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Rules of Thumb and Management of Common Infections in General Practice

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“No rule so good as rule for thumb, if it hits”.

Scottish Proverb by Kelly in 1785

To Lova, Hanna, Hedvig and Lotten

Abstract

This thesis deals with problem solving of general practitioners (GPs), which is explored with different methods and from different perspectives. The general aim was to explore and describe rules of thumb and to analyse the management of respiratory and urinary tract infections (RTI and UTI) in general practice in Sweden. The results are based upon focus group interviews concerning rules of thumb and a prospective diagnosis-prescription study concerning the management of patients allocated a diagnosis of RTI or UTI. In addition unpublished data are given from structured telephone interviews concerning specific rules of thumb in acute sinusitis and prevailing cough.

GPs were able to verbalize their rules of thumb, which could be called tacit knowledge. A specific set of rules of thumb was used for rapid assessment when emergency and psychosocial problems were identified. Somatic problems seemed to be the expected, normal state. In the further consultation the rules of thumb seemed to be used in an act of balance between the individual and the general perspective. There was considerable variation between the rules of thumb of different GPs for patients with acute sinusitis and prevailing cough. In their rules of thumb the GPs seemed to integrate their medical knowledge and practical experience of the consultation. A high number of near-patient antigen tests to probe *Streptococcus pyogenes* (Strep A tests) and C-reactive protein (CRP) tests were performed in patients, where testing was not recommended. There was only a slight decrease in antibiotic prescribing in patients allocated a diagnosis of RTI examined with CRP in comparison with patients not tested. In general, the GPs in Sweden adhered to current guidelines for antibiotic prescribing. Phenoxymethylpenicillin (PcV) was the preferred antibiotic for most patients allocated a diagnosis of respiratory tract infection.

In conclusion, the use of rules of thumb might explain why current practices prevail in spite of educational efforts. One way to change practice could be to identify and evaluate rules of thumb used by GPs and disseminate well adapted rules. The use of diagnostic tests in patients with infectious illnesses in general practice needs critical appraisal before introduction as well as continuing surveillance. The use of rules of thumb by GPs might be one explanation for variation in practice and irrational prescribing of antibiotics in patients with infectious conditions.

Keywords: General practice, rules of thumb, decision making, respiratory tract infections, urinary tract infections, diagnostic tests, C-reactive protein test, antibiotic prescribing.

List of publications

This thesis is based on the following papers, which will be referred to in the text by their Roman numerals.

- I André M, Borgquist L, Foldevi M, Mölstad S. Asking for 'rules of thumb': a way to discover tacit knowledge in general practice. *Family Practice* 2002;19:617-22
- II André M, Borgquist L, Mölstad S. Use of rules of thumb in the consultation in general practice – an act of balance between the individual and the general perspective. *Family Practice* 2003;20:514-9
- III André M, Odenholt I, Schwan Å, Axelsson I, Eriksson M, Hoffman M, Mölstad S, Runehagen A, Lundborg CS, Wahlström R. Upper respiratory tract infections in general practice: diagnosis, antibiotic prescribing, duration of symptoms and use of diagnostic tests. *Scandinavian Journal of Infectious Diseases* 2002;34:880-6
- IV André M, Schwan Å, Odenholt I, Axelsson I, Eriksson M, Mölstad S, Runehagen A, Lundborg CS. The use of CRP in patients with respiratory tract infections in primary care in Sweden can be questioned. Accepted in *Scandinavian Journal of Infectious Diseases*.
- V André M, Mölstad S, Lundborg CS, Odenholt I, Axelsson I, Eriksson M, Runehagen A, Schwan Å. Management of urinary tract infections in primary care: a repeated 1-week diagnosis-prescribing study in 5 counties in 2000 and 2002. Accepted in *Scandinavian Journal of Infectious Diseases*.

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Abbreviations

GP	General practitioner
RTI	Respiratory tract infection
UTI	Urinary tract infection
AECOPD	Acute exacerbation of chronic obstructive pulmonary disease
CRP	C-reactive protein
Strep A	Near-patient antigen test to probe Streptococcus pyogenes
PcV	Phenoxymethylpenicillin
STRAMA	Swedish Strategic Programme for the Rational Use of Antimicrobial Agents and Surveillance of Resistance

Prologue

For as long as I have worked as a general practitioner (GP) the contradictions inherent in daily practice have intrigued me. How could I manage to adhere to guidelines and at the same time relate to the individual patient in front of me?

During many years I have been involved in projects of quality improvement in the county of Dalarna. These have concerned several topics, but the use of laboratory tests and antibiotics have been recurrent themes. With great enthusiasm we carried out our projects, but the evidence of improvement was insignificant and we noticed a gap between practice and guidelines. Moreover we observed an astonishing variation between GPs. Thus I began to wonder what really happened during the consultation. In daily practice I observed the certain and reflexive answers I got from my colleagues when asking for help. In courses in quality improvement I summarized my own experience of the consultation:

We always use two hands in clinical work. One hand is the craft – what we learned in education - to prescribe the appropriate medicine or to suture a wound correctly. The other hand is the hand used for the meeting, a meeting that must be characterized by empathy and humility. The work of the GP is basically emotional: to understand and relate to another being. To be able to understand and trust the person I meet I have to lose my own foothold for a moment and, during an instant, share life and breath with the person I meet. At that time I am in my meeting hand. But just in that moment I need to use my craft knowledge, exactly the knowledge that is needed for the patient. The time in consultation is limited. Here lies the difficulty.

Thus, my preconception was that rules of thumb concerned medical, somatic problems in contrast to the social and emotional communication with the patient. The first time I stumbled upon the concept rules of thumb was in a paper of Zaat, where he discussed ordering of laboratory tests (1). With help from professor Borgquist I began to explore the concept and during some weeks in the summer of 1998, when I worked as locum, I registered every consultation in a home-made questionnaire. The definition used for a rule of thumb was: A rule for management that was instantly available to mind.

Of the 156 registered consultations, most concerned a new disorder. Rules of thumb were used more often when the problem was recognised compared to when it was unknown. I used rules of thumb above all when I felt confident of my knowledge. However, I also used rules of thumb more often when I perceived myself as ignorant rather than when I was unsure about my knowledge. When I did not recognise any rule of thumb I asked a colleague for advice in one-fourth of the consultations, but never when I used a rule of thumb.

Thus it seemed to be a challenge to explore the thinking and decision making in the consultation of the GP with regard to rules of thumb as well as to get more comprehensive knowledge of the management of GPs of common infections.

Introduction

This thesis deals with problem solving and decision making of general practitioners (GPs) and explores the domain with different methods and from different perspectives. The thesis is based upon the results from focus group interviews concerning rules of thumb and a prospective diagnosis-prescription study concerning the management of common infections. Management of patients allocated a diagnosis of respiratory tract infections (RTI) or urinary tract infections (UTI) are used as illustrations since these are the most common infectious problems in general practice (2, 3) and besides, the guidelines concerning acute otitis media and acute pharyngotonsillitis were recently updated (4, 5). In addition, unpublished data are given from telephone interviews about specific rules of thumb in some selected infectious conditions. In the thesis the concept rule of thumb is preferred to the synonym heuristic, unless reference is made to earlier research.

There is a gap between the statements given in medical guidelines and preconditions of everyday life in general practice. The gap between what is regarded as best practice and current work has been described from different domains in general practice (6) and unnecessary use of antibiotics has been one dominant theme (7-11). Strangely enough, continuing medical education activities may improve competence without change of performance (12, 13). Therefore, a better understanding of how GPs make decisions in daily practice is important. The consequences are considerable both in costs and effects (14, 15). Wide variations in clinical practice have been observed during the last decades, both at the macro level (16) and in comparison between individual GPs. Studies have confirmed the identity of the GP as an important explanatory factor, shown to be stable over time (17). A better understanding of the decision making of GPs may help to explain the variations in practice and thus contribute to quality improvement in the health care organisation.

Research in problem solving has been carried out in different research paradigms and models, with different aims and methods. Thinking and

decision making have been treated in different domains (18). Research in decision making mostly treats the actual mental processes as a black box and focuses on judgement and choice, whereas research in cognitive psychology usually aims to understand and describe the mental processes (19, 20). In decision making the question of rationality is central, thus linked to the ideology of enlightenment both as a faith and a theory. Hence there are two different research traditions: those who claim the human mind is rational and characterized by adaptation to the problem to be solved and those who claim the human mind to be fallacious as rules of logic and probability are violated (21). Moreover, educational research has explored professional skill with focus on tacit knowledge and intuition.

Research in decision making could be divided into two areas: descriptive, i.e.: How decisions are actually made, and normative, i.e.: How decisions can best be made (22). Rules of thumb were explored in descriptive decision research.

Rules of thumb and heuristics

The terms 'heuristics' and 'rule of thumb' are often used as synonyms, but there are some differences in meaning. The word 'heuristic' means serving to find out or discover. For instance, Einstein's paper for which he won the Nobel Prize used the words 'heuristic viewpoint' in the title (23). Heuristic has more recently been used in information processing (i.e. computing) (21). Another definition was 'A process that may solve a given problem, but offers no guarantee for doing so is called heuristic' (23). A rule of thumb was explained as a rough practical rule that was based on practice and experience (23).

Studies of heuristics in health care

In earlier studies the concept heuristic has been used in different ways. Research in the 70s described heuristics as a source of systematic errors and lapses of reasoning (24). Although the research has been criticized as being artificial and content-free (20, 21), other medical authors have used the concept in the same way (25, 26). Rules of thumb have been identified in decisions to choose a specific drug. Some rules were described as a result of earlier active reasoning whereas others had not been reasoned at all (27). Studies in nursing have explored tacit knowledge and heuristics (28). One study identified heuristics as pattern recognition used in familiar situations (29). Other studies found heuristics most frequently used in complex

situations (30, 31). Ben Essex, a GP from Britain, has elaborated generalized and comprehensive rules from many years of recording his own rules of thumb. He argued that these rules formed the basis of intuition and experience (32). In a study using case vignettes the effectiveness of exposure to some of the rules was evaluated. The rules improved performance in these 'paper' patients and seemed to get recalled and internalized (33).

