

University of Groningen

Drug choice in medical practice

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Document Version

Publisher's PDF, also known as Version of record

Publication date:

1994

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Denig, P. (1994). *Drug choice in medical practice: rationales, routines and remedies*. s.n.

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Chapter 2 **Factors influencing rational prescribing**

In this chapter, previous research **regarding** factors influencing rational prescribing in industrialized countries is reviewed. At first, the concept of rational drug prescribing is specified, and the quality of drug prescribing is reviewed with special reference to the situation in The Netherlands. Secondly, some attention is given to the research focusing on the use of commercial and professional information sources. Thirdly, different strategies aimed at modifying prescribing **are** evaluated. Finally, other (contextual) factors that have been identified to influence drug prescribing are described. **Three** categories of factors are involved, namely at: 1) population level (**e.g.** health care system, cultural aspects); 2) practice level (**e.g.** patient population, size of practice, practice organization, location of practice, physicians' age, attitudes, education, training, and use of professional and commercial **information** sources); 3) patient level (patients' age, gender, social class, demands).

2.1 Rational drug prescribing

Studying the behaviour of physicians might be of interest from an academic point of view, but it becomes of more relevance to the medical practice when there is a need to support and optimize this behaviour [1]. Before one can say something about the quality of prescribing, however, the rationality of drug prescribing should be defined. Rational drug **prescribing** can be seen from three angles: the pharmacological-economic or biomedical rationality, the physician's rationality, and the patient's rationality [2,3]. The first is based on 'objective' characteristics of the drug in general, such as efficacy, adverse effects, **contraindications** and costs. The **definition** of Parish that drug treatments should be appropriate, effective, safe, and economic could be seen as an example of this type of rationality [4]. The second type is based on the subjective evaluation of the physician, which may be influenced by various sources of information, personal experiences, the patient's history, and other contextual factors [5]. For example, a physician may decide to prescribe the treatment that his **co-workers** prefer, **or the drug** that the patient has asked for. More in general, prescribing can have many social and psychological functions for both prescriber and patient [6,7]. The patient's rationality is based on the patient's perception of the drug's utility for the quality of life [3,8]. Based on these perceptions, it **can** be rational for a patient to prefer a particular drug which is not rational both in general objective terms and from the physician's point of view.

When studying prescribing of physicians, all three types of rationality can be of interest. Data on the quality of drug prescribing, however, concern mostly the **first type** of rationality. The quality of drug prescribing has often **been** criticized from the pharmacological point of view (see, for instance, 19,101). It has been shown that suboptimal prescribing behaviour leads to unnecessary costs, adverse effects, and problems **of** antibiotic resistance [11-19]. In The Netherlands, suboptimal prescribing seems to exist both in general practice and in the hospital setting [20-24]. Many individual problem areas regarding the use of certain **drugs** have been **identified**, for instance, concerning the use of **digoxin**, antibiotics, antimycotics, diuretics, H₂-receptor antagonists, cholesterol lowering drugs [25-39]. Also, individual patient cases have been pointed out in which the **drug** use was not optimal from a pharmacological standpoint (see, **e.g.** the cases presented by Porsius in **Pharm Weekbl** 1989-1993).

2.2 Use of different information sources

Many researchers have looked at the use of professional and commercial information sources by prescribers. Williams et al. have tried to use meta-analytical procedures to identify possible changes in the use of information sources over time [40]. Although their data collection seems **far** from complete (18 of the 20 referenced studies were published before **1980**), they conclude that commercial sources have declined in importance. Another conclusion might be that physicians have become more reluctant to mention commercial sources as being important to them.

In The Netherlands, physicians mostly prefer to **use printed** professional sources to gather drug information [41-43]. Especially the Dutch Drug Bulletin (*Geneesmiddelenbulletin*) and the compendium of the Dutch Health Insurance Council (*Farmacotherapeutisch Kompas*) are highly valued and used [41,43]. Furthermore, the local

pharmacist is seen as an important information source [41]. This might be due to the fact that in The Netherlands a growing number of physicians discuss their pharmacotherapy in counselling groups with pharmacists. It is the intention of the government and the professional organizations of physicians and pharmacists that eventually all **general** practitioners and local pharmacists participate in these counselling groups (which are now called *Farmaco Therapie* Overkg-groepen). In 1993, **around** 80% of all general practitioners and 80% of **all** local pharmacies were involved in such groups [44].

Other studies have looked into the relation between the use of information sources and the adoption of new drugs. Several researchers have found that commercial sources are important to learn about new drugs, whereas professional sources are more important when evaluating and adopting new drugs [41,45-49]. Different groups of physicians may prefer different professional sources. For some physicians, written information might be sufficient, whereas others **are** more susceptible to information coming from personal sources, such as colleagues [SO]. It has been suggested that physicians who use an independent journal, **i.e.** 'Prescrire', base their prescribing intentions more on scientific information from clinical trials than other physicians [5]. The influence of publications of clinical trials on **practice**, however, can be ambivalent [51]. One and the same publication may strengthen positive as well as negative judgments regarding a treatment [52]. **On** the whole, clinical trials with positive results seem to have more effect on practice than negative ones [53,54].

