

ORIGINAL ARTICLE

Scope and nature of prescribing decisions made by general practitioners

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Background: This study describes cognitive processes of doctors who are deciding on the treatment for a patient. This helps to uncover how prescribing decisions could benefit from (computerised) support.

Methods: While thinking aloud, 61 general practitioners made prescribing decisions for five patients with urinary tract infections or stomach complaints. The resulting 305 transcripts were analysed to determine the scope and nature of the decision processes. Differences in the process were related to case or doctor characteristics, and to differences in the quality of prescribing behaviour.

Results: The decision processes were not extensive, particularly for patients with a urinary tract infection. The doctors did not actively consider all possible relevant information. Considerations referring to core aspects of the treatment were made in 159 cases (52%) and to contextual aspects in 111 cases (36%). Habitual behaviour, defined as making a treatment decision without any specific contemplation, was observed in 118 cases (40%) and resulted in prescribing first choice as well as second choice drugs. For stomach complaints, second choice drugs were often prescribed after considering other treatments or in view of specific circumstances. Experience of the doctor was not related to the type of decision process.

Conclusions: The processes observed deviate from the decision theoretic norm of thoroughly evaluating all possible options, but these deviations do not always result in suboptimal prescribing. Decision support is useful for bringing pertinent information and first choice treatments to the prescriber's attention. In particular, information about relevant contraindications, interactions, and costs could improve the quality of prescribing.

Most general practitioners have a limited set of 100–200 different drug treatments they usually prescribe.¹ The decision which, if any, drug to prescribe from this set for an individual patient has to be made many times each day. The quality of these decisions has been criticised repeatedly.^{2–3} Prescribing rationally requires setting a therapeutic goal and choosing the best possible treatment for reaching that goal, taking into account aspects of efficacy, safety, and suitability for the patient. Choosing the best treatment thus involves weighting different alternatives on many divergent aspects and performing difficult calculations. People are, by their nature, not self-evidently able to perform these procedures correctly. In the process underlying doctors' treatment decisions, several biases have been observed which may lead to suboptimal quality of care.^{4–5}

Computerised systems are being developed that aim to provide support for making optimal treatment decisions.^{6–10} Computers may help to reduce decision errors because they never forget, never get tired, and are faultless calculators, yet existing programs are not widely used. To enhance the acceptability and usefulness of decision support systems, they should fit the needs of the doctors and augment their capabilities while respecting their autonomy.¹¹ Designers of such systems therefore need to take into account not only how decisions should be made, but also how they are actually made. This is of particular importance for decisions resulting in suboptimal treatment of patients when no support is used.

The aim of this study is to describe the decision making process by general practitioners who are deciding on a treatment for an individual patient, and to relate the scope and nature of this process to the quality of the decision outcome. The main questions are: do doctors consider different treatments on relevant aspects or do they follow simple decision rules or habits, and to what extent are differences in the

decision process related to prescribing (sub)optimal treatments? The answers to these questions may be influenced by several background variables. We specifically looked at the influence of the patient case itself and the practice experience of the doctor.

To reveal the decision making process, doctors were asked to "think aloud" while making a decision.¹² Since it is not possible to verbalise all thoughts in the presence of a real patient, written patient cases were used. Written patient cases do not fully reflect daily practice where a doctor actually sees the patient, but are considered valid for measuring decision processes for which actual interaction between doctor and patient is not strictly needed.¹³ For prescribing behaviour in particular, written cases have been found to be a valid proxy for actual patients.¹⁴

The two therapeutic fields studied—uncomplicated urinary tract infections and stomach complaints—are common in general practice and prescribing occurs in these fields which is not in agreement with prevailing standards for quality of care.^{15–19}

METHODS

Subjects

From a random sample of 101 general practitioners working in the northern part of the Netherlands, 61 participated in an in depth study focusing on prescribing.¹⁹ There were 54 men and seven women and they had been in general practice for a mean (SD) of 14 (8.5) years (range 2–37). The participating doctors were comparable with the whole population of general practitioners in the Netherlands at the time of data collection with regard to mean age, practice size, and practice organisation.²⁰

