ORIGINAL Research

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Written Examinations in Swedish Medical Schools: Minds Molded to Medicate?

Abstract: *Lifestyle medicine (LM) is part of official educational goals in Swedish medical schools. We studied questions concerning 5 noncommunicable diseases: diabetes, hypertension, coronary heart disease (CHD), chronic obstructive pulmonary disease (COPD), and stroke from 124 written examinations conducted between 2012 and 2015. LM knowledge yielded between 2% and 10%, whereas pharmacology-related knowledge yielded between 24% and 50%, of total points. The multiples at which pharmacology-related knowledge was valued higher than LM knowledge were 2.4 for COPD (*P < *.056), 4.3 for diabetes (*P < *.0001), 4.8 for hypertension (*P < *.0001), 5.2 for CHD (*P < *.0001), and 31.5 for stroke (*P < *.0001). Our results indicate that lifestyle-related knowledge, though covered by official teaching goals, is currently underrated in Swedish medical education.*

Keywords: lifestyle medicine; medical education; curriculum; examination

From δίαιτα (regimen) of Hippocrates to 18th centuries' humanist medicines' *non-naturals*, control of lifestyle factors has been a major modality of medical teaching and practice.[1,2] With the advent of more effective pharmacological and surgical treatments, lifestyle medicine (LM, although this term had not been coined) was gradually marginalized in the Western medical tradition. Today, there is overwhelming evidence for the importance of lifestyle factors in the prevention and management of noncommunicable diseases (NCDs). Lifestyle practices and habits have been shown to play key roles in prevention and/or management of diabetes,[3,4] coronary heart disease (CHD),[5,6] stroke,[7] hypertension,[8] chronic obstructive pulmonary disease (COPD),[9] and various forms of cancer.[10] This new knowledge calls, again, for adaptation of the way we teach and practice medicine.

> Today, there is overwhelming evidence for the importance of lifestyle factors in the prevention and management of noncommunicable diseases (NCDs).

The 5½-year undergraduate medical program in Sweden is offered by 7 universities. On average (2011-2013), 784 students were admitted each term (ie, twice a year) for medical training, nationally. Of these, 53% were female and the age distribution at admission was 76% younger than 25 years, 20% 25 to 35 years, and 4% 36 years or older.[11]

Medical schools follow national regulations for overall academic and professional outcomes. The Higher Education Authority (UKÄ) is responsible for quality control and accreditation.[12] For undergraduate medical education, there are 15 nationally defined outcomes. Outcome 6 requires: ". . . ability to initiate and execute health-promoting and preventive work in health care aimed at individual patients as well as groups . . ."[13] A recent audit by UKÄ,

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based on self-evaluation concluded that all medical schools effectively convey these skills to their students.[14]

Based on this finding, we tested the hypothesis that LM knowledge and knowledge about pharmacological interventions are rated equally in the domain of NCDs.

Methods

Examinations have been shown to exert a strong influence on students' knowledge acquisition.[15,16] Although other forms of examination are used as well, written examinations are the dominant form of evaluation in Swedish medical schools. We therefore decided to focus on questions regarding NCDs from written examinations. We asked the chairmen of the educational boards and/or administrative personnel of all medical schools to provide previous examinations, including expected correct answers and respective attainable points. 124 examinations from clinical courses in internal medicine that had taken place between fall 2012 and fall 2015 were retrieved, thereby covering the period of the UKÄ audit from 2013. Depending on the university, the clinical course in internal medicine is given in the third or fourth year of undergraduate medical training.

Two authors (BK, CL) read all examinations and identified questions concerning lifestyle-related disease. We confined ourselves to the following NCDs: diabetes, hypertension, CHD, COPD, and stroke.

We (BK, CL) discriminated between 3 categories of knowledge: lifestyle-related, pharmacology-related, and other. The latter category includes knowledge about pathophysiology, clinical examination, investigation, interventions other than lifestyle or pharmacological, differential diagnoses, ethical considerations, and so on. All questions related to pharmacological treatment of the 5 NCDs, including decision-making instruments like CHADS2 or the NIH (National Institutes of Health) scale were categorized as pharmacology related. Questions concerning lifestyle habits (eg, food and exercise habits, stress management, regular sleep and rest, smoking, and consumption of alcohol) or health behavior change in the context of 1 of the 5 aforementioned NCDs were categorized as lifestyle related. An example for the classification of an examination question is given in Figure 1.