Fast and frugal heuristics

Gigerenzer et al in the ABC programme in Berlin described heuristics as fast, frugal and computationally cheap and adaptive to a particular environment (21). A heuristic was defined as an useful shortcut, an approximation or a rule of thumb for guiding search. In the studies made, these heuristics were shown to be as accurate as complex statistical models (e.g., multiple regression or Bayes' theorem). One reason for this was thought to be that they can exploit structures of information in the environment, that they are 'ecological rational'. The rules explored were one of three groups: simple rules for guiding search, for stopping search and for decision making. The concept of bounded rationality as an adaptive mechanism in an evolutionary perspective was the starting point for this research. Since the decision makers' cognitive ability is limited, the information must be reduced to simplify the information processes. Bounded rationality is looked upon as the key to understand how people make decisions in the use of simple step-by-step rules (21).

The most widely used method to study judgements has been the 'lens model' (34). The model provides a method for comparing the correlations among available clinical data (cues) used in judgements. Statistical calculations described how well the outcome was captured by the model and how well the judgement of the physician compared to the norm. Studies have shown that there was pronounced variation between different physicians. The cues actually used were markedly different from those obtained from the physicians' verbal report (34). Moreover, the number of cues used were surprisingly low (two to three). When a heuristic with only one cue was identified it fitted data equally well and allowed for flexibility as different cues were used in different situations (35, 36).

Therefore, rules of thumbs or heuristics were identified as well adapted for decisions in defined contexts. Research in decision-making focuses on judgement and choice but treats the mental processes as a black box, whereas research in cognitive psychology usually aims to understand and describe the mental processes in problem solving.

Mental processes in medical decisions

One of the pioneer works in exploring medical problem solving was started in The Medical Inquiry Project 1969 by Elstein et al (18). It was based on the conception that medical expertise was the same as good medical problem solving. Expectations were also high to implement medical knowledge in expert systems with a general problem solving design (37). In the core study three consultations with simulated patients were videotaped and the 24 physicians stimulated to talk aloud about their diagnostic reasoning. The result of this study was a description of the problem solving of physicians, the hypothetico-deductive method: cue acquisition, hypothesis generation, cue interpretation and hypothesis evaluation. Surprisingly there was no difference in reasoning between expert and novice, which the researchers explained was because expertise was being content specific (18).

The study was criticized because it lacked internal consistency, the results reflected the thinking of the investigators and the tasks were limited only to label acute diseases (38, 39). Barrows et al had described the early appearance of a limited set of hypotheses, almost before the consultation begun. The hypothesis influenced what features were identified in the further consultation (40). According to McCormick, a GP from Ireland, the concept gave an illusion of scientific discovery. He argued that the claim to replace the complete patient history and physical examination with the hypothetico-deductive method as a norm for clinical work was to exchange rubbish for nonsense (41).

In his investigations on simulated patients, Ridderikhoff studied problem solving among 60 GPs (42, 43). He characterized the diagnostic process as one of iterative pattern recognition, i.e. a speculative form of inductive reasoning. The GPs collected hypothesis, not data. The confidence in data was unshakable; 86% of the consultations were finished without testing the diagnosis (42). This is in concordance with the illusion validity, where inferences made without reliance on memory led to overconfidence and exaggerating the extent of correctness (44). Ridderikhoff concluded that this approach was based on personal intuition rather than general knowledge (43). The hypotheses were the GPs' brainchildren. One consequence was that GPs do not learn with experience (42).

Hence, early research in the problem-solving of physicians was characterized by the hypothetico-deductive method. This research has been criticized as giving an illusion of science. From further studies, which

identified, e.g., inductive reasoning and pattern recognition, a comprehensive theory on medical expertise was formulated (45).

Expert knowledge

In 1990 Schmidt et al. proposed that experienced physicians developed illness scripts from exposure to patients (45). These scripts contained only little pathophysiological knowledge but a wealth of clinically relevant information. Thus physicians actually used memories of previous patients when diagnosing a new case. Mental networks of propositions represented how findings were related and with experience the findings got compiled from a list-like structure to 'illness scripts'. The scripts included contextual factors and normal variations and appeared in a script-like order. Hence problem solving in the routine case was proposed to be a process of script search, script selection and script verification. As these scripts developed with experience they became idiosyncratic for the individual physician. Previous patients were stored in memory as instances and new presentations were recognised because of their similarity. This would explain why the expert asked fewer questions and had no use for biomedical knowledge. Pattern recognition is therefore an essential skill. The authors also suggested that previously acquired knowledge remained available and the physicians moved to a slower, analytic reasoning as the complexity of the problem demanded (45).

Expertise has further been characterized in research in cognitive psychology. The experts seem to have a special enhanced memory for information in their domain, namely, remembering the patterns and what to do in the presence of these patterns. However, the expert knowledge often was quite limited. As tasks were practiced they became more automatic and required less cognition to execute (20). In problem-solving 'production rules' were described organized in condition (if) and action (then) used in problem solving (20). Moreover, although the experienced physician got more confident, he was not always more accurate (46).

Intuition and tacit knowledge

The description of expertise from cognitive psychology is in concordance with empirical studies in health care. Greenhalgh, a British GP, described the intuitive work in general practice and characterized intuition as a rapid, unconscious process, that was context sensitive and came with practice, could not be reduced to cause-and-effect logic, and that integrated and made sense of multiple complex pieces of data (47). Benner's research of the

expertise of nurses built on a model of skill acquisition where analysis and intuition were the key concepts (48). The novice must think analytically and adhere rigidly to rules (49). As competence was enhanced, behavior got more automatic and the expert grasped the situation intuitively (48).

Intuition makes use of tacit knowledge (50). Polanyi defined tacit knowledge as “that which we know but cannot tell”. He gave as an example that people can perform skills (such as driving a car) without being able to describe what they are doing (51). Some medical writers have kept to this definition and defined tacit knowledge as ‘knowing how’ in contrast to the explicit knowledge ‘knowing that’ (52). However, other authors disagreed and defined tacit knowledge as “that which has not yet been abstracted from practice” (50). Molander argued that there is no knowledge which is totally tacit and none without some tacit aspect. Some tacit knowledge could be described as silenced knowledge (53). Schön described tacit knowledge as knowledge-in-action (54).

Katherine Hunter, a literature professor, explored intuitive knowledge in medicine from quite another starting point. She observed that physicians were engaged in an interpretive practice and accommodated to the uncertainties by the use of competing maxims such as “When you hear hoof beats, don’t think zebra”. These maxims were not accidental but worked in real-life care of patients precisely because of their contradictions. Alone, each maxim reeked of certainty, but each could be contradicted by another maxim. They were useful because of timing and the circumstances for their use (55).

In conclusion, expert knowledge has been explored in different research domains and with use of different concepts. Expert knowledge has been characterized as more automatic, depending on rules and schema in memory. The concept ‘intuition’ seems to correspond to the description of expertise from research in cognitive psychology. Tacit knowledge is described to be used in intuition.

Evidence based decisions

Normative decision theory is used to calculate probability and utility as well as cost-effectiveness to form optimal decisions under uncertainty (22, 56). The systematic appraisal of clinical research in evidence-based systematic reviews makes use of normative decision-making. Decision theory expresses the rational and scientific norm in medicine, the measurable outcomes of a clearly defined problem. Decision analysis is the systematic application of

decision theory (56). Specific decision tools for decision analysis exist, e.g. decision trees, algorithms and cost-effectiveness analysis.

The evidence-based medicine is a yardstick for the work in health care and has raised the standard of clinical care. However, results from studies appraised in evidence-based medicine sometimes are of limited use, when applied in clinical practice. They usually have high internal validity, which implies that extraneous variables, that may confound the results, are controlled for. At the same time the external validity, i.e. the possibility to generalize from the studies decreases, because patients with variables that may be of interest for the GP, such as comorbidity or personal characteristics of the patients are excluded (57). The implementation of evidence-based knowledge in clinical care has been difficult and the use in clinical practice of tools for decision-analysis has mainly failed (58-62). Hamm et al suggested that the explanation was that physicians did not use decision theory information such as probability or utility reasoning in clinical practice (60).

So evidence based decision make use of normative decision analysis and is the yardstick for health care as scientific and rational. However, implementation of clinical practice tools has mainly failed.

General practice

A primary care orientation of the health system was shown to contribute to better health and lower costs of care (14, 15). In the updated Health and Medical Service Act (1995) the commission for primary care was defined as 'a part of out-patient care with no restriction as to illness, age or patient categories, cater to the need of the population for such basic medical treatment, nursing, preventive work and rehabilitation as do not require the medical and technical resources of hospitals or other special competence.' According to the intentions general practice in Sweden has grown but more slowly than the secondary and tertiary sector (63). Primary care in Sweden is characterized by public financed general practice where GPs are salary paid, working together with nurses in health centers. The GPs have no gatekeeper function, do not get reimbursed for activities and the encounter rate is low compared to other countries, only half of that in Great Britain (64).

The spectrum of problems encountered in general practice is characterized by being in the front line of health care (65, 66). Many of the patients in primary care have problems that are not and may never be allocated to

definite diagnoses (14). A study from US showed that in 80% of the encounters the patients had self-limiting disorders, psychosocial problems or used preventive services, thus outside the borders of clinical medicine. Regardless, the patients needed to be cared for, which was possible in a relational model, giving focus to the quality of the process between the patient and the physician (67). A recent study from the Netherlands showed that in 12% of the consultations neither a specific diagnosis could be made nor were the problems explained by the somatic or psychosocial context of the patient (68). As much illness of patients remained undifferentiated, dealing with uncertainty is inevitable for the GP. Moreover, decisions for management often substituted the intervening stage of diagnosis (2, 69).