Table 1 Short description of the five cases and full description of two cases

Case no	General	Diagnosis	Specific details	Full description
1	F, housewife, 36 years	Uncomplicated UTI confirmed by nitrite and sediment test	Epileptic patient who uses carbamazepine; she is not pregnant	The 36 year old woman visits your surgery. She is a housewife and has 3 children. She is not pregnant. During the past couple of years she sometimes visited you with one of her children. She herself has never had any complaints until two months ago. Two months ago she came to you with complaints of painful micturition. The urine test then confirmed that she had a urinary tract infection for which you have treated her. Today she tells you that since two days she again has this painful micturition. From the urine test you conclude that she again has a cystitis (nitrite/sediment positive).
2	F, housewife, 36 years	Uncomplicated UTI confirmed by nitrite and sediment test	Patient was treated for similar infection 2 months before; she is not pregnant	
3	F, shop assistant, 24 years	Non-specific stomach complaints	Patient is about to go on holiday, and asks for tablets her brother received for his ulcer	The 24 year old woman (working in a fashion store) visits your surgery. The last couple of weeks she often feels a nagging pain in the upper stomach. Sometimes on the left side, and sometimes on the right side. Occasionally she suffers from some heartburn and belching. Her stools are of normal colour, she does not have obstipation, nor diarrhoea. According to the patient there is no direct relation between certain food or beverages and the complaints. The complaints are also not related to bending forward or lying down. She seldom drinks alcohol and she does not smoke. There is no specific pressure or stress in her life. No abnormalities can be found upon physical examination. She tells that her brother has suggested that she might have a stomach ulcer. He had advised her to take milk against the pain, and this helps a little. Her brother (not a patient of yours) has an ulcer, according to the patient. Her brother gets tablets which help him very well. The patient asks whether you could give her those tablets. She wants to go on holiday next week.
4	M, accountant, 55 years	Non-specific stomach complaints, endoscopy shows minor gastritis	Used over-the-counter tablets (5 days) which did not help much, asks for something for stomach ache	Previous episode reacted well to H ₂ antagonist, free of complaints for 4 months, patient stresses she has more complaints now; patient occasionally uses temazepam for sleeping problems
5	F, secretary of small firm, 43 years	Relapse episode reflux oesophagitis, endoscopy shows grade II oesophagitis		

Material

The original data were collected in 1992 and 1993. Part of the material collected then was used for the present study. All doctors had made treatment decisions for five written patient cases. For the diagnoses described in these cases there have been no significant changes in the recommended first choice treatment in recent years.^{17 18 21 22}

The written cases were based on actual patient cases and were tested in a pilot study with 30 general practitioners practising outside the study area. In this pilot the five written cases were selected from a set of 12 cases using the following criteria: (1) the written case included sufficient (diagnostic) information for making a treatment decision; and (2) a panel of two medical doctors and one pharmacist, all involved in academic teaching of pharmacotherapy, had agreed on what the recommended treatment would be according to the guidelines.^{17 18}

The cases described a patient's complaints, the circumstances, and diagnostic information (table 1). Two were dealing with uncomplicated urinary tract infections in non-pregnant women (cases 1 and 2) and were relatively short (100 words). Three patient cases dealt with stomach complaints (cases 3, 4, 5); these were longer (170–315 words) and included contextual aspects such as patient demand. Co-medication was mentioned in cases 1 and 5. For the urinary tract infection cases it was stated that these women were not pregnant, but no information was given on other contraindications such as drug allergies.

