

# Why don't medical textbooks teach? The lack of logic in the differential diagnosis

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## ABSTRACT

Medical textbooks are an important aid in the process of diagnosing and treating patients. Medical students use these books to acquire the skills necessary for this process, while medical teachers and experienced doctors use them for teaching these competences. We posed the question whether medical textbooks are structured in such a way that medical students are taught to structure knowledge and to make a differential diagnosis in a logical way. Five major textbooks were compared with regard to four clinical problems (gastrointestinal bleeding, anaemia, oedema and heart failure). The presentation appeared to be very variable in respect of logic and systematic arrangement. In fact, it was disappointing that even in well-reputed textbooks, a systematic approach is lacking. We feel there is a need for improvement, in order to facilitate the learning of medical students and to enhance their abilities in clinical problem solving.

## INTRODUCTION

For clinicians, medical textbooks are an important source of information on diseases. Such books are used to check whether certain symptoms or signs fit into a clinical syndrome, to look for diagnostic or therapeutic strategies and sometimes for completion of a differential diagnosis. Most textbooks are extensive and difficult to use, but a good index and electronic versions with a search system have enhanced accessibility.

Medical students are stimulated to buy and use textbooks of the major medical disciplines and discouraged to use readers with copies of articles without an index. In modern medical curricula, histories of patients are already used in the first years of training, and thus medical textbooks are used more intensively. These clinical problems have to be analysed, and consequently, a motivated plan for diagnostic procedures and therapy has to be made. In addition, students are stimulated to look for additional information in the medical literature. Depending on the study progress, level of competence and the depth needed, a concise or comprehensive textbook is used. Apart from finding answers to specific questions, it is important that students learn to use textbooks. In this way similar clinical problems can be solved and in the long run students will be able to reproduce differential diagnoses by head.

A systematic arrangement of differential diagnoses may be based on anatomy, pathophysiology or epidemiology.<sup>1-4</sup> For symptoms as pain or bleeding an anatomical approach is useful, whereas for signs as fever or shortness of breath a pathophysiological one is preferable. Sometimes a combination of approaches is necessary, especially in case of a more detailed differential diagnosis. Others plead for scheme-induced reasoning as an aid in the instruction of clinical problem solving.<sup>5</sup> However, it may be difficult to recognise the logic and systematic construction of these schemes.

In most textbooks the amount of epidemiological information is rather limited. It is important to realise that such data are dependent on the clinical setting. The prevalence

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of a certain diagnosis differs in a primary care setting, in a regional hospital and in a tertiary referral university medical centre. Therefore, it is easier and safer for medical students to use their preclinical knowledge in anatomy and pathophysiology and make a logical differential diagnosis according to this knowledge. With regard to the latter, the question is whether medical textbooks are structured in such a way that medical students can recognise the logic. If they can, this facilitates them to acquire this competence. In other words: do medical textbooks teach in making a differential diagnosis and help to structure knowledge in a logical way?

## METHODS

For four textbooks we made a comparison of the given differential diagnosis for four illustrative clinical problems.<sup>6-10</sup> We gave special attention to the degree of logical categorisation. We compared one American comprehensive textbook (*Harrison*),<sup>6</sup> two British rather concise textbooks (*Kumar, Souhami*)<sup>7,8</sup> and one Dutch concise textbook (*Van der Meer*<sup>9</sup>). Each of these books is widely used in medical schools in the Netherlands. In addition, we used the web-based version of *UpToDate*.<sup>10</sup> For four major clinical problems (upper gastrointestinal bleeding, anaemia, oedema and heart failure) we have summarised the presentation of the differential diagnosis in these textbooks in *tables 1 to 4*. The organising principle

is listed and some examples are given. The information is gathered from the original text (sometimes with headings, or with bold or italic accents), from tables or figures and sometimes from a combination of these.

## RESULTS

### Upper gastrointestinal bleeding (*table 1*)

This symptom or sign can be analysed typically by an anatomy-based approach. Two textbooks use this approach. For each anatomical site some examples of lesions are given. *UpToDate* uses a pathophysiological approach, *Souhami* a combination of anatomical and pathophysiological. Two books use a nonspecific or epidemiological arrangement; this illustrates that such a listing is difficult to reproduce for inexperienced medical students.