At the same time as general practice is normality orientated, the GP has to be aware of those symptoms and signs that early distinguish a serious disease (2, 66). Having excluded an immediate serious disorder the GP used time and watchful waiting (2, 70). This emphasizes the importance of the dialogue with the patients as well as the continuity of the GP. The accumulated knowledge of the patient was of special value when patients presented new unspecified problems (71). The consultation is the core task of the GP. Knowledge of the factors that influence the consultation and the decisions made are therefore important.

The consultation

The research in general practice concerning the consultation has been pioneering. Byrne and Long categorized audiotaped consultations as either doctor-centered or patient-centered based on whether the GP made use of the knowledge and experience of the patient or not. Surprisingly the GPs kept their working style independent of the problems presented (72). Several studies have confirmed the importance of patient-centered consultations, when the GP encourages the patient to present her agenda and to elicit expectations and fears (73-77). When GPs adhered to this method, patients were more satisfied and had improved health outcomes (78, 79). However, patients with an acute organic illness were more satisfied with a directing style than a sharing style (80). Most of this research concerned exclusively the process of consultation and took medical knowledge for granted. However, McWhinney described that the essence of the patient-centred clinical method was the fulfillment of the twofold task of the GP: understanding the patient and understanding his or her disease (2).

Research from the Netherlands took both the biomedical and the patient-centered approach into consideration. Observations and taperecordings of

1085 consultations with GPs showed a close and positive relation between the behavioural and the medical skills. GPs with an integrated patient- and goal-oriented approach performed many necessary but few superfluous diagnostic activities, recorded less unnecessary laboratory tests and less prescribed antibiotics and analgesics (81). The style of practice correlated to the risk-taking of the GP (82). GPs that performed many superfluous diagnostic activities seemed prone to invoke somatic fixation as the patient got more dependent on the GP (81, 83). The subjective sense of health among the patients of the integrated GPs were better than the others, they had more realistic expectations and visited their GP less frequently (84). Fhersen and Henbest in South Africa further developed a model for assessment of the work of the GP where three stages were used; the clinical, the individual and the contextual. Primacy was given to person over the disease and the assessment aimed to understand, not classify, the problem of the patient. Thus the biological, psychological and environmental systems were taken in account (85).

In conclusion, the experienced practitioner used tacit knowledge, described as 'fast and frugal heuristics' (21), 'illness scripts' (45), 'pattern recognitions' (45), 'production rules' (20) or 'competing maxims' (55). In general practice many disorders are minor and self-limiting but at the same time the GP has to identify the patient with a serious disease. Hence the task of the GP is twofold: to understand the patient and understand his or her disease (2). Only few studies identified explored the use of heuristics in health care and none empirical study described heuristics among GPs. Further research in this area would thus be of interest.

Management of respiratory and urinary tract infections

Infections are common in the population and in general practice (2, 86-88). In the Nordic countries, patients with RTI accounted for 10-39 % of the consultations in general practice (89). RTI was most frequent especially among children, whereas UTI most commonly affected women (86, 90). Although the majority of these infections are minor and self-limiting, there is always a risk of life-threatening conditions, such as severe acute pneumonia (91).

Antibiotic resistance is increasing worldwide and intensified measures are called for globally as well as in individual countries to reverse or at least level off this trend (92, 93). The causes of this increase of resistance are many, but the use and misuse of antibiotics and the clonal spread of resistant

bacterial strains are regarded the most important (94-96). It has been suggested that approximately 50% of antibiotic use in Sweden was prescribed for infections where patients do not benefit (97).

Diagnosis and antibiotic prescribing

Compared with other European countries antibiotic use in Sweden has been relatively low and the proportion of phenoxymethylpenicillin (pcV) high (98). Antibiotic use has been shown to vary considerably between countries, but also between counties and municipalities (99). Patterns of antibiotic prescribing in patients with RTI varied between GPs, but were surprisingly constant for the individual GP (100-103). High antibiotic prescribing by the GP was shown to be associated to high prescribing in general (104, 105). Although GPs reported that unnecessary antibiotic prescriptions caused discomfort (106, 107) the decision to prescribe antibiotics was also determined by the anticipated regret of missing to treat a pneumonia or to put strain onto the doctor-patient relation (the chagrin factor) (108, 109). In patients with sore throat, it was easier to influence what the GP prescribed than whether a prescription was issued (101).

There is known to be a complex relation between the style of consultation, symptoms and signs used for diagnosis, laboratory tests, diagnosis and treatment. Several studies concerning antibiotic prescribing have highlighted the intricate association between diagnosis and treatment. GPs with a high share of antibiotics also had a high share of bacterial diagnoses (100, 110, 111). Studies by Howie on RTI showed that clinical signs correlated better to antibiotic treatment than the diagnosis. The author suggested that the diagnostic labeling was made after the management decision, often as a justification for the treatment chosen (69).

Guidelines try to make diagnostic criteria explicit. However, no individual finding or symptom in the physical examination is accurate enough by itself to rule in common infections such as streptococcal tonsillitis, acute sinusitis or acute pneumonia (112-115). Studies that explored GPs' use of criteria have confirmed the wide differences between GPs. When GPs were asked to define the criteria used to diagnose acute bronchitis there were wide variations (116) as there were when differentiating between upper RTI, acute bronchitis and pneumonia in questionnaires with hypothetical patients (117, 118). Several studies confirmed that the symptom of purulence and rales heard in the auscultation of the lungs influenced the diagnosis as well as antibiotic prescribing although these findings lacked discriminative power to

identify acute sinusitis or pneumonia (104, 114, 119-123). Furthermore, the diagnoses of acute pneumonia, as well as streptococcal tonsillitis were often overestimated (114, 122-124).

Use of near-patient diagnostic tests in RTI and UTI

The use of laboratory tests in minor illnesses is not harmless (125, 126). Superfluous testing carried the risk of false-positive outcome and might increase the risk for somatisation (84). The relation between use of laboratory tests and antibiotic prescribing does not seem to be straightforward. In a Danish study, GPs who were high prescribers of antibiotics performed fewer throat swabs but more urine cultures than average (105), whereas GPs, who order less laboratory tests also prescribed less antibiotics in a Dutch study (81).

Near-patient antigen tests to probe *Streptococcus pyogenes* (*S. pyogenes*, *Group A beta-haemolytic streptococci*) are widely used in the Nordic countries. Compared to throat-swab culture, the specificity has been shown to be excellent (97%) but the sensitivity varying (62-90%) (127-129). These antigen tests are susceptible to the same shortcomings as throat swabs for culture. Symptomless carrier rates are reported to be 10-25% (5).

C-reactive protein (CRP) is an acute phase reactant and the level increases in tissue injury or infection (130). Near patient testing was introduced in general practice to distinguish viral from bacterial infections (131). In patients with RTI, the current Swedish guidelines recommend use in lower RTI and that the level of >50 mg/l may indicate a bacterial infection (87).

Urine tests, i.e. dipstick testing for leucocytes and nitrite, are recommended for patients with suspected UTI throughout the western world (88, 132). The Swedish guidelines furthermore recommend urine culture in all children and men, in women with recurrent lower UTI and in patients with acute pyelonephritis (88).

Patient expectations

Studies of the consultation, that involved both the GP and the patient have prompted important questions. The perception of the patient expectations was frequently overestimated by the GPs (9, 133, 134) and directly influenced both ordering of tests and antibiotic prescribing (68, 107, 135-140). Patients' pressure for antibiotic prescribing were seldom explicit. When GPs prescribed unnecessary antibiotics they often rationalized their decision by

finding symptoms or a diagnosis to justify prescribing (141). In turn, the prior experience of antibiotic prescribing influenced future expectations of the patients (142, 143).

The influence of the perceived expectations of the patients emphasizes the importance of consultation skill (81) because unnecessary antibiotic prescribing could probably be avoided if patients expectations were made explicit. Longer consultation time correlated to lower prescription of antibiotics (144, 145). The satisfaction of the patients was more related to the explanation of the illness than antibiotic prescribing (107, 133, 146). However, several studies confirmed that GPs seldom elicited patient expectations; thus, patients' need will be unanswered and there will be a risk for misunderstanding (147-149).

Only few studies have explored the public understanding of common infections. The sign of purulence increased the expectations of the patients for antibiotic prescribing (120). Moreover, the label of RTI seemed important. In the US and the Netherlands both GPs and the public/patients seemed to comprehend acute bronchitis as a concept where antibiotics were perceived beneficial (118, 150-152), while the terms chest cold were used in the US and flu in the Netherlands, when antibiotics was comprehended not to be needed (151, 152).

Evidence based knowledge and guidelines

Systematic reviews of randomised controlled trials on antibiotic treatment have shown the scarcity of studies from primary care settings and the marginal effects of antibiotic treatment in most conditions. These reviews have several limitations. For example, they usually include few studies and the number of included patients is limited. Moreover, in most studies, small children, immunocompromised patients and those with comorbidity have been excluded.

In common cold, antibiotics caused more harm than benefit (153). In acute maxillary sinusitis, randomised controlled studies showed benefit with antibiotic treatment in patients with objective signs of fluid, not when patients were selected based on clinical signs alone (154, 155). The benefit of antibiotic treatment in acute bronchitis and in acute otitis media in children older than 18 months was minor (156, 157). The suspicion of renal damage that could be caused by lower UTI in healthy women has been erased (158). In

lower UTI, a few placebo-controlled studies indicated that antibiotics had modest effect in relieving symptoms in lower UTI (159, 160).