Data collection

The "think aloud" method was used to elicit the doctors' decision processes. "Think aloud" is a process tracing method which reveals the cognitive processes engaged in while making decisions, without affecting the outcome of the decisions.^{12 23 24} Subjects are asked to verbalise all thoughts that come into their mind while performing a decision task. Most people are able to do so quite easily after a little practice; the only side effect is that it may slow down the decision process. "Think aloud" gives more accurate information about decision processes than when doctors are asked to describe or explain their decisions, since most people are not fully aware of all the thoughts that crossed their mind before the final decision was made and tend to make hindsight rationalisations.^{23 25 26} The most important limitation of the "think aloud" method is that not all thoughts can be verbalised. For example, recognition of and reaction to non-verbal stimuli, such as smells or patterns, are difficult to verbalise. Such stimuli were not present in our patient cases. Furthermore, automatic thought processes are often one step procedures of which only the outcome will be verbalised. These will be identified as such in our analysis.

The doctors were presented with the written patient cases and asked to verbalise aloud all thoughts and considerations that came into their minds while reading the case and while deciding upon the treatment. To get used to verbalising all thoughts each doctor started with an extra patient case which was not included in the analysis. The verbalisations

Table 2 Aspects mentioned when deciding on a treatment

Category	Consideration refers to
Core aspects	<ul style="list-style-type: none"> • Effects of the drug • Side effects of the drug • Costs of the drug • Other characteristics of the drug • Co-medication • Co-morbidity
Contextual aspects	<ul style="list-style-type: none"> • Previous experiences • Patient demand • Circumstances of the patient
Habitual aspects	<ul style="list-style-type: none"> • Habits • Standard treatment

were tape recorded and subsequently typed out verbatim. This gave us written transcripts of the decision processes.

Data analysis

Scoring the transcripts

For all 61 doctors there were separate transcripts for each of the five patient cases resulting in 305 transcripts. These 305 transcripts were cut up into segments of independent sentences or groups of closely associated sentences. Two of the authors (CLMW and HWS) independently coded these segments to indicate the type of thought it contained. Cohen's kappa was calculated to assess their agreement regarding the codes assigned to each segment. The following coding categories were used: 0 for verbalisation of the text of the written patient case; 1 for remarks not related to the treatment choice; 2 when a treatment option was mentioned; 3 when an aspect relevant for a treatment choice was considered; and 4 for the final treatment choice.

We distinguished between drug treatments, non-drug treatments, and no treatment. To establish the number of treatments mentioned, a class of drugs was counted as a separate treatment option if no further generic or brand names belonging to that class were mentioned by the doctor. When a brand name as well as its generic name was mentioned, these were counted as one treatment option. Aspects relevant to the treatment choice were divided into: (1) core aspects referring to effects, side effects, co-medication, co-morbidity, or other characteristics of the treatment itself; (2) contextual aspects referring to specific circumstances influencing the decision such as previous experiences of the patient or patient demand; and (3) habitual aspects—that is, references to habits or standard treatment (table 2).

Categorising the decision process

On the basis of the coded transcripts, the doctors' decision processes were categorised as one of seven types depending on the number of treatments and aspects considered (table 3). These categories refer to differences in scope and nature of the decision process. When only one treatment is mentioned, this indicates a decision process in which no comparison is made between different alternatives. This could be a type A process in which also no aspects are mentioned, or a type B or C process in which one or more aspects are mentioned. Type A is typically an automatic or habitual process. Type B and, especially, type C can be interpreted as *satisficing* strategies—that is, settling for the first treatment that comes into mind which satisfies some basic criteria such as being effective and not contraindicated for that patient. This is contrasted with *optimising* strategies where one tries to evaluate and compare several options in search of the optimal choice.²⁷ Types D, E, and F are processes in which more than one treatment was mentioned and again either no, one, or more than one aspect. Type F processes are closest to the optimising strategy. This thorough deliberation of different treatments on different aspects is seen as the normative model in decision theory.²⁷