### Anaemia (*table 2*)

All textbooks adopt a pathophysiological approach, usually based on blood cell indices, with the addition of various examples. Only *van der Meer* uses a pathophysiological arrangement based on the mechanism; such a mechanistic approach is commonly used for cases with a shortage or deficit of cells or molecules: decreased production, increased destruction or increased loss. It is obvious that use of these mechanisms is logical, and perhaps therefore well known among teachers and students.

**Table 1**  
*The aetiology of upper gastrointestinal bleeding in various textbooks*

TEXTBOOK	CATEGORIES	SPECIFIC ENTITIES	ORGANISING PRINCIPLE
Harrison		Ulcers, varices, Mallory Weiss tears, erosions, erosive oesophagitis, malignancies	Epidemiological (with incidence rates)
Kumar	Oesophagus	Varices, etc.	Anatomic (with figure and incidence rates)
	Stomach	Ulcer, etc.	
	Duodenum	Ulcer, etc.	
Souhami	Oesophagus	Carcinoma, etc.	a) Anatomic
	Stomach	Ulcer, etc.	b) Pathophysiological
	Duodenum	Ulcer, etc.	
	Systemic	Renal failure, clotting disorders, etc.	
	Vascular		
Swallowed blood			
Van der Meer		Ulcer, varices, gastritis, gastric carcinoma, Mallory Weiss tears, oesophagitis	Nonspecific
UpToDate	Ulcerative or erosive	Ulcer, inflammation	Pathophysiological
	Portal hypertension	Varices	
	Vascular malformations	e.g. Angiomas, teleangiectasias	
	Traumatic		
	Tumours		

**Table 2**  
*The aetiology of anaemia in various textbooks*

TEXTBOOK	CATEGORIES	SPECIFIC ENTITIES	ORGANISING PRINCIPLE
Harrison	Normocytic	Marrow damage, iron deficiency, etc.	a) Pathophysiological (based on blood cell indices)
	Microcytic	Deficiencies, defects	
	Macrocytic	Deficiencies	
	Haemolysis		b) Pathophysiological (based on mechanism)
	Blood loss		
Kumar	Microcytic	Iron deficiency, etc.	Pathophysiological (based on blood cell indices)
	Normocytic	Blood loss, chronic disease, etc.	
	Macrocytic	Vitamin B12 and folic acid deficiency	
Souhami	Microcytic	Iron deficiency, etc.	Pathophysiological (based on blood cell indices)
	Normocytic	Blood loss, haemolysis, etc.	
	Macrocytic	Megaloblastic change	
Van der Meer	Decreased production	Bone marrow disease, immunological, deficiencies	a) Pathophysiological (based on mechanism)
	Increased destruction	Intra- and extracellular	
	Increased loss		
	Microcytic	Iron deficiency, etc.	b) Pathophysiological (based on blood cell indices)
	Normocytic	Aplastic, renal insufficiency, etc.	
	Macrocytic	Vitamin B12 and folic acid deficiency, etc.	
UpToDate	Microcytic	Iron deficiency, etc.	Pathophysiological (based on blood cell indices)
	Normocytic	Blood loss, chronic disease, etc.	
	Macrocytic	Ethanol, vitamin B12 and folic acid deficiency, etc.	

### Oedema (table 3)

A useful pathophysiological approach to the differential diagnosis of oedema can only be found in *UpToDate*. The textbooks lack a logical differential diagnosis. They use different approaches (except *van der Meer* where there is no differential diagnosis of oedema), but none of them are systematic and therefore they are difficult to reproduce. In all textbooks there is an extended review of the pathophysiology of oedema in certain circumstances, i.e. heart failure or hepatic cirrhosis.

### Heart failure (table 4)

It is remarkable that for a rather difficult syndrome as heart failure, only two textbooks use a systemic approach. The organising principle is based on the pathophysiology, each book in a different way. It is obvious that the non-specific approach with a random list of various causes, as used in the three others, is not particularly helpful for medical students to make a differential diagnosis.

## DISCUSSION

In this paper, we demonstrate how variable the presentation of differential diagnoses in medical textbooks is. Despite the

availability of logically organised differential diagnoses, which are well known and widely used in teaching and clinical practice and easy to reproduce, it is disappointing that in respected textbooks an obvious systematic approach in differential diagnoses is often lacking. We compared only four textbooks and a web-based edition, and four clinical problems, but it is likely that other textbooks and additional differential diagnoses will yield similar results. It is remarkable that there seems to be no real difference between concise and comprehensive textbooks.