In streptococcal tonsillitis the earlier feared complications, rheumatic fever and acute glomerulonephritis, have almost disappeared from the western world (161). Four discriminating, clinical criteria (the Centor-criteria) have been evaluated (tonsillar exudates, swollen tender anterior cervical nodes, history of fever, and lack of cough) that are useable both for prediction of aetiology and possible gain of antibiotic treatment (112). When patients met three out of four criteria 40-60% had a throat culture with growth of *S. pyogenes* (162). These patients might gain 1-2 days of fever and sore throat by antibiotic treatment (5, 163, 164).

The Swedish guidelines for acute pharyngotonsillitis and acute otitis media were updated recently (4, 5), whereas guidelines for the remaining RTI diagnoses and for UTI were not (87, 88). The patient with sore throat and without signs of viral infection (coryza and cough) and with at least 2-4 Centor criteria is recommended to be tested for *S. pyogenes* and when detected, the patient should be offered antibiotic treatment (5). The guideline for uncomplicated acute otitis media allows for expectancy for 3 days without antibiotics in children older than 2 years (4).

Surveillance of antibiotic use

Knowledge of current practice is a prerequisite in any quality improvement project, in order to evaluate practice against guidelines and evidence based knowledge (59). Since 1978 the Swedish Diagnosis Prescription Study has produced detailed information of antibiotic treatment for specific diagnoses. Owing to a decreasing participating rate, the study was terminated. The Swedish Strategic Programme for the Rational Use of Antimicrobial Agents and Surveillance of Resistance (STRAMA) is a national network of experts from the medical profession, different authorities and organisations, which was founded in 1994 (99, 165). One important task for STRAMA was to create a valid picture over time of the number of patients that were prescribed antibiotics, which class of antibiotics and for which diagnoses.

A method to follow the prescribing of antibiotics in outpatient care was used in Finland (166, 167). In that project a randomised number of health centres were selected and all visits for infections were registered during one week in November. In Sweden, the STRAMA Study Group on Antibiotic Use, was formed to design a prospective diagnosis-prescription study. The first study was performed in 2000 (168) and the second in 2002.

In conclusion, patients with infectious diseases are common in general practice and the majority consult with minor illnesses. Guidelines and evidence-based knowledge express the norm for management of common infections. However, knowledge of current practice is a prerequisite to evaluate adherence to current guidelines. Hence studies describing management of infectious diseases in general practice were judged important.

Aims

The general aim of this thesis was to describe and analyse rules of thumb of general practitioners in Sweden and their management of respiratory and urinary tract infections.

Specific aims were:

- To investigate whether general practitioners (GPs) recognise the use of rules of thumb and to describe some of their characteristics (I).
- To analyse how GPs express the application of rules of thumb to different situations (II).
- To describe rules of thumb of different GPs for diagnosis and antibiotic treatment of patients with acute sinusitis and for antibiotic treatment of patients with prevailing cough (Additional unpublished data).
- To analyse the use of near-patient rapid tests (Strep A, CRP and urine dipsticks) in RTI and UTI in relation to diagnosis and antibiotic treatment in general practice (III, IV, V).
- To analyse the antibiotic prescription pattern in the management of RTI and UTI in general practice (III, V).
- To evaluate the management of patients allocated a diagnosis of RTI or UTI in relation to current guidelines in general practice (III, IV, V).

Material and methods

This thesis is based on data mainly acquired from
A qualitative study with focus groups (I, II)
Additional unpublished data with structured telephone interviews
A prospective diagnosis-prescription study (III-V)

Table 1. Summary of study characteristics

	Year of data collection	Study population	Data source	Method
Paper I and II	2000	GPs	4 focus groups with 23 GPs	Focus group interviews
Additional unpublished data	2000	GPs	52 individual GPs	Structured telephone interview
Paper III	2000	Patients with upper RTI ^a consulting GPs	2899 consultations	Questionnaire study
Paper IV	2000 and 2002	Patients with RTI ^b consulting GPs	6 778 consultations	Questionnaire study
Paper V	2000 and 2002	Patients with UTI consulting GPs	1564 consultations	Questionnaire study

^a Patients allocated the diagnoses streptococcal tonsillitis, acute pharyngitis, acute otitis media and acute sinusitis

^b Patients allocated RTI diagnoses with the exception of acute or recurrent otitis media, otitis simplex and acute exacerbation of chronic obstructive pulmonary disease (AECOPD).

Paper I and Paper II

At the time of the study about half of the 140 GPs in the county of Dalarna in Sweden participated in seven groups for continuing medical education, and the groups were invited to participate in the study. One of the groups declined to participate and a total of four groups were interviewed. The groups worked in different parts of the county and comprised between 4 to 7 GPs. The participating 23 GPs, 10 females and 13 males, had worked in general practice from 5 to 20 years. The moderator (MA) was acquainted with all the participating GPs.

In the interviews the moderator introduced the subject and presented the concept “rule of thumb”, defined as an action-oriented mental pattern, used during the consultation irrespective of whether the background for the rule was understood. Moreover, a rule of thumb should not be based on prior knowledge of the patient. She also gave two examples of her own: “When a patient can bear weight on a leg it isn’t broken” and “When a rapid streptococcal test is positive, prescribe pc V.” A guide for the interview had been created beforehand and contained the questions: Do you recognise the use of rules of thumb? Are you able to give some examples? What are the benefits and danger of using rules of thumb? Where do they come from? In the discussion, which lasted for 60 to 90 minutes, the moderator followed the guide, confirmed statements and asked for clarifications.

The interviews were audiotaped, transcribed verbatim (two transcribed by MA and two by a secretary) and read several times by two of the authors. The templates from the interview guide were used for initial coding (169). The ‘rules of thumb’ were identified as normative statements (170). The statements were shortened, rephrased, put in an ordinary Word-file and ordered manually.

The different examples of rules were classified using an editing (inductive) analysis procedure (169). The coding procedure was carried out stepwise in an iterative process, going back and forth between the interviews and the resulting categorization. Although only statements about somatic problems were initially classified as rules of thumb, rules for psychosocial problems were soon identified. Different forms of coding were applied to the material before the final categorization into somatic or psychosocial issues as well as when they were used in the consultation (diagnosis, investigation, management and treatment). At this point special rules used early in the consultation were identified, which seemed to be used for a rapid assessment. The categorization was discussed among the authors until

agreement was reached. Recruitment of new groups was stopped when examples of rules of thumb were repeated and few new items were found, which was considered as the time for saturation. To further validate the result, the study was discussed at seminars with the interviewed GPs.

Additional unpublished data

The study was set up as a part of a quality improvement project in collaboration with the pharmacies in the county Dalarna, especially to address unnecessary prescribing of tetracyclines and quinolones. The aim was to explore the variation in practice between different GPs by describing and analysing rules of thumb and signs and symptoms for diagnosis in some selected conditions. In the diagnosis-prescription study in Dalarna in 2000 tetracyclines were prescribed to 8% of the patients allocated a diagnosis of RTI but to 25% of the patients allocated a lower RTI diagnosis and to 29% of patients allocated an acute sinusitis diagnosis. Thus the diagnoses acute sinusitis and prevailing cough were chosen for investigation.

GPs were chosen with respect to their prescribed antibiotics, having either a low or high share of tetracyclines or quinolones to achieve a sample of GPs with different habits. A pharmacist identified half of the 135 GPs in different parts of the county in 2000 (58 GPs). The GPs were asked by a letter to participate in a telephone interview about their decision-making in patients with some common infections. Six GPs declined to participate; hence 52 GPs from different parts of the county, 30 men and 22 women, were interviewed.

The structured interviews, which lasted for 10-15 minutes, were conducted by the author and consisted of predesigned questions with no preset alternatives. Notations were made in a coding scheme and unexpected factors were written down as well. The rules of thumb were noted word for word. The interviewer did not evaluate the answers and no follow-up questions were asked. The questions used were: Do you have any rule of thumb to diagnose acute sinusitis? Which symptoms and signs do you think are most important to diagnose acute sinusitis? Do you have any rule of thumb for antibiotic treatment for acute sinusitis/ for a healthy adult with a cough lasting 3 weeks but no fever? Besides their rules of thumb the GPs were asked to rank the three most important signs and symptoms for the diagnosis of acute sinusitis.

Papers III-V

A prospective diagnosis-prescription study was conducted simultaneously in five Swedish counties during one week in November 2000 and was repeated in November 2002. The participating counties (1,290,000 inhabitants) were selected with the purpose of achieving both a geographical spread and to incorporate low-, medium and high-prescribing counties according to data from 1999 from Apoteket AB (National Corporation of Swedish Pharmacies). Participating counties were Uppsala, Östergötland, Kronoberg, Dalarna and Jämtland (168). Both public and private surgeries, when available, were included. In 2000 and 2002 a total of 155 and 140 primary care centres, respectively, with approximately 600 physicians participated. In 2000 hospital departments and specialised surgeries (ear, nose and throat [E.N.T.], infectious diseases and paediatrics) participated as well.

The questionnaire form was a modified version of one previously used in Finland (166, 167). The final version was piloted in a small group of GPs and found acceptable. The physicians were asked to complete a form for all patients that they thought consulted for an infectious disease (Table 2). Thus prescriptions issued without patient consultations and to the elderly in nursing homes were excluded. The forms were to be completed irrespective of whether the patient was prescribed an antibiotic or not. Only one diagnosis per form was to be given and only antibiotics for oral systemic use were included. The choice of antibiotic and duration of treatment were written in full text. Dosage was not included. Detailed information for the doctor was printed on the reverse side of each form.

Table 2. Main topics included in the questionnaire

-
1. Sex and year of birth
 2. Visit: New i.e. "first" visit or return visit. If return visit; if the patient was already on antibiotic treatment or not
 3. Time of visit: Office hours or out-of- hours
 4. Duration of symptoms, in days
 5. Main diagnosis
 6. Diagnostics used
 7. Treatment with antibiotics (yes/no), referral or both
 8. Antibiotic class and treatment length
 9. Factors influencing the choice of treatment
-

Each participating doctor collected the completed forms anonymously in envelopes. In 2000, the category of physician and name of the county were recorded and in 2002, also the name of the health centre. The overall data from the study in 2000 were published in 2002 (168). Of all consultations

92% were in general practice. Therefore, when the study was repeated in 2002, only GPs were invited to participate. To simplify the registration in 2002 factors influencing the choice of treatment were omitted.