Table 3 The seven types of decision process

Type	No of treatments	No of aspects considered	Example
A	1	0	... this is clearly a urinary tract infection. I will write a prescription for co-trimoxazole ... and that she brings some urine to check if it is clean (case 1)
B	1	1	... the relief is doing so much already that I wonder whether you should give something, so I would give something simple like Antagel (case 4)
C	1	2 or more	... I think that I will give her those tablets, two reasons, I don't think she has anything serious ... I don't think I can do wrong with it. I also think I can help her by giving them. And then I have a satisfied person because she wants those tablets, but that is not the most important reason. She goes on holiday next week, so I think I give her Zantac for 2 weeks (case 3)
D	2 or more	0	... she gets furadantine from me, and not trimethoprim, 4 times daily 100 mg for a week ... and then come back the last day for a urine check (case 1)
E	2 or more	1	... I would talk with her ... that precisely when she is very busy those complaints may get worse ... so that's the talk-side of the story ... and then I would give something like Ulcogant or Gaviscon ... well, I will give Ulcogant, it attaches to the spots themselves, Gaviscon works more superficially (case 5)
F	2 or more	2 or more	Yes, I could do two things. Should I give her a blocker again ... few months without complaints, that is rather short ... I would rather give her a kinetic, Prepsid, together with an H ₂ -blocker, or maybe something stronger like Losec, because the complaints came back so soon. But this final step may be premature, she could do well on a maintenance treatment, that her complaints disappear completely. Yes, I would give her twice daily the H ₂ -blocker and for a short period also Prepsid, to reduce her complaints at a faster rate. Prepsid alone might be enough, but I don't think she will be motivated for that, she will also want the H ₂ -blocker ... she has had good experience with it (case 5)
N	0	0 or more	I wouldn't prescribe any medication, I would put it clearly to her that I do understand that she comes to me with those complaints, also giving the relation, but that her complaints do not point at an ulcer, they are too variable, left and right ... (case 3)

Table 4 Number of drug treatments considered for each case

No of treatments*	Total no (%) of all 305 transcripts	Case 1	Case 2	Case 3	Case 4	Case 5
0	5 (1.6%)	–	–	2	3	–
1	175 (57.4%)	52	45	18	35	25
2	78 (25.6%)	4	14	30	15	15
3	37 (13.1%)	3	2	10	6	16
4	8 (2.6%)	2	–	–	2	4
5	2 (0.7%)	–	–	1	–	1
Mean (SD)		1.26 (0.70)	1.30 (0.53)	1.85 (0.85)	1.49 (0.87)	2.03 (1.05)

*Friedman test for differences between cases, $n=61$, $df=4$, $p<0.001$

Table 5 Number of cases in which core, contextual, and habitual aspects were considered

	Total no (%) of all 305 transcripts	Case 1	Case 2	Case 3	Case 4	Case 5
Core*	159 (52.1%)	40	14	32	28	45
Contextual**	111 (36.4%)	6	17	39	20	29
Habitual***	41 (13.4%)	12	8	9	8	4
No aspects****	72 (23.6%)	15	26	3	18	10

*Cochran's Q test for differences between cases, $n=61$, $df=4$, $p<0.001$; **Cochran's Q test for differences between cases, $n=61$, $df=4$, $p<0.001$; ***Cochran's Q test for differences between cases, $n=61$, $df=4$, $p=0.29$; ****Cochran's Q test for differences between cases, $n=61$, $df=4$, $p<0.001$.

Transcripts that mentioned no treatment at all were classified as type N.

The type F processes were described in more detail by classifying the steps made when going from one treatment or aspect to another as either alternative wise, aspect wise, or diagonal steps. The occurrence of many alternative wise steps indicates that the doctor first considers one alternative on a number of aspects before moving to another alternative. Such a strategy may inhibit a thorough comparison of treatments. Aspect wise steps indicate that treatments are explicitly compared with each other on an aspect. In diagonal steps such comparisons could be made implicitly—for example, when a doctor says “X is quite effective, but Y is a lot cheaper”.