An important physician characteristic related to the use of information sources seems to be the number of years in practice (or age). Older physicians rely more on commercial sources, such as drug company representatives, and less on professional meetings [55]. Also, their attitude towards drug company organized meetings is more positive [56]. This tallies with the **findings** of **Haayer** that younger physicians prescribe more rational which is reflected in the patterns of information gathering, **i.e.** less reliance on commercial information sources and the use of more up-to-date drug compendia [57].

The influence of the industry on prescribing has been the subject of several studies (see, for instance, [58-60]). Many strategies are employed by the industry [54,61-63], and appear to be quite successful [64,65]. Both rational and non-rational appeals **are** used by the industry [60]. Non-rational appeals may help the physician to justify prescribing a specific drug. Through **advertisements**, mailings, 'free' publicity, advertising to the public, and **drug** company representatives physicians are made aware of (new) drugs and brand names [66]. These communications disseminate information often many months before the data **are** published in peer-reviewed medical journals [67]. This information can mislead the reader **regarding** the claims of **efficacy** and 'drug of choice' [61,68]. **Information** on efficacy is often not balanced with information on side effects, costs, and **contraindications** [69]. Industry supported books, journals (or supplements of journals), meetings and conferences help the physicians to decide in favour of these drugs [61,70]. Industry funding of continuing medical education has been shown to influence the physicians in favour of the products of that industry [71]. **Free** samples and 'seeding' trials encourage physicians to get personal experience with the drugs [72]. Also scientific research is influenced by industry funding [73-74].

2.3 Effect of professional strategies aimed at **modifying** prescribing

Over the past decades, many professional intervention strategies have been developed to improve rational prescribing. The interventions can be divided in restrictive and voluntary strategies, which are shortly reviewed in this section.

Restrictive strategies **are** interventions that limit the possibility to prescribe **certain** drugs, for instance, by allowing only formulary drugs to be prescribed freely, by demanding a special request form for certain **drugs**, by allowing only certain specialists to prescribe a drug, or by not reimbursing certain **drugs**. These strategies **try** to **limit** the treatment options that a physician might want to consider. It goes beyond the scope of this study to discuss these interventions in detail. They can be very effective in limiting the use of certain drugs, but sometimes unexpected-and unwanted substitutions may occur [75-79]. Furthermore, restrictive strategies do not help to cope with the inappropriate use of approved, not restricted drugs [80].

Voluntary strategies have an educational or guiding nature, but in the end the prescriber is free to do as **(s)he** likes. These strategies can be divided in the following types [81]:

1. communication and dissemination of information (changing knowledge, attitudes and norms of the prescribers),
2. development and presentation of guidelines or protocols (facilitating the desired behavioural changes),
3. giving feedback or medication review (determining practice and reinforcing behavioural changes).

Educational programmes that make use of printed material, such as drug bulletins, disseminate **information** and **are** mainly directed at improving knowledge [82]. Verbal interventions, either individual or at group level, may also include discussion of the values and decision criteria to be used when deciding on a treatment. In this way, they can focus on attitudes as well as knowledge. In addition, educational interventions at group level have the opportunity to discuss norms in the professional environment.

Secondly, setting of standards may help physicians to initiate optimal behaviour. Formularies and guidelines can change the physicians' perception of acceptable practice [83]. Protocols and algorithms can enable them to implement new behaviour in practice.

Finally, there are strategies which try to change prescribing by confronting the prescriber with suboptimal behaviour. Presenting feedback of prescribing data or medication reviews to physicians shows them what they actually do, and where there is room for improvement. It can be a motivating trigger, and make physicians aware of certain behaviour [84]. When individualized feedback is combined with patient specific recommendations, one could speak of medication review or auditing.-when such review is computerized and the physician gets automatic suggestions or signals, the strategy might become less voluntary.

Evaluation studies of voluntary interventions aimed at prescribing behaviour are presented in table 2.1 and figure 2.1; only randomized or otherwise controlled studies are included. Besides these controlled studies, many uncontrolled studies have been reported of mostly successful interventions, for instance, with regard to printed educational material [85]. Discussed in successive order are interventions using: 1a) only printed material, 1b) verbal individual education, 1c) verbal group education, 3a) individual feedback, 3b) individual feedback combined with group discussions, and 3c)

individual feedback combined with patient specific recommendations. The introduction of guidelines or formularies as such (category 2), *i.e.* without an additional educational programme, has been tested mostly in inadequately controlled studies. Therefore, this second category is not included in table 2.1 and figure 2.1, but this category will be discussed shortly at the end of this section.