In the areas studied, the most widely used near-patient antigen test to probe *S. pyogenes* was Strep A[®], all of which will be called Strep A in this thesis. Tests showing *S. pyogenes* will be called positive tests.

Paper III

This study concerned only the patients registered in 2000 that consulted primary care and were allocated a diagnosis of streptococcal tonsillitis, acute pharyngitis/viral tonsillitis, unspecified upper respiratory infection/common cold, acute otitis media or acute sinusitis. In the analysis the diagnoses acute pharyngitis and common cold were chosen where alternatives were given. In addition, information of age, gender, time of visit (office time or out-of-hours), duration of symptoms, diagnosis, diagnostic tests used, any treatment with antibiotics, antibiotic class prescribed and length of treatment was used. Furthermore, information on whether the choice of treatment was influenced by the request of the patients and whether the patient was referred to hospital was used. Patients registered as recurrent streptococcal tonsillitis (n=36), recurrent acute otitis media within a month (n=44) or otitis simplex (n=347) were not included.

Paper IV

In this study patients allocated a diagnosis of RTI (acute otitis media, recurrent otitis media, otitis simplex and acute exacerbation of chronic obstructive pulmonary disease (AECOPD) excluded) and consulting in 2000 and 2002 were analysed. Patients registered as recurrent streptococcal tonsillitis were included in the diagnosis streptococcal tonsillitis. The lower RTI diagnoses unspecified RTI and infectious cough were combined with the diagnosis influenza and termed unspecified RTI. Information on age, gender, "first" visit or a return visit, duration of symptoms, diagnostics used (CRP, Strep A test, x-ray) and treatment with antibiotics for systemic use was used. The value of CRP were recorded in intervals; <10mg/L, 10-24mg/L, 25-49 mg/L, 50-99 mg/L and ≥100 mg/L.

Paper V

In this study patients allocated a diagnosis of UTI registered in 2000 and 2002 were analysed. The preset alternative diagnoses were lower UTI/acute

cystitis, which in this paper were termed lower UTI, recurrent UTI (≥ 2 episodes during 6 months or ≥ 3 episodes of uncomplicated UTI during the last year), upper UTI/pyelonephritis, which were termed upper UTI, and urethritis. In addition, information of age, gender, duration of symptoms, use of diagnostic tests, referrals, and in cases when an antibiotic for systematic use was prescribed, the type of antibiotic and length of treatment was used.

Statistics

The envelopes were sent to Department of Public Health Sciences, Karolinska Institutet where the data were entered and analysed using SPSS version 10.0 in 2000 and SPSS version 11.0 in 2002 (SPSS Inc., IL. USA). A descriptive analysis was performed for the individual diagnosis separately and for the overall material. Chi-square test or Fishers exact test when appropriate, was used to assess the significance of differences between two numerical groups (III-V). One-way analysis of variance (ANOVA) was used for statistical comparison of antibiotic prescribing in patients allocated diagnoses of presumed viral origin in relation to duration of symptoms and for comparison of antibiotic prescribing in patients allocated a diagnosis of lower RTI of presumed viral origin in relation to CRP value and duration of symptoms (IV).

Ethics

The Gävle-Dala research ethical council approved the focus group studies and the telephone interview study. The diagnosis-prescription studies were not sent for approval to an ethical committee, since they were judged to be a quality improvement project. The director and management boards for every health centre in the invited counties were asked for participation. All patient data as well as the participating GPs were anonymous.

Results

Description of rules of thumb (Paper I)

In every focus group the GPs recognised using rules of thumb and each group gave 30-40 examples of rules. The GPs explained that a rule of thumb immediately came to mind and helped simplify and structure their work. Often a rule was an expression of probability. The GPs were astonished at having so many rules of thumb.

Two major groups of rules were identified: rules for somatic and psychosocial problems (Table 3). Rules for somatic problems were stated very simply, were content specific and were expressed as axioms without any explanation (Table 3:1-10). They were described as being invariable step-by-step processes. Mostly, others in the focus groups did not object to these statements, even when different doctors postulated different rules for the same problem.

There were also rules to guide the doctors' communication for psychosocial matters (Table 3:11-15). Only a few of the rules were content specific. The rules were all accompanied by explanations, and were discussed by the colleagues in the group. A few examples were also given about when not to use a rule of the thumb (Table 3:16-18). Overall, the rules were not affected by the sparse objections given.

When the GPs discussed where they had obtained their rules they mentioned a variety of sources. Personal experience was thought to be required to use rules. When a source of a rule was mentioned at the same time as the rule, it almost always was a named colleague passing on the rule by word-of-mouth.

Table 3. Examples of rules of thumb

<i>Rules for somatic problems</i>	
1	Chest pain described somehow as a stab or knife in the heart – then in any case it's not the heart.
2	Before when someone in their forties came and said 'I have such pain in my chest,' it wasn't automatically the heart. Rather I began to ask about other things, too. But I've learned while practicing in the countryside that if a forty-year-old comes in and says 'I have pain in my chest,' then it's a heart attack. The first days I had to rethink my rules.
3	CRP less than 10 – then it is a virus.
4	Sore throat, difficulties in opening the mouth, and high temperature, that's peritonsillitis of course.
5	For a woman who feels a lump in her breast you say she should come in at once and we'll make a referral for mammography.
6	Able to lay down and sleep at night, no heart failure.
7	Whether they are stiff-neck or not, but are able to raise their leg and then jump up and down a while... then it's sure as heck not meningitis.
8	Those prevailing infectious complaints, coughing and stopped up nose for 1-2 months, I guess you are inclined to prescribe a broader kind. A tetracycline or something like that.
9	With dysuri and positive leukocyte test you've almost already written the prescription in your head before you've met the patient.
10	Pneumonia – penicillin V. Penicillin V not any good – tetracyclines.
<i>Rules for psychosocial problems</i>	
11	If I think it's psychosomatic I begin to try to tie down the idea right away. I won't start with a physical examination before talking about the possibility that it could be something emotional. Because otherwise patients have often painted themselves into a corner, don't you think?
12	If a patient confides very delicate matters in I see about arranging another consultation soon, since the patient sometimes feels remorse afterwards.
13	Yes, it's about anxiety too. I've got a rule that... if the patient doesn't express concern that it's cancer, I'll ask if they are worried about cancer.
14	I have another rule of thumb that I always or almost always ask what the patient herself thinks it's about. Before I've finished. And sometimes quite near the beginning.
15	I try to be at good terms with the patient when we separate.
<i>Rules for when not to use a rule</i>	
16	I think of our groups of immigrants. There are no rules of thumb for them. The communication is different and not what you expect.
17	When someone came in for something and maybe I didn't find anything and they return, then you should be particularly alert.
18	When I feel confused... when there is a discrepancy... then it's, now I've to consider or listen one more time... that could be a rule of thumb.

Description of the use of rules of thumb (Paper II)

A specific set of rules was identified as used for a rapid assessment of the consultation, which implied a rough sorting into one of three situations: emergency, somatic or psychosocial (Table 4). This first classification determined the further route of the consultation as the GPs adjusted their work to the setting. The rapid assessment was described as a process with time constraint in contrast to the following process of the consultation, where rules of thumb were used in an iterative way irrespective of time. The remaining rules of thumb covered the different steps in consultation: investigation, diagnosis and treatment. Most diagnostic rules for somatic problems were formulated as necessary criteria to be fulfilled or not, rendering answers yes or no. In this way the problem was dichotomised.

The GPs gave examples of how they alternated between rules for somatic and psychosocial problems (Table 5), thus they alternated between a generalizing, biomedical approach and an individualizing, patient-centred approach (Figure 1). The assessment of risk influenced the relative preference given to the generalizing and the individualizing process. When the GP considered the risk of a serious somatic disease to be high, the GP tended less to individualize the consultation. The GPs discussed the rules learned as a trainee in hospital, whereby they recognized the difficulties owing to difference in prevalence of diseases.

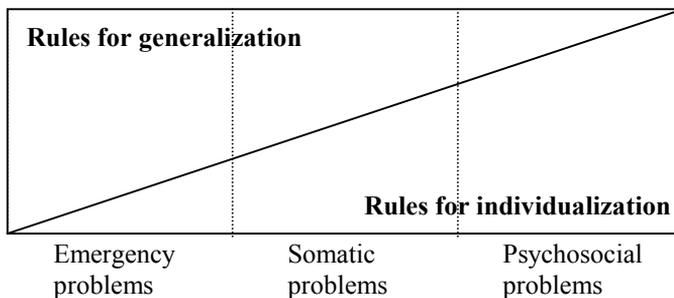


Figure 1. Use of rules of thumb in the consultation according to the identified situation.

Table 4. Examples of rules of thumb for rapid assessment

<i>Rapid assessment - Identify emergency problems</i>	
1	Very early in the consultation you form an opinion of the seriousness, unconsciously, very soon during the consultation you assess whether the patient is sick or not sick.
2	Chest pain is for me...very little that I go in and differentiate... for me a chest pain in someone whom I've never seen before becomes...a quick thought toward the hospital.
3	Pains in the chest described as a prick, cut or that a knife is stabbed in the chest – that's definitely not the heart anyway.
4	I think, small children...there you've got rules... if they seem really tired out then I become particularly wary...In those cases I have different rules than for adults.
<i>Rapid assessment - Identify psychosocial problems</i>	
5	If the patient made an appointment for pain in the neck, pain in the shoulders and then is totally unaffected ...then I think ...Is this something with stress or a depression? ...What's behind this?
6	Similarly, it crosses my thoughts—lumbago, a man with lumbago, alcohol? Then everything goes through your mind, subconsciously or unconsciously.