Statistical analysis

The influence of the patient case on the number of treatments and type of aspects considered during the decision process was tested with non-parametric tests for more than two related samples (Friedman test for ordinal data and Cochran's Q test for dichotomous data).²⁸ The relation between the doctors' years of practice experience and number of treatments or aspects considered was tested for each case separately with non-parametric correlations (Spearman's rho). To test whether differences in the decision process were related to prescribing different treatments, χ^2 tests or Fisher's exact tests were used, making comparisons between first and second choice treatments for each case. The treatments prescribed were classified as either first choice or second choice treatments according to the Dutch national guidelines for general practice.^{17 18 21 22}

RESULTS

There was a high level of agreement in the coding of the transcripts: 92.6% of the text segments were classified in the same coding category by both judges resulting in a kappa value of 0.84. In total, 2.9% text segments were coded as not relevant (code 0 or 1) by one of the judges and relevant (code 2, 3 or 4) by the other. In addition, there were a few discrepancies (1.4%) between assignments of code 2 (mentioning a treatment option) and code 4 (the final treatment choice), and

between subcategories of one code (<1.4%). These differences were resolved in discussion.

In 175 of the 305 transcripts (57%) only one treatment was considered, whereas two or more were considered 125 times (table 4). Core aspects were mentioned in just over half of the transcripts, contextual aspects in more than a third, whereas “habit” was explicitly mentioned in relation to 14% of the treatment decisions (table 5). In a quarter of the cases no explicit considerations were made, indicating an automatic or habitual process. The core considerations in case 1 mostly referred to the co-medication mentioned in this case (table 6), but many said they would rely on the pharmacist for checking possible drug-drug interactions. The possibility of a drug allergy was almost never explicitly contemplated, although this was relevant before prescribing an antibiotic (cases 1 and 2). Efficacy was the most often mentioned consideration in cases 2, 3, 4 and 5, followed by side effects and by mechanism of action for the stomach complaint cases (table 6). Costs were considered only in some of the stomach complaint cases. Contextual aspects were considered in almost half of the cases with stomach complaints (table 5). Patients 3 and 4 explicitly asked for drug treatment, whereas patient 5 implicitly emphasised the need for an effective drug. These patient demands were considered by 60.7%, 24.6%, and 19.7% of the doctors, respectively. Other frequently mentioned contextual aspects were “going away on holiday” (case 3), “previous use of an over the counter drug” (case 4), and “previous experience with an H_2 antagonist” (case 5). Finally, several general practitioners mentioned their own good experience or affinity with a specific drug for stomach complaints.

Common decision processes were type A, mentioning only one drug without any considerations; type B, considering one drug on only one aspect (either a core or contextual or habitual aspect); and type F, considering two or more drugs on two or more aspects (table 7). Aspect wise steps in the decision process, indicating that two treatments were explicitly compared on the same aspect, were made 109 times in the type F transcripts. Alternative wise steps were made 83 times, whereas diagonal steps going from mentioning one aspect in relation to one treatment to another aspect related to another treatment occurred 208 times. Again these aspects could be either core, contextual, or habitual in nature (table 2).

Table 6 Total number of different core aspects mentioned (more than one core aspect can be mentioned in one transcript)

	Case 1	Case 2	Case 3	Case 4	Case 5
Efficacy	–	5	20	37	46
Side effects	–	3	9	8	10
Interaction	33	–	–	–	–
Contraindication	7	3	–	–	–
User friendliness	–	2	4	7	4
Cost	–	1	–	6	12
Mechanism of action	–	–	16	12	14

Table 7 Types of decision processes observed

Type of process	Total no (%) of all 305 transcripts	Case 1	Case 2	Case 3	Case 4	Case 5
A	67 (22.0%)	13	26	2	17	9
B	79 (25.9%)	28	17	10	13	11
C	28 (9.2%)	10	2	6	5	5
D	5 (1.6%)	2	–	1	1	1
E	39 (12.8%)	3	12	13	5	6
F	82 (26.9%)	5	4	27	17	29
N	5 (1.6%)	–	–	2	3	–

A = 1 drug and no aspect; B = 1 drug and 1 aspect; C = 1 drug and 2 or more aspects; D = 2 or more drugs and no aspects; E = 2 or more drugs and 1 aspect; F = 2 or more drugs and 2 or more aspects; N = no drugs.