In some **cases, combinations** of methods were used which were classified as follows. When verbal education was combined with printed material the intervention was classified as verbal education; when educational programmes included the discussion of guidelines in groups they were classified as verbal group education; when feedback was combined with verbal group education it was classified as feedback with group discussion, and when it was combined with verbal individual education or the individual comparison with guidelines or standards it was classified as feedback with recommendations.

It can be seen that most unsuccessful interventions were reported regarding printed materials (see table 2.1). Some researchers have argued that printed material is only successful in changing knowledge, but seldom changes prescribing [11,86]. Some characteristics of the material evaluated, however, should be taken into account. Aspects such as attractiveness, clarity, credibility, and efficiency of the distribution influence the successful transmission of information [87,88]. It is important, for instance, whether the printed material is well-distributed, well-known and the source is believed to be reliable. Regularly distributed bulletins and bulletins in institutional settings seem to be more effective than printed material that was developed only for an intervention project [89].

Verbal education is reported as being more successful in changing the prescribing behaviour as well as prescribing costs (table 2.1, figure 2.1). Individual feedback as such has not been found very effective. Combining such feedback with group discussion makes it more successful in improving the quality, as well as reducing the costs of prescribing. The combination of feedback with **specific** recommendations or so-called medication review is also quite effective. Remarkable in these cases is that recommendations focused only on costs are less effective than recommendations focused on the quality of prescribing in general. In their review, **Mugford et al.** conclude that feedback of information is most likely to influence clinical practice if the physicians have agreed to review their performance, and if it is presented close to the time of decision making [84]. Other aspects that can be important are the format of the presented feedback, and the perceived validity of the data [84]. The studies reported in table 2.1 do not describe **all** these aspects in detail; it seems that agreement with the medication review is less important than time-lag. The role of format and perceived validity can not be determined.

The introduction of formularies and guidelines appears to be moderately successful in changing prescribing behaviour, but most of **these interventions** were evaluated in inadequately controlled study designs (see, *e.g.* [90-97]). **Sofar**, it seems that the involvement of the physicians in the development of the formulary or guidelines, and additional review, education and feedback **are** necessary to keep the adherence at a high level [50,91,94,96,98].

Table 2.1 Evaluation of educational interventions

	<i>design</i>	<i>aimed at</i>	<i>target group</i>	<i>effect on level</i>			
				<i>K</i>	<i>P</i>	<i>C</i>	<i>O</i>
Ia. Printed material							
Watson DS, e.a. (1975) [99]	CT	10 topics	1		+		
Sibley JC, e.a. (1982) [100]	RCT	18 topics	1		+		±
Avorn J, e.a. (1983) [101]	RCT	vasodilators cefalosporines propoxyfene	1				
Schaffner W, e.a. (1983) [102] & Ray WA, e.a. (1985) [103]	CT	antibiotics	1		-	-	
Evans CE, e.a. (1984, 1986) [104,105]	RCT	hypertension therapy	1		±		
Hershey CO, e.a. (1988) [106]	RCT	costs drugs	1				
Angunawela II, e.a.(1991) [107]	RCT	antibiotics	1				
Ib. Verbal individual education (faceto-face)							
Stross JK, e.a. (1980) [108]	CT	antirheumatic drugs	1				+
McConnell TS (1982) [109]	RCT	tetracycline	1				+
Schaffner W, e.a. (1983) [102] & Ray WA, e.a. (1985) [103]	CT	antibiotics	1			±	±
Avorn J, e.a. (1983) [101] & Soumerai SB, e.a. (1986) [110]	RCT	vasodilators cefalosporines	1			+	+
Ray WA, e.a. (1986) [111]	CT	diazepam	1			±	
Landgren FT, e.a. (1988) [112]	CT	antibiotics	2			±	±
Steele MA, e.a. (1989) [113]	RCT	drug wsts	1				+
Raisch DW, e.a. (1990) [114]	CT	antiulcer drugs	1			±	±
Stross JK, e.a. (1983) [115]	CT	COPD treatment	1/2			+	-
Font M, e.a. (1991) [116]	RCT	vasodilators antibiotics	1			±	±
Newton-SymsFAO, e.a. (1992) [117]	RCT	NSAIDs	1			+	+
Ray WA, e.a. (1993) [118]	CT	antipsychotic drugs	2			+	+

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Table 2.1 Evaluation of educational interventions (continued)