Table 5. Examples of rules of thumb for simultaneous individualizing and generalizing the consultation

<i>Rules to secure psychosocial problems in the consultation with somatic focus</i>	
1	It's automatic, isn't it? You ask the patient—What are you anxious about?
2	Yes, it's about anxiety too. I've got a rule that... if the patient doesn't express concern that it's cancer, I'll ask if they are worried about cancer.
3	I think I almost have a rule of thumb. When people come in about headaches, I always asked near the end 'Are you worried about a brain tumour?' And then all of them say 'yes' for the most part.
4	I ask all the younger people who come in with heart problems 'Has anything happened to your family?' And it's not at all uncommon that there's someone who has had a heart attack or died suddenly or something.
<i>Rule to secure somatic problems in consultations with psychosocial focus</i>	
5	There is an interaction between the body and the soul...so that one must follow two paths at the same time. That's a rule of thumb, you could say. So that even if I feel pretty certain that it's psychosomatic, I nevertheless continue on a little bit and work with a somatic investigation.

Symptoms, signs and rules of thumb in acute maxillary sinusitis and prevailing cough (Additional unpublished data)

When the 52 GPs were asked for symptoms or signs used to diagnose acute sinusitis, all GPs mentioned a combination of factors. The most common factors stated were purulent drainage as a sign, fever, coloured nasal discharge and unilateral maxillary pain as symptoms (Table 6). Purulent drainage as a sign, protracted symptoms and fever were ranked most important (Figure 2). The combinations of the stated signs and symptoms varied between the interviewed GPs (Figure 2). When the GPs were asked for their rule of thumb for the diagnosis, all except one GP, admitted that they had a rule. For most GPs the rule consisted of the earlier mentioned complex of symptoms and signs, but three GPs mentioned that they used the result of x-ray, or ultrasonography and two the fact that the patients had not improved with decongestions.

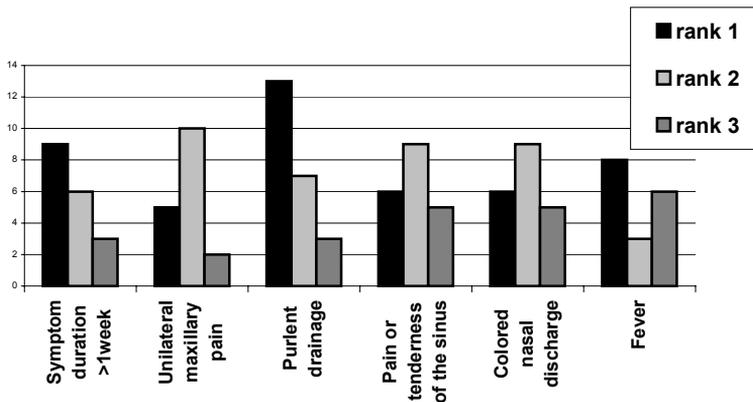
When asked for a rule of thumb for antibiotic treatment of a patient with acute sinusitis two-thirds of the interviewed GPs referred to the earlier ranked symptoms but quite a few (n=11) postulated, that a rule of thumb was the fact that the patients had used decongestions without improvement or that the symptoms had prevailed for long time. Some of the interviewed GPs (n=4) stated that the fact that the patient had earlier had acute sinusitis was their rule, and others (n=4) the fulfilment of the patient's desire for antibiotics as their rule of thumb for prescribing. No GP questioned antibiotic prescribing.

When the GPs were asked for their rule of thumb used when to decide whether to give antibiotics to 'an healthy adult patient with three weeks' cough but no fever' many (n=16) expressed that the rule was never to give antibiotic treatment. However, quite a few GPs said they used raised CRP (n=16) or erythrocyte sedimentation rate (n=6) as a rule of thumb to prescribe antibiotics. The suspicion of atypical pneumonia as well as abnormal pulmonary auscultation was mentioned by some of the GPs (n=9) as well as long-standing symptoms (n=7). Two of the GPs said that they used their compassion for the patient as a rule to prescribe antibiotics. All rules of thumb were stated as rapid answers without signs of deliberate thinking.

Table 6. Percentage of symptoms and signs given by 52 GPs to diagnose acute maxillary sinusitis.

<i>Symptom or sign</i>	<i>%</i>
Purulent drainage ^a	48
Coloured nasal discharge ^a	44
Pain or tenderness of sinus ^a	40
Fever	40
Symptom duration >1 week ^a	37
Unilateral maxillary pain ^a	35
Pain in the teeth ^a	19
Raised CRP test	15
Pain at bending forward	15
Impaired general condition	13
Cacosmia ^a	10
Headache	6
Hyposmia ^a	4
Oedema in concha media	4
Oedema over maxillary sinus	2

^a Symptoms and signs according to Swedish guidelines 1994.

**Figure 2.** Ranking of symptoms and signs in acute maxillary sinusitis by 52 GPs

Management of RTI and UTI (Paper III-V)

Diagnoses and antibiotic prescribing

The proportion of patients allocated to the diagnoses RTI and UTI was stable for both study periods (Table 7). However, there was a significant decrease in the proportion of patients allocated the diagnoses streptococcal tonsillitis and unspecified RTI and significant increase in the proportion of patients allocated the diagnoses common cold and acute sinusitis between the years studied ($p < 0.0001$) (Table 8). Phenoxymethylpenicillin (pcV) was the preferred antibiotic in 63% of the patients allocated an RTI diagnosis during both studied periods.

Table 7. Number of consultations in general practice and distributions of infectious diseases in 2000 and 2002 in percentage^a.

Year	2000		2002	
	Number	%	Number	%
RTI	4383	(71.1)	3795	(71.0)
UTI	869	(14.1)	698	(13.1)
Skin and soft tissue infections	607	(9.8)	525	(9.8)
Others	312	(5.1)	325	(6.1)
Total*	6171	(100.0)	5344	(100.0)

^aMissing diagnosis 2000 n=36, 2002 n=51

In Paper III a total of 2899 patients were allocated the diagnoses of streptococcal tonsillitis, acute pharyngitis, common cold, acute otitis media or acute sinusitis, in 2000. During out-of-hours sessions, the proportion of children younger than five years was higher ($p < 0.0001$) and patients were more often allocated the diagnosis streptococcal tonsillitis and acute otitis media compared to visits during office time ($p < 0.0001$). Approximately half of the patients (56%) were prescribed an antibiotic, during out-of-hours 69% and during office time 53% ($p < 0.0001$). Almost all patients who were allocated the diagnoses streptococcal tonsillitis, acute otitis media or acute sinusitis were prescribed antibiotics in contrast to patients with common cold or acute pharyngitis, where antibiotics were prescribed only to a low extent (Table 8) (III).

Table 8. Number and percentage of consultations allocated RTI diagnoses in 2000 and 2002, percentage of antibiotic treatment and of CRP tests, number of performed Strep A tests and percentage of positive Strep A tests.

Diagnose	Consultations		Laboratory tests				Antibiotic treatment ^e	
	n (% of total)		CRP %		Strep A n (% positive)		%	
Year	2000	2002	2000	2002	2000	2002	2000	2002
Common cold	1023 (23)	1263 (33)	48	49	325 (2)	327 (1)	8	9
Acute otitis media ^a	536 (12)	476 (13)	6	9	30 (11)	27 (4)	95	93
Otitis simplex	126 (3)	115 (3)	13	8	3 (0)	6 (7)	8	9
Acute sinusitis	347 (8)	463 (12)	21	18	16 (0)	28 (0)	97	94
Streptococcal tonsillitis ^b	740 (17)	501 (13)	17	22	509 (88)	339 (81)	99	99
Acute pharyngitis	333 (8)	224 (6)	35	35	280 (1)	177 (1)	11	14
Acute pneumonia ^c	351 (8)	186 (5)	68	64	23 (6)	13 (15)	97	100
Acute bronchitis	384 (9)	272 (7)	57	63	39 (3)	27 (4)	53	48
Unspecified RTI ^d	470 (11)	222 (6)	61	57	98 (1)	19 (0)	36	44
AECOPD	73 (2)	73 (2)	45	40	5 (0)	2 (0)	88	82
Total	4383 (100)	3795 (100)	37	37	1328 (35)	965 (29)	57	53

^a The diagnosis acute otitis media included recurrent otitis media, ^b streptococcal tonsillitis included recurrent streptococcal tonsillitis, ^c acute pneumonia included atypical pneumonia, ^d unspecified RTI included infectious cough and influenza, ^e antibiotic treatment included patients referred and delayed prescription. Missing data for antibiotic treatment in 2000 n= 23.

In Paper IV, in 2000 and 2002, there were 6778 consultations (42% men) allocated the diagnoses of respiratory tract infection (acute otitis media, recurrent otitis media, otitis simplex and AECOPD excluded) during the two weeks studied and 48% got an antibiotic prescription (IV) (Table 8). In patients ≥ 15 years allocated a lower RTI diagnosis of presumed viral origin (unspecified RTI or acute bronchitis) 36% consulted after more than 14 days of symptoms. In these patients CRP was performed in 63% and antibiotics were prescribed in 52%, of which 29% was pcV and 50% a tetracycline.

In Paper V, during the weeks studied, in 2000 and 2002, a total of 1564 consultations were categorized as UTIs (Table 9). The distribution of sex, age and diagnoses differed only to a minor degree between the years studied. Of patients with lower UTI, 58% consulted within 3 days and 84% within 1 week. It was more common that patients with recurrent UTIs and urethritis had their symptoms for more than two weeks (V).

Table 9. Number of consultations allocated UTI diagnoses, visits out of hours, diagnostic tests and antibiotic treatment in percent ^a.