Table 8 Relation between type of decision process and decision outcome

Type of decision process	No of first choice treatments					No of second choice treatments					Total no (% per type of decision process)	
	1	2	3	4	5	1	2	3	4	5	First choice	Second choice
A	11	23	1	4	9	2	3	1	13		48 (71.6%)	19 (28.4%)
B	26	16	5	10	10	2	1	5	3	1	67 (84.8%)	12 (15.2%)
C	10	2	2	3	5			4	2		22 (78.6%)	6 (21.4%)
D	2							1	1	1	2 (40.0%)	3 (60.0%)
E	3	10	5	2	5		2	8	3	1	25 (64.1%)	14 (35.9%)
F	4	4	6	6	26	1		21	11	3	46 (56.1%)	36 (43.9%)
N			2	3							5 (100%)	0 (0%)
Total	56	55	21	28	55	5	6	40	33	6	215 (70.5%)	90 (29.5%)

Background variables

The cases themselves had a clear effect on the number of treatments, type of aspects, and type of decision process (tables 4, 5, 6, 7). The urinary tract infection cases predominantly triggered more simplistic decision processes (types A and B). Alternatives were considered by only 16.4% of the doctors for case 1 and by 26.2% for case 2. In case 2 this occurred mostly in view of the recurrence of the infection. For the stomach complaint cases, two or more drugs were mentioned by 67.2%, 37.7%, and 59.0% of the doctors, the majority considering more than one aspect (type F). In particular, more contextual aspects were mentioned in relation to the stomach complaint cases.

The experience of the doctors was not consistently related to the number of treatments or aspects considered. Only for case 1 did doctors with more practice experience mention fewer core aspects (Spearman's rho correlation coefficient -0.276 , $p=0.031$), and for case 4 doctors with more practice experience mentioned fewer treatment options (Spearman's rho correlation coefficient -0.256 , $p=0.046$).

Relation to prescribing second choice treatments

For the urinary tract infection cases most of the general practitioners (91.8% and 90.2%) prescribed drugs recommended as first choice in the national guideline for general practice

(table 8). Second choice drugs such as norfloxacin or co-trimoxazole were prescribed five times in case 1 and six times in case 2, four times by the same doctor. In eight cases this decision process could be classified as habitual.

For the cases with minor stomach complaints (nos 3 and 4), second choice drugs (e.g. H_2 antagonists) were prescribed by 65.6% and 54.1% of the doctors, while the others prescribed antacids or no drug treatment. For the patient with reflux complaints (case 5), most doctors prescribed an H_2 antagonist which would be the drug of first choice. Second choice drugs were more often prescribed after consideration of two or more alternatives in a type D, E, or F process (table 8). There was no relationship between the number of core or habitual aspects mentioned and the outcome of the decisions. Doctors more often mentioned contextual aspects before prescribing a second choice drug for case 3; 31 of the 40 doctors who prescribed a second choice drug considered one or more contextual aspects, whereas eight of the 21 doctors prescribing a first choice drug considered contextual aspects ($p=0.004$, Fisher's exact test). Furthermore, costs were only mentioned by doctors prescribing a first choice drug in cases 4 and 5.

DISCUSSION

The doctors in this study were not asked to explain or defend treatment decisions, but just to verbalise all thoughts when

making a decision for an individual case. This gives insight into what is actively considered during this process and helps to uncover where and how prescribing decisions could benefit from support.

The decision behaviour of the general practitioners was not very extensive and, in almost 40% of the transcripts, it could be classified as habitual. More than one drug was considered in less than half of the transcripts. Usually only a limited number of considerations was made. Some considerations referred to core aspects of the drug or the patient case, others referred to more contextual aspects. When doctors evaluated different treatments on more than one aspect, they often made diagonal steps going from one aspect of one treatment to a different aspect of another. This indicates that they made shortcuts and did not necessarily compare treatments explicitly with each other, which is in line with previous findings among medical specialists.²⁹⁻³² There was no consistent influence of the doctors' practice experience on the decision process.