	<i>design</i>	<i>aimed at</i>	<i>target group</i>	<i>effect on level</i>			
				<i>K</i>	<i>P</i>	<i>C</i>	<i>O</i>
1c. Verbal group education							
Inui T, e.a. (1976) [119]	RCT	hypertension treatment	1				+
Klein LE, e.a. (1981) [120]	CT	antibiotics	2		+	+	
White CW, e.a. (1985) [121]	RCT	myocardial infarc.treatm.	2	+	±		
Mölstad S, e.a. (1989) [122]	CT	antibiotics	1			+	
Rutz W, e.a. (1989,1990,1992) [123-125]	CT	psychotropic drugs	1	+	±		
Holm M (1990) [126]	RCT	benzodiaz.	1				
Angunawela II, e.a.(1991) [107]	RCT	antibiotics	1				
Friis H, e.a. (1991) [127]	CT	antibiotics	1			+	
3a. Individual feedback							
Johnson RE, e.a. (1976) [128]	RCT	all drugs	1		-	-	
Koepsell TD, e.a. (1983) [129]	RCT*	interactions redundancies	2				
Hershey CO, e.a. (1986) [130]	RCT	drug costs	1	-	-		+
Holm M (1990) [126]	RCT	benzodiaz.	1				
Meyer TJ, e.a. (1991) [131]	RCT*	all drugs polypharmacy	1			±	
3b. Individual feedback + group discussion							
Harris CM, e.a. (1985) [132]	RCT	all drugs	1		±	±	
Manheim LM, e.a. (1990)[133]	RCT	drug costs	2			+	+
Stokx LJ, e.a. (1992) [134]	CT	antibiotics benzodiazep. antiasthmatics NSAIDs	1		+	-	
Zijlstra IF (1991) [37]	CT	peptic drugs hypertensives NSAIDs	1		±	±	

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Table 2.1 Evaluation of educational interventions (continued)

	<i>design</i>	<i>aimed at</i>	<i>target group</i>	<i>effect on level</i>			
				<i>K</i>	<i>P</i>	<i>C</i>	<i>O</i>
3c. Individual feedback + patient specific recommendations (medication review)							
Herfindal ET, e.a. (1983) [135]	CT	drugs prescr. by orthoped.	2				±
Gehlbach SH, e.a. (1984) [136]	RCT	drug costs	1				+
Manning PR, e.a. (1986) [137]	RCT	several drugs	1				+
Tierney WM (1986) [138]	RCT	several drugs	2				±
Tamai IY, e.a. (1987) [139]	CT	potential drug problems	1				+
Stergachis A, e.a. (1987) [140]	CT	drug costs	1				± -
Steele MA, e.a. (1989) [113]	RCT	drug costs	1				
Crischilles EA, e.a.(1989)[141]	CT*	all drugs	1				+ +
Forstrom MJ, e.a. (1990) [142]	CT	costs of hypert.ther.	1				+ +
Kroenke K, e.a. (1990) [143]	CT	elderly and polypharmacy	1				+ +
Frazier LM, e.a. (1991) [144]	RCT	drug costs	1				±
Britton ML, e.a. (1991) [145]	RCT*	all drugs polypharmacy	1				+ +
Meyer TJ, e.a. (1991) [131]	RCT*	all drugs polypharmacy	1				±
Levens Lipton H, e.a. (1992) [146]	RCT*	geriatric prescribing	2				+
Mason JD, e.a. (1993)[147]	CT	potential drug problems	1				+ +

design RCT=randomized controlled trial; CT=controlled trial (non-randomized); * patients were devided in intervention and control group (not physicians)

aimed at specific drugs or treatments; reducing costs

target group 1=general practitioners| family physicians| doctors treating outpatients; 2=physicians treating patients in hospitals or institutional settings

level of evaluation effect K=knowledge of physicians; P=quality of prescribing behaviour; C=economic costs; O=patient outcomes or quality of care
+ significant effect; ± only short-term effects or mixed effects (some positive, some negative); - no significant effect