Figure 1.

Example for classification of an examination question.

Example for classification of an examination question (Umeå, fall 2014, questions 28):

Berit 65 year-old and recently retired, comes to your primary care center for a yearly routine control of her hypertension. Since there is a family history of cardiovascular disease (brother had myocardial infarction at age 52) she has started thinking about her health and risk for myocardial infarction. Apart from hypertension and osteoarthrosis she is healthy, non-smoker. Her current height is 169 cm and her weight 80 kg; her blood pressure is 150/90 mmHg with medication Enalapril (ACE-inhibitor 20mg once a day). Total cholesterol 4.3 mmol/L with LDL at 1.9 mmol/L, S-creatinine 70 mmol/L. She does her best to be physically active but here ankle-osteoarthrosis inhibits that ambition. She is obviously concerned about having a myocardial infarction and wonders what she herself can do to reduce her risk.

a) what can she herself do to reduce her risk for myocardial infarction (1p)
Expected correct answer: Regular exercise e.g. swimming, cycling (0.5p), weight reduction (0.5p)

b) on follow up 2 months later her blood pressure is unchanged. What change in her medication is advisable to reduce the risk for cardiovascular complications? (1p)
Expected correct answer: Addition of Ca-channel blocker (e.g. amlodipine) or thiazid diuretic (e.g. hydrochlortiazide) (one correct alternative renders 1p)

Classification: NCD yes; Hypertension; lifestyle 1p; pharmacology 1p; other 0p.

With the help of expected correct answers, we determined distribution of points attainable for knowledge pertaining to the respective category (lifestyle/pharmacology/other). Conflicts of opinion regarding category were resolved by consensus.

Statistical Analyses

We used the Statistical Analysis System (SAS for Windows, version 9.4, SAS Institute, Carry, NC, USA) for all statistical evaluations. To determine the likelihood of equal weight for lifestyle- and pharmacology-related knowledge, we calculated the difference between obtainable points in respective category (lifestyle vs pharmacology) for each NCD for each individual examination. We used the sign test in the PROC UNIVARIATE procedure to obtain respective *P* values for the hypothesis of equal or higher number of obtainable points for LM knowledge compared with pharmacology-related knowledge.

Results

Distribution of points attainable for all 5 NCDs are shown in Table 1. LM knowledge yielded between 2% and 10%, whereas pharmacology-related knowledge yielded between 22% and 50% of total points. Multiples at which LM knowledge is discounted compared with pharmacology-related knowledge are given in Figure 2. The largest difference between lifestyle and pharmacology was seen in stroke, and the smallest difference was observed in COPD.

Discussion

Questions regarding hypertension, CHD, diabetes, stroke, and COPD offered consistently more points for pharmacology-related knowledge than for LM knowledge. This bias against LM knowledge was found for all 5 NCDs. Thus, our hypothesis, that the ability to initiate and execute health-promoting

Table 1.

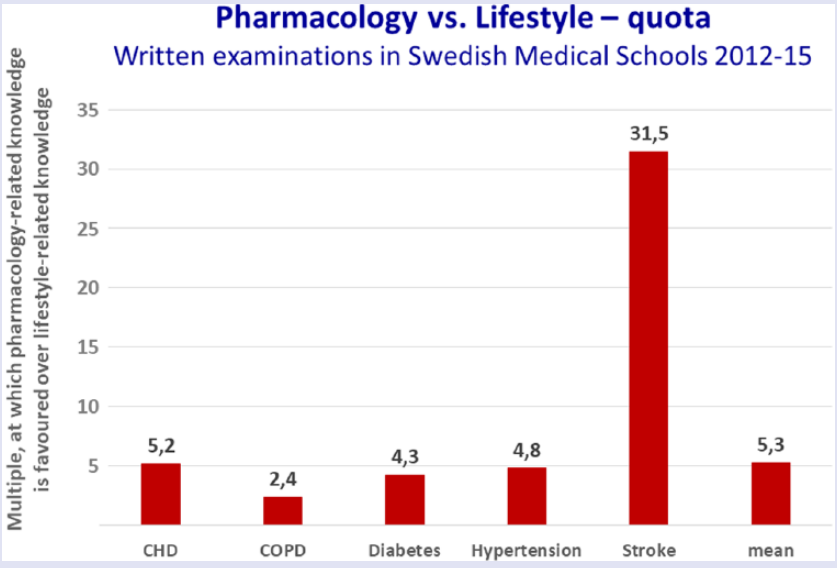
Relative Importance of Lifestyle-Related, Pharmacology-Related, and Other Knowledge in Written Examinations.[a]