Clinical problem solving is difficult for students and even for their educators to teach it. Experienced clinicians often think associatively or by pattern recognition. They are familiar with the clinical presentation of diseases and are aware of the epidemiology in their own clinical setting. For students, lack of experience is a major handicap to understanding the clinical reasoning of experts and to memorising the differential diagnoses. Therefore, in modern medical curricula a systemic instruction of clinical problem solving is an essential part.<sup>1-5,11,12</sup> Textbooks should be important aids in this learning process. Traditionally, however, they contain typical descriptions of diseases and these are insufficient for education in clinical problem solving. It is the world turned upside

**Table 3**  
*The aetiology of oedema in various textbooks*

TEXTBOOK	CATEGORIES	SPECIFIC ENTITIES	ORGANISING PRINCIPLE
Harrison	Localised	Inflammation, venous or lymphatic obstruction	Anatomical
	Generalised	Cardiac, hepatic, renal, nutritional	
Kumar		Heart failure, hypoalbuminaemia, hepatic cirrhosis, sodium retention, other	Nonspecific
Souhami		Heart failure, hypoalbuminaemia, peripheral venous insufficiency, idiopathic	Nonspecific
Van der Meer			None
UpToDate	Increased capillary hydraulic pressure	Increased plasma volume due to retention, venous obstruction	Pathophysiological
	Hypoalbuminaemia	Protein loss, reduced synthesis	
	Increased capillary permeability		
	Lymphatic obstruction		

**Table 4**  
*The aetiology of heart failure in various textbooks*

TEXTBOOK	CATEGORIES	SPECIFIC ENTITIES	ORGANISING PRINCIPLE
Harrison		Infection, anaemia, thyreotoxicosis, arrhythmias, myocarditis, endocarditis, environmental excesses, hypertension, myocardial infarction, pulmonary embolism	Nonspecific
Kumar	Myocardial dysfunction	Ischaemic, hypertension, etc.	Pathophysiological
	Volume overload	e.g. Valvular heart disease	
	Obstruction to outflow		
	Obligatory high output	Anaemia, etc.	
	Compromised ventricular filling	Pericarditis, etc.	
	Altered rhythm		
Souhami		Ischaemic heart disease, cardiomyopathy, hypertension, myocarditis	Nonspecific
Van der Meer	Pressure overload	e.g. Hypertension	Pathophysiological
	Volume overload	e.g. Valvular heart disease	
	Inflow obstruction	e.g. Valvular heart disease	
	Myocardial dysfunction	Ischaemic, etc.	
UpToDate		Coronary heart disease, hypertension, cardiomyopathy, valvular heart disease, pericardial disease, tachyarrhythmias, high output states	Nonspecific

down: the entry is the disease instead of the patient's symptom or physical sign. Moreover, these descriptions apply to classical, full-blown diseases with the complete clinical picture that is only present in patients with advanced disease.<sup>11,12</sup>

It is a positive point that more and more textbooks give attention to the approach to the patient and to differential diagnoses of clinical problems, but attention is rarely

given to the principles of clinical problem solving. It is our experience that a systematic, logical set of differential diagnostic options can easily be remembered for similar cases in the future. Experienced clinicians may also use the systematic approach for complex cases when the diagnosis is not initially found.

A systematic approach is an aid in teaching clinical problem solving.<sup>1,2</sup> It is remarkable that even in the literature on

instruction of clinical problem solving only one article makes notice of this topic; it pleads for logical organisation of knowledge in medical textbooks.<sup>3</sup> During the preparation of this manuscript a literature search in PubMed revealed no further hits on this subject since 1986. We conclude from our limited survey that it is hard for medical teachers giving instruction on systematic clinical problem solving to refer to textbooks. We feel this is a missed chance. Editors of textbooks should further improve their textbooks by paying attention to these systematic aspects. Textbooks with logical and systematic approaches to differential diagnosis will support and stimulate medical students and their teachers in the learning process of clinical problem solving.

Several medical journals review new editions of medical textbooks, and often compare them with the existing ones. We recommend reviewers to give more attention to these aspects of logical categorisation to help the present and future generation of clinicians.

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