	Lower UTI		Recurrent UTI		Upper UTI		Urethritis		Total
	♀ n=1012 %	♂ n=130 %	♀ n=187 %	♂ n=32 %	♀ n=67 %	♂ n=31 %	♀ n=51 %	♂ n=33 %	n=1564 %
Visit out of hours	19	20	16	7	22	33	15	14	19
Any diagnostic test	98	98	97	100	99	100	96	91	98
Nitrite test	76	84	90	91	79	84	84	70	87
Leukocyte esterase test	88	81	83	78	85	74	86	64	85
Urinary sediment	9	16	9	6	4	3	14	18	9
Culture	16	34	26	41	33	29	25	21	22
CRP	10	18	11	25	70	74	12	24	15
Antibiotic treatment	96	92	94	88	97	97	29	59	92

^a Information of gender was missing in 21 cases

♀ used for females, ♂ for males

For women who were allocated the diagnoses lower or recurrent UTI, the most commonly prescribed antibiotic was trimethoprim, followed by pivmecillinam and a quinolone (V). The use of nitrofurantoin increased signifi-

cantly between 2000 and 2002 from 3% to 6% in women with lower UTIs and from 3% to 13% in women with recurrent UTIs. The use of quinolones decreased significantly from 21% to 13% in the treatment of lower UTIs, but there was no significant change in women with the diagnosis recurrent UTI. The majority of the patients with UTI were prescribed treatment for 7-10 days, of which 65% were prescribed an antibiotic for 7 days. Treatment for 3 days increased significantly for trimethoprim from 1% to 12% between the years and in total 3-days treatment increased from 2 % to 6% in women allocated the diagnoses lower or recurrent UTI (V).

Use of near-patient diagnostic tests and antibiotic prescribing

Overall, a diagnostic test was performed in 61% of the consultations in 2000; and in 57% in 2002.

During the weeks studied in 2000 and 2002, 41% and 46%, respectively, of the Strep A tests (near-patient antigen tests) were performed in patients with diagnoses other than streptococcal tonsillitis or acute pharyngitis. Of the patients with negative Strep A, overall 25% and 29%, respectively, were prescribed antibiotic treatment. There was a significant decrease in the use of Strep A overall in patients allocated an RTI diagnosis ($p<0.0001$) as well as in patients allocated the diagnoses common cold ($p<0.0001$) between the periods studied. The proportion of positive Strep A tests decreased as well ($p=0.002$).

In Paper III, in 2000, a Strep A test was performed in 74% of the patients finally diagnosed as having acute pharyngitis or streptococcal tonsillitis (Table 8). When Strep A tests were performed, 66% of the patients with acute pharyngitis or streptococcal tonsillitis got an antibiotic prescription compared to 83% when no test was performed ($p<0.0001$). If the test was positive almost all patients received an antibiotic prescription (III).

In Paper IV, a CRP test was performed in 42% of patients with RTI and more often in patients allocated the diagnosis pneumonia, atypical pneumonia, unspecified RTI and acute bronchitis (Table 8). CRP was significantly more often performed in older patients, patients with longer duration of symptoms and in patients making revisits (IV). The majority of CRP tests (69%) were performed in patients allocated an upper RTI diagnosis. Overall, the value of CRP decreased with increasing duration of symptoms (IV).

In total, 41% of the patients allocated an RTI diagnosis received treatment with antibiotics when CRP was performed compared to 44% when no CRP was performed ($p < 0.01$) (IV). For patients allocated an RTI diagnosis of presumed viral origin (acute pharyngitis, common cold, unspecified RTI, acute bronchitis), there was a significant increase in antibiotic treatment, when symptoms prevailed more than 2 weeks. In these patients there was a significant decrease in antibiotic prescribing when CRP was performed (IV).

In Paper V, almost all patients (98%) allocated a UTI diagnosis were examined with an urine test (Table 9). The use of diagnostic tests in UTI, were equally frequent irrespective of age and gender. Urine cultures were performed only in 34% of men allocated a lower UTI diagnosis, in 26% of the women and in 41% of the men allocated the diagnosis recurrent UTI and in approximately 30% of patients allocated the diagnosis upper UTIs. Most patients received an antibiotic treatment even though all tests were negative (V).

General discussion

General practitioners (GPs) were able to verbalize their rules of thumb, which were recognised as an immediate and semiconscious kind of knowledge that could be called tacit knowledge. The rules seemed unaffected by the sparse objections given (I). A specific set of rules of thumb seemed to be used for rapid assessment, when emergency and psychosocial problems were identified. In the further consultation the rules of thumb seemed to be used by the GPs in a simultaneous individualizing and generalizing process (II). There was considerable variation between the rules of thumb of different GPs for patients with acute sinusitis and prevailing cough (Additional unpublished data). A high number of Strep A and CRP tests were performed in patients with RTI, where testing was not recommended (III, IV). In general, the GPs participating in the studies seemed to adhere to current guidelines regarding class of antibiotic prescribed (III, IV, V).

Methodological considerations

Papers I-II

Scientific rigour in qualitative studies can be judged by the criteria credibility, dependability (171), objectivity and generalizability (171, 172). Credibility corresponds to internal validity and answers the question: How truthful are the results? When discussing credibility attention is paid to data collection during the group interviews and data analysis. To study the problem-solving of GPs is difficult. Simple introspection has proved to be unreliable because people were unable to distinguish between inferences and assertions, that is they theorized their mental processes and did not critically evaluate their knowledge (173). Videorecording of the consultations as stimulus for audiotaped interviews with the GPs is considered to be most reliable but also most expensive method (174). The consultation is an interactive process between the GP and the patient; however our studies only considered the view of the GP. Interviews of individual GPs would probably have yielded different results (175). However, focus group interviews render

not only much data in limited time, but also makes use of the interaction between participants. Thus over-idealised statements get challenged and statements are more accurate account on what people do (176).

Qualitative research often aspires for diversity in a given population. In these studies homogenous collegial groups of GPs participated (177). There is probably a selection of the GPs who attend groups for continuing medical education. If the purpose is to explore the 'assumptions taken for granted' a group of strangers will provide more productive group dynamic. On the other hand, persons who perceive each others as similar spend less time explaining themselves to each other and more time discussing the issue at hand (178). The moderator was acquainted with the interviewed GPs and the persona of the moderator might have influenced the interviews. Still, prior knowledge is crucial to understand the conversation (175). Also the initial examples of the moderator, which concerned somatic problems, might have influenced the result. Although not recommended, the moderator conducted the focus groups alone, and it was occasionally difficult to pay attention to the quieter members of the group (179).

The extent of a qualitative study is also of relevance for the creditability of the results. The study was set up to describe rules of thumb of the GPs and not primarily their application; consequently recruitment of new focus groups was stopped when the material seemed saturated in terms of examples of rules of thumb and not their application (177). No effort was made to cover the whole range of work in the consultation; thus the description applied only to fragments of GPs work. Only four interview sessions were done which are fewer than recommended (177). However, the study was an attempt to explore an earlier not researched domain and the rules of thumb gathered must be looked upon as examples.

Dependability described the ability to change according to the emerging results. "Rule of thumb" was not a defined entity of knowledge, and during the focus group interviews, no clear distinction was made between habit and rule although consideration was given to sort out statements with normative functions (170). The rules of thumb were identified independently by two of the authors. As Barbour points out, most important in multiple coding is not the degree of concordance, but the insights provided for refining the codes (180). Although respondent validation has been questioned, the recognition of rules of thumb during subsequent seminars, confirmed rules of thumb as expressions of knowledge of the GPs (172, 180).

Additional unpublished data

The GPs participating in the telephone interviews were not given any definition in connection with the interview. Nevertheless, it seemed that the concept 'rule of thumb' was easy to interpret because all the interviewed GPs gave examples without hesitation and none asked for clarifications. However, expert knowledge is known to be extremely context specific, and it is quite a different process to recall signs and symptoms as well as a rule of thumb in an interview compared to the recognition triggered by a patient consultation (181). A limitation with the structured interviews is the liability of the respondents to give a socially desirable response, which may explain why only few GPs stated non-medical issues in their rules of thumb (182).

Qualitative studies cannot be generalized as quantitative studies. Our results, both from the focus group studies and the telephone interviews, are context bound to Sweden today. Most interviewed GPs were educated in the 70s and 80s when lessons in patient-centred consultation were not given. This calls for caution in terms of generalizability (171, 172).

Papers III-V

The number of registrations in 2002 was lower than in 2000. In 2002 10% fewer health centres participated and in one county surgeries were minimised on account of educational activities. In 2000 the total of antibiotic prescriptions captured in the study was calculated to constitute approximately 60% of the antibiotic prescriptions prescribed by the participating physicians (168). In 2002 the number of prescriptions registered accounted for 71% of the antibiotic prescriptions issued from the participating GPs (183).

Only prescriptions issued in direct connection with the consultations were to be recorded. Hence prescriptions issued on telephone or after indirect contact with a patient as well as to the elderly in nursing homes were not registered. Antibiotic prescriptions to patients in nursing home amounted to approximately 6% of the total antibiotic prescribing to outpatients in Sweden the years studied (183). In a Norwegian study one-fourth of the antibiotic prescriptions resulted from an indirect contact (184), however no current data from Sweden have been found. In the few similar studies data on actual cover rate were not given (167, 185).

Only patients that the GP perceived had an infectious problem were to be included. This could explain the higher share of antibiotic prescribing in women with diagnoses UTI, when compared to studies of women with

urinary complaints (186-189). When the results for RTI were compared to data from electronic patient records from 11 health care centres during one year in Sweden the results were similar both in level of antibiotic prescribing and use of laboratory tests (190).

Hence, the conclusion was that registered data could be regarded as a relatively good estimate of antibiotic prescribing in general practice in the participating counties during the weeks studied.