		Percentage of Points, Mean			
	Examinations, n = 124	Lifestyle	Pharmacology	Other	$P_{Lifestyle \geq Pharmacology}$
CHD	62	5.0	26.1	68.9	<.0001
COPD	48	9.5	22.4	68.1	.0567
Diabetes	55	9.3	39.7	51.0	<.0001
Hypertension	57	8.5	41.2	50.3	<.0001
Stroke	70	1.6	49.5	48.9	<.0001

Abbreviations: CHD, coronary heart disease; COPD, chronic obstructive pulmonary disease.
[a]*P* values for hypothesis that lifestyle-related knowledge renders as many points as pharmacology-related knowledge.

Figure 2.

Pharmacology versus lifestyle quota. Questions regarding lifestyle-related diseases (hypertension, stroke, coronary heart disease [CHD], diabetes, chronic obstructive pulmonary disease [COPD]): Knowledge related to pharmacological treatments is rated between 2.4 and 31.5 times higher than knowledge about lifestyle factors.



and preventive work in the field of LM is examined on equal terms with knowledge about pharmacological treatments could not be confirmed.

Smoking cessation can reduce the rate of forced expiratory volume (FEV_1) decline that exists in smokers with COPD.[17] It is therefore reasonable that LM has the highest relative relevance in COPD and the only nonsignificant difference compared with medication in our analysis. Regarding stroke, examination questions focus on both acute thrombolysis and prevention by anticoagulants, which might explain the high relative weight of pharmacological treatments. Whether available pharmacological treatments justify a 140% preference over lifestyle in COPD and a 3050% higher importance in stroke is doubtful.

Our results are at variance with the finding of the 2013 UKÄ audit. A possible explanation is that our view of goal 6 as a description of lifestyle prevention is too narrow: The goal not only includes LM but also pharmacological prevention and public health initiatives. Moreover, self-evaluations may be testing universities' abilities to convincingly present curriculum content, rather than evaluating the education itself.

Basic pharmacology is taught during preclinical terms and its practical application during clinical training. There is no equivalent systematic education and training regarding LM at any of the surveyed seven medical schools. Karolinska Institutet (Stockholm) is the only one that has a chair in the field of LM (preventive cardiology), which is outnumbered by 10 chairs for pharmacology in Stockholm alone.[18] Therefore, the observed bias against LM in written examinations does not come as a surprise. However, neglect of LM in basic medical curricula is not confined to Sweden. The majority of US medical schools do not include LM as a regular part of their undergraduate training [19] and initiatives offering lifestyle-medicine

as optional courses are reported as novelties.[20] Yet, recently evolved LM curricula[21,22] and implementation initiatives[22-24] instill hope that a change may be underway.

Our survey has several limitations. We covered only examinations from terms that teach internal medicine. A complete survey of examinations from all clinical terms at all 7 universities was beyond our capacity. The fact that some universities examine primary care knowledge of the same diseases on different occasions might have inflated the observed bias in favor of pharmacology-related knowledge. However, we extracted all primary care–related questions for one medical school (Umeå), which yielded no additional LM questions regarding the 5 chosen NCDs. Furthermore, we have not investigated practical or oral examinations. However, we are not aware of any evidence that any of these examination forms is more amenable to assess LM knowledge as contrasted to pharmacology.

Our results indicate that lifestyle-related knowledge, though covered by official teaching goals, is currently underrated in Swedish medical education.

Authors' Note

A table with classification of questions from individual examinations is available from the corresponding author.

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