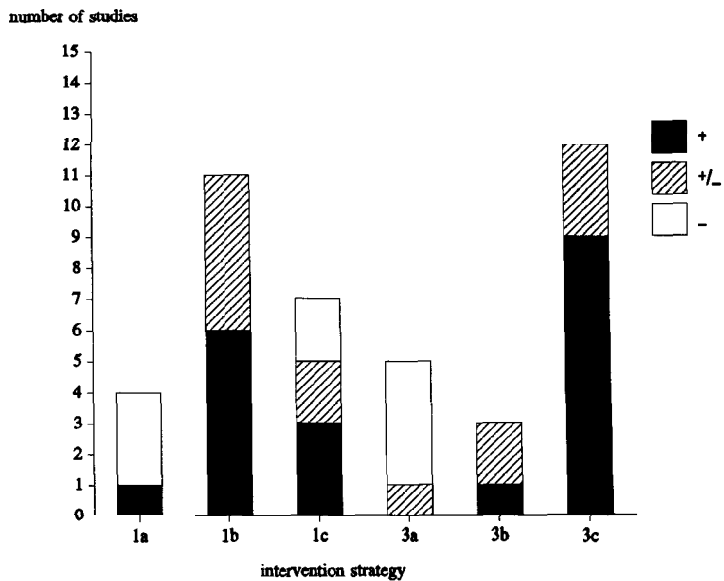


Figure 2.1 Impact of different educational strategies on prescribing

2.4 Contextual factors influencing drug prescribing

In the previous sections, the emphasis was on the influence of professional and commercial information on prescribing. However, these are not the only factors influencing drug prescribing. To obtain a wider perspective on the drug choice **behaviour**, the economic, ethical, legal, social, and professional context of medical decision making should be taken into account [148,149]. **Research** in this area focuses on the relation between **drug** use or drug prescribing and specific characteristics of society, health care organization, general practice, physicians, or patients. These can be called the contextual factors influencing medical decision **making**. Many contextual factors have been identified which influence drug prescribing (see for reviews, e.g. [7,37,150,151]). These factors can be on the level of [A] the whole society or population, [B] the practice or physician, and [C] the individual patient or patient-physician contact (table 2.2).

Table 2.2 Contextual factors influencing prescribing

[A] population level	regulation, financing , and availability of health care power of pharmaceutical industry culture, tradition, beliefs regarding health and illness
[B] practice level	practice characteristics: age and gender distribution of the patient population size of practice, number of patient contacts practice organization location of practice physician characteristics: age attitudes and working style training and education use of information sources physician-patient interaction
[C] patient level	patient characteristics: age, gender, race, appearance social class expectations and demands

Characteristics of society and health care organization

Prescribing of drugs is influenced on the population level by cultural and organizational factors [152]. Cultural differences in beliefs and attitudes regarding health and illness may result in different presentations and definitions of morbidity, and consequently **different drug** use. Hull [153] found large differences between general practitioners in different countries in their perceived patients' expectations of receiving drugs, and also in their intention to prescribe, for instance, symptomatic treatment and antibiotics for a 17-year old girl with a sore throat. Treatment regarded as needed in one country can be seen as superfluous in another. For example, treatment of low blood pressure with drugs, which is accepted in Germany, is seen as excessive in the Anglo-Saxon world [154]. Furthermore, the social acceptability and the meaning of drug use

for the patients is **determined** by the cultural setting [7]. People who migrate to another culture experience differences in illness beliefs and sick roles, and may have trouble in accepting the 'solutions' of the other culture [155].

Organizational factors that may be of influence involve the drug regulation and registration, the payment for drugs, the self-medication market, the education and regulation of health professionals, and the **production** and power of the pharmaceutical industry.

Both the pharmaceutical industry and the drug regulatory agencies have a direct impact on the number and quality of the drugs available on the market, which has resulted, for instance, in considerable drug use **differences** in different **European** countries [156]. Measures related to the payment of drugs, such as limited lists or constraints to reimbursement, are known to influence drug use, although the effects are not always those expected or hoped for (see [157], for a review). Furthermore, **drug** prescribing is influenced by the self-medication market. When a **drug** becomes available over the counter (**OTC**), the options for self care expand, and less people may consult a physician. Also, it has been suggested that physicians sometimes feel compelled to prescribe drugs that are not directly available to the patient [158,159]. In that case, prescribing practices may change when prescription drugs become available on an **OTC** basis.

The education and regulation of health professionals may influence drug use. The health authorities can set minimum standards for education. They may also influence the number of health care professionals available in a region. It seems that the more physicians are available, the more interventions will be performed or prescribed [160]. Furthermore, prescribing in general practice might be influenced by prescribing by specialists [161,162]. In addition, professionalisation of certain health care workers, such as the pharmacists, may lead to an increase of their influence on drug use [163]. In the last decade, **pharmacists** have become more important in advising the physicians, counselling the patients, and monitoring drug use [156].

Characteristics of morbidity and practice

It seems obvious that drug choices and drug prescribing are influenced by the diagnoses that have been made. However, much research studying prescribing lacks a direct diagnosis linkage. Therefore, assumptions have to be made as regards the actual morbidity. This may lead to **unclearities** regarding the exact role of the diagnosis, as can be illustrated by a discussion in The Netherlands [164,165]. In this discussion, **Mokkink** defended the idea that physician characteristics influence the volume of, what he called, nonspecific prescribing. He used **data** on practice level to support this idea. Prescribing of 'specific' drugs (such as antidiabetics and cardiovascular drugs) was found to be related to the age of the patient population within a practice, and as such to the morbidity, whereas the prescribing of 'nonspecific' drugs (e.g. **analgetics, tranquillizers, antibiotics, cough medication**) was found not to be related to the age of the patients [166]. Thus, the conclusion of **Mokkink** was that prescribing of 'nonspecific' drugs could be **seen** as a working style of the prescribing physicians. **De Maeseneer**, on the other hand, argued that the actual diagnosis should be taken into account, because much of the **interdoctor** variation in prescribing could be explained by the diagnosis [167]. He believed that the finding that some physicians prescribe more '**nonspecific**' medication was not a physician characteristic as **Mokkink** had concluded, but was the result of

seeing (or at least diagnosing) more patients with nonspecific complaints. Of course, it could be objected that this diagnosing could still be the result of the physician's working style. It might be true that some physicians diagnose more 'nonspecific' complaints than others, or that they make these diagnoses as a **justification** for treatment [168]. **Lack** of knowledge about the true **morbidity** makes it difficult to determine whether prescribing nonspecific drugs should be seen as a physician characteristic.

