ÄApprO also offers the chance of implementation without increasing the total course volume, which currently appears to be a major obstacle. A reduction of other teaching contents could (already now) be circumvented by including NM in an elective curriculum, as was done in the case of *Eat This!*.

The involvement of non-university institutions can support the universities, as was suggested, for example, with regard to the teaching of scientific competencies by the Science Council ("Wissenschaftsrat") in 2018 [22]. In this context it must be critically questioned how the involvement and thus a potential influence on university teaching can be regulated. In the case of approved non-profit organisations (e.g. aid organisations, registered associations), the risk of manipulation may be lower than, for example, on the part of industry, but here too, faculties should make regulations [23]. In the case of *Eat This!* the solution was a "patronage" of the elective course by a professor from the University Hospital of Cologne.

In a multi-centre survey of medical students in Germany, "Prevention and Health Promotion" was ranked in the bottom fifth of subjects in medical studies in terms of motivation

to learn [24]. The evaluation was somewhat better with regard to relevance for the everyday work of physicians. Another study shows that the interest of medical students in prevention correlates with the frequency of counselling on this topic later [25]. This suggests the need to make medical students more aware of nutrition and nutritional medicine topics, which seems to be possible with teaching programmes such as *Eat This!*. Interestingly, Frank et al. also found that a healthy lifestyle and studying at a university that promotes this behaviour correlates with the likelihood of addressing prevention later [25]. An ongoing study is investigating whether *Eat This!* also has an effect on health-conscious behaviour (Ethic Committee Cologne, file No. 20-1522). Self-efficacy in counselling and better personal health behaviour are stimulators for preventive medical counselling by physicians [26]. Feeling of preparedness and competence are factors of self-efficacy [27]. Whether the parameters collected in the present work as well as in other publications are predictive for increased knowledge and better performance in medical practice remains to be shown [8, 13, 14]. However, we consider the better assessment of teaching offers, the increase in perceived preparedness and competence as well as the assessment of the importance of nutritional medicine to be relevant, as they target the hurdles that prevent physicians from implementing nutritional counselling in their daily routine, as described in the introduction [5–8].

Our participants rated the learning progress as rather moderate, while there was a significant increase in the assessment of preparedness and competence regarding nutritional medicine topics at the end of the course. One explanation is that the learning progress was more related to cognitive, declarative knowledge, while after the course the students felt confirmed in their attitude towards nutritional medicine topics and thus felt more confident with regard to representing this attitude.



Limitations

Our data may be subject to selection bias. The comparison with guest students from other universities makes it unlikely that there were location-specific peculiarities among Cologne participants. However, it is likely that the participants represent a positive selection with regard to interest in nutritional medicine topics, but also healthy lifestyles. Scepticism towards digital learning formats may have decreased due to the pandemic and the lack of alternatives. However, the quality of *Eat This!* itself may have convinced participants that good courses can be realised online.

Conclusion

Eat This! shows that an accepted course on nutrition and nutritional medicine topics can be implemented in medical studies at a low threshold. Despite the possible selection of those interested in the topic, there is evidence that such a lecture series can be beneficial for the perception and assessment of the importance of nutritional medicine topics. The fact that the participants rated the project positively is not only reflected in the evaluation data, but also in the fact that *Eat This!* received a teaching award by the student body of the Medical Faculty in Cologne in 2020. The lectures have been included in the elective curriculum of other medical faculties (e.g. in Aachen, Düsseldorf, Gießen and Regensburg).

Conflict of Interest

The authors declare no conflict of interest.

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