The behaviour observed clearly deviates from the decision theoretic norm of making an inventory of the treatment options, filtering out those options that are risky, and weighting the remainder on relevant aspects such as expected effectiveness, side effects, and suitability for the patient. One could argue that it is not pragmatic to follow this norm for repetitive decisions, and our study showed that simple decision rules may result in choosing a first choice treatment. On the other hand, it is obvious that prescriptions that ignore possible side effects, interactions, or contraindications should be avoided.

The type of aspects considered is partly influenced by the case descriptions since contextual aspects in particular will only be considered when included in a case. However, the doctors did not actively consider all information presented and made their own selection for each case. The doctors almost never asked for information on drug allergies relevant to the patients with a urinary tract infection, and possible drug-drug interactions were only considered by half of the doctors and seldom checked. Decision support can be of help by bringing such pertinent information to the prescriber's attention.^{9, 33, 34}

With regard to characteristics of the medication, most considerations referred to efficacy and mechanism of action, while possible side effects and costs were only mentioned occasionally. Although many doctors say that these latter aspects are important for their prescribing decisions,³⁵ it seems that only a minority consider these aspects when choosing a treatment for an individual patient. When looking at the available treatment guidelines, it becomes clear that side effects and costs are relevant criteria for differentiating between first choice and second choice treatments.^{17, 18, 21, 22}

Many drugs are considered effective for the type of cases included in our study, and it is advised that drugs should be prescribed that are cheap and cause few (serious) side effects.

For the stomach complaint cases, two thirds of the second choice drugs were chosen after deliberation of other alternatives. Offering correct information on the expected benefits and costs may then be useful. When such support is given routinely, however, doctors may feel overloaded with information during the consultation.¹¹ Since general practitioners seldom focus on more than one core aspect, they may perceive it as a disruption when a support system forces them to pay attention to other aspects. Such "intrusions" on the normal procedure should be made either on request or sparingly with a specific purpose.

Second choice drugs were sometimes prescribed in view of specific circumstances. One could argue that this may be justified. For instance, in one case the patient had used a first choice drug himself without experiencing much effect. Computer systems do not include such contextual information and this may be perceived as a drawback by the doctors. On the other hand, it is clear that some doctors are more sensitive to contextual aspects than others. A decision

Key messages

- GPs' prescribing decisions for uncomplicated urinary tract infections are mostly habitual and may overlook the aspect of suitability for the patient.
- GPs' prescribing decisions for stomach complaints may include some deliberation but seldom involve a comparison of different treatments on all relevant aspects.
- Consideration of contextual aspects, such as patient demand or circumstances of the patient, may lead to prescribing more second choice drugs.
- Decision support bringing information about relevant contraindications, interactions, and costs to the prescriber's attention could improve the quality of prescribing.

support system may help these doctors to resist, for instance, patient demands for second choice treatments.

Finally, most general practitioners had their favourite drug for treating urinary tract infections and this was sometimes a second choice drug. Either they chose it habitually or evaluated it on one or two aspects—that is, following a kind of *satisficing* strategy. Habits are usually difficult to change and it is unlikely that doctors will consult a decision support system for habitual decisions. A support system could help to remind doctors of the first choice treatments. For those who are willing to change their habits, such reinforcements may be useful.³⁶

Conclusion

The decision process of general practitioners deviates from the decision theoretic norm of thoroughly evaluating all possible options, but these deviations do not always result in suboptimal prescribing behaviour. Divergence from optimal care can be due to unawareness of situations where certain drugs may or may not be beneficial, to focusing primarily on efficacy or contextual aspects and not on costs, or to habitual preferences for "second choice" treatments. Decision support can lead to improvements in the quality of prescribing when it interrupts the decision making process when needed—for example, by bringing relevant side effects, costs, interactions, or contraindications to the attention of the prescriber and by reminding them what is considered the treatment of first choice for a specific patient. It should be made clear to the users that support systems can never incorporate all circumstances of a patient, and that the doctor remains responsible for the final treatment decision.

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