The age, gender, insurance status, and social-economic class distributions of the patient population have **been** found to be related to ~~the~~ the volume of prescribing [20,160,169-172]. This can in part be explained by the relation of these variables with the perceived health status [173] (see also section on *patient characteristics*). On the other hand, it has become clear that the variation in medical consumption can not be fully explained by **differences** in morbidity or in age and gender distribution of the patient population [173,174]. This leads to the idea that there may be other relevant practice characteristics.

Several studies have tried to establish the relation between practice characteristics and drug prescribing [20,167,175,176]. The **findings**, however, are sometimes difficult to interpret. Some so-called practice variables may actually be physician related. For example, the number of patient contacts is often mentioned as a practice variable, but this is in **part** related to the working style of the physician, **i.e.** the wish to **see** his patients more often [177]. Therefore, the findings that physicians with smaller practices, **i.e.** less patients, prescribe more drugs [175], and that physicians with more patient contacts **also** prescribe more drugs [20,167] **are** not necessarily in contradiction with each other.

Furthermore, research findings with regard to the practice setting **are** not consistent. The prescribing volume and quality of physicians working in solo practices, group practices, or health care centres was found to be similar in two studies [20,167], but in other studies physicians working in health care centres have been found to prescribe less drugs in general [175], or less unnecessary drugs [176].

The location of the practice is another characteristic that correlates with the volume of prescribing; the more urbanization, the more drugs are prescribed [20,178]. To what extent this is caused by differences in morbidity, presentation of complaints, availability of other health care services, or the physician's working style is not clear.

Finally, the practice organization with regard to **indirect** consultations by telephone or receptionist **can** influence the volume of prescribing. Indirect consultation has been found to result in small increases especially of repeat prescribing [179].

Physician characteristics

As was said before, diagnosis and patient **specific** factors **are** important for any **treatment** decision. **Deber** concluded that the characteristics of the patient cases influenced treatment decisions more than the characteristics of the decision makers [180]. This study concerned decisions of physicians and other health care professionals whether or not a cadaver transplantation should be performed in six cases of end-stage renal disease. Although the study shows that variation in treatment decisions is caused to a large extent by differences in disease presentation and diagnosis, it also shows that some of the variation in the decisions is caused by practitioner-specific factors. This agrees with findings that physicians who **are** confronted with the same case or the same diagnosis do not necessarily prescribe the same treatment [20,41,176,181,182]. As

Eisenberg put it 15 years ago, the physician's decision-making process is influenced by factors intrinsic to his own personality [183]. These factors might be 'internal' elements of the decision-making **process**, such as beliefs or expectations about different drug treatments, which will be discussed further in chapter 3. Other factors could be seen as 'external' to the decision-making process. These factors are often referred to as **being** the physician characteristics.

Much research has focused on the relation between such physician characteristics and prescribing (see, e.g. [20,166,167,184,185]). These characteristics include factors such as age, gender, attitudes, training and education, and use of information sources. The physicians' age or the number of years in practice is negatively related to both the volume and the quality of prescribing; **i.e.** older physicians prescribe more drugs, and their quality of prescribing is assessed as being inferior to that of younger physicians [20,167,184,185]. In one study, the reported choice of antihypertensive drugs was related to age and gender of the prescribers; female and older physicians were more conservative in their **drug** selection [186]. In another study, older physicians were found to be less willing to proceed with treatment without consulting a specialist in certain cases than younger physicians [187]. This might be due to the physician **being** less up-to-date. In a study of attitudes and practices of physicians regarding osteoporosis prevention, female physicians were more likely to prescribe hormone replacement therapy [188]. When **looking** at gender differences in practice behaviour, however, it should **be** noted that female physicians **see** more female patients and different health problems from their male colleagues [189].

It seems that having specific case-related experience also influences treatment decisions. Having more case-related experience and seeing more serious cases may lead to a more aggressive attitude regarding starting or proceeding treatment [187,190].

Several attitudes of physicians have been studied. An often used typology of physicians concerns their risk-taking attitude; it seems that some physicians are less willing to take risks than others [191,192]. Some researchers refer to this attitude as being a "defensive attitude" [193], while others have also called it the "physicians' attitude towards uncertainty" [191,194]. Its basic characteristic is the physician's tendency to 'do something' versus to 'wait-and-see'. As such it can result in positive defensive behaviour [195]. The risk-taking attitude seems to be associated with the number of -sometimes unnecessary- prescriptions [20,167,193,196]. It was also found to **be** related to a **working** style that was called the 'do-er' [166]. Do-ers are physicians who perform a lot of nonspecific clinical actions [166].

An attitude which seems to be associated with increased prescribing of symptomatic medication and with less appropriate prescribing is the disease-centred attitude [184,197]. This attitude is seen as opposite to the patient-centred attitude, which implies taking the patient serious, involving the patient in decisions, and recognizing the non-medical aspects of the presented problems. Another attitude that has been studied involves the concern of the physicians about the costs and quality of drug prescribing in general. It seems that physicians who prescribe less medication as well as cheaper drugs are more concerned about prescribing in general [20,167,169].

Job satisfaction is yet another factor that might be related to the practice performance of physicians, although the direction of the relationship is not unambiguous. Stolley [184] concludes that unsatisfied physicians are better prescribers, whereas other researchers established a positive **correlation** between some aspects of job satisfaction

and the volume and quality of prescribing [20,198,199]. In their review, Groenewegen et al. conclude that "no firm conclusions **can** be drawn, although there are indications of a positive relation of satisfaction and quality of work" [200].

The location of the medical school where the physician received **his/her** training does not seem to influence the drug prescribing volume and quality [20,184]. Different use of commercial and professional information sources, however, is related to the prescribing behaviour (see also section 2.2). Physicians who rely more on and approve more of commercial sources show higher prescribing costs and lower **prescribing** quality [20,64,167,184,185,201]. Also, the professional environment may influence medical decisions [183,202,203]. When a physician feels **(s)he** is working as part of a team (or is observed by one's peers), **(s)he** is likely to conform with the norms of these other physicians.

Physician-patient interaction

Some of the sociological and anthropological research on drug use has focused on physician-patient interactions. Medication can be seen as a means of communication between the physician and the patient, for instance, expressing the physician's power, as well as willingness to help, or indicating the end of a consultation [6,204]. Factors relating to the doctor-patient relationship are frequently mentioned by physicians as a reason for prescribing when this might not be clinically indicated [202,203]. A prescription may also be a tool to encourage the patient to deal with a certain problem [6,205]. Furthermore, a prescription can be a tool to gain time or reduce workload of the health care professionals [6,204].

Schwartz et al. [206] state that several patient and physician characteristics, such as social class, appearance, and personality, appear to affect clinical decisions through the physician-patient relationship. The authority of the physician, the active role of a patient, the communicative skills of both physician and patient may **all** influence the medical decisions.

Another relevant factor that is related to both physician and patient is the physicians' perception of patient compliance and patient demand. Compliance and demand can be seen as patient characteristics, but the perception of compliance and demand is also influenced by characteristics of the physician and the physician-patient interaction. Much research has been conducted aimed at understanding and improving patient compliance [207-210]. Improving patient compliance **can** be a reason for prescribing 'user-friendly' drugs [211]. Drugs that can be used once a day, that are easy to administer, or that taste better may be preferred over alternatives. Especially when choosing a drug from a group of drugs with similar efficacy and side effects, compliance can be an important factor [212]. In therapeutic areas where compliance is seen as more important than costs this may lead to more expensive prescribing [212].

Perceived patient demand also influences prescribing. Physicians sometimes feel pressured to prescribe more often and to prescribe even nonscientific drugs, because of this perceived patient demand [39,88,201-203,213]. In general, physicians seem to overestimate the patient demand [167,214], but the perceived patient demand is not equal for **all** physicians. Physicians' estimates of patients wanting medication range from 20 to 100% [167]. On average, estimates have been found of 75% \pm 15 (sd), and 52% \pm 20 (sd) [20,215]. In a national study of primary health care in The Netherlands, 7.4% of the patients visiting their general practitioner received a drug while they

believed they did not need a drug, and 11.5% received no drug while they had thought they needed one [216].

Patient characteristics

As was mentioned previously, beliefs and attitudes of patients in general influence prescribing (see Characteristics of society), but also characteristics of individual patients can be of influence. It has been argued that a patient's social class, gender, and appearance affects the medical *care (s)he* receives irrespective of the morbidity [148,183,217]. As Clark et al. [148] put it, the characteristics of patients influence their decision to *seek* medical *we*, and may frame the physicians' assessments and responses. In their review of the literature, they come to the conclusion that in cases where age should make no difference younger people are given better prognoses and less treatment than older people. Furthermore, controlling for age, patient status, and seriousness of illness, differences have been found regarding the services that women and men receive. These differences, however, are not consistent; sometimes women seemed to receive more health care, whereas on other occasions the men seemed to get more *care* [148]. Recent studies *regarding* gender differences in the treatment of patients with acute myocardial *infarction* show similar *inconsistencies* [218]. Studies regarding *benzodiazepines*, on the other hand, invariably show that these drugs are more often prescribed for women than men who present the same complaints, but also for symptoms and diagnoses that do not warrant their use [219-221]. Other characteristics that have found to be related with the medical *care* received, *are* race, (*over*)*weight*, and social class (see [148,183], for a review).

As was mentioned earlier, patient demand is known to influence drug prescribing. In the previous section, the perceived patient demand was discussed in the context of physician-patient interaction. Now, some remarks will be made regarding patient demand as a characteristic of the patient. Patient demand may consist of either the question for a specific drug, or the question for medication in general. The direct question of a patient to get a particular drug is a kind of patient demand that is not so common, although it might become more widespread, since pharmaceutical companies nowadays make use of (illicit) plugging of prescription drugs towards the public through news media and television *programmes* [222-224]. The general patient demand to prescribe 'something' or, for instance, to prescribe 'antibiotics' is more common, and is influenced by the place and meaning of drugs in a society. There has been much research on the social, cultural, and symbolic functions of drug prescriptions (see for review, e.g. [6,204,225]). A drug prescription can be seen as a sign that the patient's *disease* is recognized and treatable. Drugs may help patients to normalize their life [226,227]. For this kind of reasons, patients may pressure their doctor to prescribe a drug. On the other hand, there *are* patients who *are* averse to drug taking. Especially when their own vision of the cause of *their* complaints differs from the medical vision, they might not accept the *medical* solution of taking drugs [8]. Such averse attitudes, however, do not seem to be related to the prescribing behaviour [228].

2.5 Concluding remarks

Rational prescribing from a pharmacological point of view is prescribing the appropriate drug at the right time at an affordable price in the right dose and for the right length of time; the appropriate drug must be effective and of acceptable quality and safety [229]. Using these criteria drug prescribing has often been criticized as being irrational. However, such prescribing can be rational from the physician's point of view. Some of the prescribing decisions may be based on a great deal of thought. When balancing pharmacological with **non-pharmacological** considerations, the prescriber does not necessarily prescribe irrationally from **his/her** own point of view [202]. This brings us to one of the research questions: Do physicians choose the drug treatments that can be seen as optimal according to their own views? (see chapters 6 and 7)

Many professional interventions have been developed to increase prescribing rationality. The more extensive and costly strategies have proved to be the most successful; combinations of verbal education, group discussions and feedback of prescribing behaviour with specific recommendations can reduce inappropriate prescribing. To educate a large or diverse group of physicians in an economic and efficient manner, however, written information is more attractive. Such simple educational strategies which focus mostly on one aspect of the prescribing behaviour, **viz.** improving knowledge about the drug treatments, seem to fail frequently in the industrialized countries. This might be due to the fact that ignorance is not the only problem [202]. On the other hand, these failures may to some extent be countered by improving the characteristics of the educational material. A reliable, highly valued and much used information source might be more successful in improving prescribing, even when only written material is used. This brings us to another of the research questions: What is the impact of highly valued, independent drug information on the physicians' knowledge and **drug** prescribing? (see chapter 5)

Research of factors influencing drug **prescribing** has shown us that physicians can not be regarded as autonomous individuals practising in socially isolated settings [148]. The pharmaceutical industry is often mentioned as a factor explaining irrational prescribing behaviour, but it is not clear why a certain physician is only influenced to prescribe some of the promoted products. If a physician decides to prescribe a newly promoted drug, does he actually think better of the drug, or has he been persuaded to change his prescribing routine without further reasoning?

Other contextual factors - **e.g. cultural** factors, morbidity, practice organization, urbanization, and patient characteristics, such as social class, gender and **appearance** - can explain variation in prescribing behaviour to some extent, but again questions remain regarding the reasons for the associations found. Moreover, physicians practising in the same country do not prescribe the same treatments for identical, standardized patients [20,41,176,181,182]. It has become clear that physician characteristics, such as age and attitudes, are also associated with **prescribing** behaviour. The research on physician characteristics discussed **sofar**, however, gives little insight in the precise mechanisms underlying differences in medical decision making. The finding, for instance, that dispensing physicians are cheaper prescribers [230,231] does not explain why this is the case; maybe these physicians are better informed about the costs of drugs, or they might be more willing to take costs into account, or maybe the patient population of dispensing physicians differs from other physicians working in less

rural areas. There are also several explanations possible for the finding that the age of the physician is negatively associated with the quality of prescribing. Older physicians use less reliable and more out-of-date knowledge, but they also might be more influenced by (biased) experiences, and their decision-making process could be dominated more by poor habits.

To get further information about the mechanisms underlying the drug choice and prescribing behaviour, the decision-making process itself needs to be studied. This insight can help us develop efficient educational programmes. Questions to be answered are: What is the contribution of the physicians' knowledge about drug treatments in the drug choice process? Which *other* determinants are relevant in this decision-making process? (see chapters 6 and 7) Do physicians who choose possibly suboptimal drugs differ regarding their knowledge or the way they apply or use this knowledge from physicians who do not choose *such* drugs?(see chapters 8 and 10)

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