The questionnaires contained only few criteria for the diagnoses and no other validation was made of the allocated diagnoses. Active data collection itself may influence the behaviour of the GP but cannot be avoided in these kinds of studies. A further concern is that the studies lasted only one week, consequently, caution is needed when interpreting the results. To confirm a trend, repeated measurements must take place. Moreover, when comparing data between different countries, differences in health care system must be taken in account. Compared to most countries, patients in Sweden consult relatively seldom, which influences the prevalence of illnesses encountered (64).

Rules of thumb - a link between theoretical knowledge and practical experience

The interviewed GPs recognised the use of rules of thumb and gave many examples (I). The rules appeared to be a type of immediate knowledge, which was not really conscious and might be called tacit knowledge. The rules were characterized as rapidly uttered statements without signs of deliberate thinking. However, since the studies were set up without any clear-cut definition of the concept, the identified rules were not in exact accordance with earlier research. The rules identified had many of the characteristics described for fast and frugal heuristics. Many were content specific and restricted the problem space, and when used the decision would be stepwise (21). The content-specific diagnostic rules for somatic conditions corresponded to the concept illness script and certainly some resembled verbalized pattern descriptions (45). Rules for management rather corresponded to production rules (20). Moreover, rules for not using rules resembled the competing maxims described by Hunter (55).

However, according to Hamm et al it does not matter what the statements are called, as long as we mean a statement that might describe and control how the physician makes the decision (60). The important point is that a physician who follows a script or rule recognises the clinical situation and consid-

ers the response for that type of situation stored in memory (60). Hence rules of thumb could be considered to be a link between theoretical knowledge and practical experience, where the verbalized rules work as markers for complex mental representations (191). Consequently, use of rules of thumb is not cookbook medicine. The GPs also postulated that experience was a prerequisite to use a rule (I). However, to what extent the identified rules of thumb correspond to behaviour is still an unanswered question.

Rules of thumb in the consultation

The description of the use of rules of thumb revealed some possible characteristics of the consultation (II). However, caution is demanded, because many situations were not mentioned. The rapid assessment identified emergency and psychosocial problems. Retrieval of plausible information is faster than retrieval of the exact so when the situation demands rapid action, tacit knowledge is the only possible solution (20, 50). Although this first assessment of the present situation seems like common sense, it is not the usual way to describe the problem-solving process in general practice (75, 192). However, when GPs described their clinical method based on their own experience, the descriptions were similar (2, 3).

The use of rules of thumb described the management of the consultation stepwise (II). Thus the problem space was narrowed and mental strain reduced, and the decision was made stepwise. This contrasts to the classical description of problem solving in consultation (the hypothetico-deductive method), which assumes a scientific method (18). The rapid assessment of emergency and psychosocial problems as well as separate rules for somatic and psychosocial problems could be part of the tailored scheme and expertise knowledge used by the experienced GP (45, 193). In contrast to a deductive strategy, where the singular event is predicted from general laws, most rules expressed an inductive reasoning from singular events, in accordance with earlier studies (42, 43, 45). With the use of rules of thumb for diagnosis of somatic disorders, the problem was dichotomized and the GP therefore avoided statistical reasoning (I, II). This is the problem solving of the experienced expert, also described as intuitive and confident, not available for critical analytic thinking (46, 181, 194).

The initial rapid assessment seems to be crucial, because this seemed to determine the extent of individualizing of the consultation (II). It may be one factor in explaining the different working styles of doctors and may correspond to the classical description of doctor-centered or patient-centered con-

sultations (72, 195). There seemed to be a tacit understanding that somatic problems were the expected, normal state. This may explain why GPs often did not elicit patients' unvoiced worries (147, 196). No rules of thumb were given for treatment of acute sinusitis and prevailing cough aimed to patient-centre the consultation or elicit the concerns of the patient (Additional unpublished data). Different patient problems require different working style of the GP (80). However, several studies indicate that GPs tend to keep their own pattern of work independently of the situation (72, 195). In some of the examples of rules of thumb the context of the patient was taken in account (Table 5:4). However, only one GP, who had moved to another setting, mentioned the influence of the cultural context (Table 3:2).

The GPs described how they neither abandoned the somatic nor the psychosocial focus (II). Thus, they expressed how they practiced medicine both as a science of diseases and a practice involving persons with illnesses. The rules of thumb could therefore be seen as a link between the biomedical and the humanistic perspective in clinical practice (197). The evidence-based medicine presupposed an interpretive paradigm within which the patient experience of illness and the clinician-patient encounter were enacted (198, 199), described as a social construction, where both the patient and the GP were interactional partners (200). Hence a hermeneutic understanding is needed together with the evidence-based knowledge. As Greenlough pointed out, in reality, both clinicians and patients readily transfer between different paradigms when addressing a single clinical problem (201). The rules of thumb seemed to give empirical evidence to these conditions.

Benefits and risks with the use of rules of thumb

The GPs acknowledged the benefit of rules of thumb because they helped to simplify and structure the work (I). The rules seemed to lessen mental strain and helped the GP to manage uncertainty. One consequence is that more mental energy will be left for the emotional and social communication with the patient. This is not only profitable for the patients but probably also crucial for the GPs, to endure and be happy with their work. The use of rules of thumb thus should probably be cherished.

However, not all rules seemed adequate. The analysis of rules of thumb for antibiotic treatment of acute sinusitis revealed not only rules clearly in line with guidelines and evidence-based knowledge, but also other rules that did not seem appropriate (Additional unpublished data). The use of decongestant offered may give an opportunity to gain time, which is important in primary

care where at least half of the patients with acute sinusitis recover without antibiotic treatment (113). However, to use the rule ‘the patient earlier had experienced acute sinusitis’ seems misleading because this has been shown to be negatively correlated to the diagnosis (202). Moreover, the rule ‘to fulfil the patient’s desire for antibiotics’ probably preserves non-optimal prescribing habits. Identification and evaluation of GPs’ rules of thumb would therefore be important.

The rules of thumb included no reference to pathophysiological knowledge. This could be seen as one explanation why experienced GPs scored less than newly examined in knowledge tests (45, 203). Medical isolation is a danger to GPs. Without continuing discussions with colleagues there is a hazard of ‘loose’ thinking (3), exemplified by some of the rules stated.

Management of RTI and UTI

The most important results in the first study in 2000 was that common infections are almost exclusively seen in general practice (168). Research in this domain is therefore a concern for general practice.

Although the influence of rules of thumb on the behaviour of GPs has not been explored, the agreement between the stated rules of thumb for antibiotic prescribing in acute sinusitis and prevailing cough (Additional unpublished data) and the results from the Studies III-IV indicated a correlation. Overall, antibiotic prescribing to the patient with acute sinusitis took place without any questioning at all (Additional unpublished data). The stated rules of thumb in ‘the healthy adult with a 3-weeks cough but no fever’ were clearly separated in two different patterns: those who immediately declared not to prescribe antibiotics and those looking for traits of a bacterial infection (Additional unpublished data). This was in accordance with the share of antibiotic treatment in patients allocated the diagnoses acute bronchitis and unspecified RTI (IV). However, because the use of rules of thumb of GPs has not earlier been explored, this inference must be interpreted with caution and confirmed by further research.

There was a significant decrease in the number of patients allocated the diagnosis streptococcal tonsillitis in 2002 and a corresponding increase in the diagnosis common cold. Although a shift in diagnostic labelling within the group of RTIs may have several explanations, the new guideline for the management of pharyngotonsillitis might have contributed. It has been said that physicians alter their perception of a problem as to fit what they have to

offer (204). There is no explanation for the increase in the proportion of patients allocated to the diagnosis acute sinusitis in 2002. Both years almost all of these patients received an antibiotic. This can be questioned, since benefit has not been shown if patients were diagnosed on clinical signs alone (155).

The new guideline for acute otitis media, allowing for expectancy for 3 days without antibiotics in children older than 2 years, was issued 6 months before the first study in 2000 (4). However, no changes in the treatment of acute otitis media could be observed, neither a reduction in number, nor a reduction in proportion given antibiotic treatment in 2000 or 2002 (Table 8). Nonetheless, there are indications that the number of patients allocated the diagnosis acute otitis media in general practice (Sven Engström, personal communication) decreased by 50% between 1999 and 2003. This decrease is further supported by the fact that the annual incidence of acute otitis media, if calculated on data from our studies, would be approximately 200 000 per year instead of previous estimates of 500 000-700 000 (4). These results were in accordance with studies from the US, where consultations allocated the diagnosis acute otitis decreased but the prescription pattern of the physicians remained constant (185, 205).

In different ways, our studies explored the relation between diagnosis and treatment of the GPs. According to Howie, the diagnostic labelling was made after the management decision, often as a justification for the treatment chosen (69). Our studies did not contradict this statement. Patients allocated diagnoses of presumed bacterial origin, where antibiotic treatment may have some benefit, were almost all prescribed antibiotics (III-V). The antibiotic treatment in patients with acute sinusitis was taken for granted (Additional unpublished data). Although there were some indications of a shift in the distribution of diagnoses between the years studied, the share of antibiotic treatment per diagnosis was unchanged. It has been shown to be far easier to change behaviour if an alternative is proposed rather than simple inaction (101, 206). The number of patients allocated the diagnosis acute otitis seemed to have decreased in recent years, but the GPs seemed to keep their prescribing pattern unchanged. Hence diagnosis and treatment seemed to be tightly interlaced, perhaps almost perceived as one entity and sometimes verbalized as a rule of thumb (Table 3:10).

To some extent the examples of rules of thumb might explain antibiotic prescription to patients allocated diagnoses of presumed viral origin. Several rules of thumb for management of common infections were clearly action oriented (I, Additional unpublished data). The rule: "With dysuria and posi-

tive leucocyte test you've almost already written the prescription in your head before you've met the patient" clearly bypassed the diagnosis (I). The GPs had no problem relating rules of thumb for treatment of the patient with prevailing cough without ever mentioning a diagnosis (Additional unpublished data). Hence it seemed to be most important for the GP to manage the consultation and the perceived patient expectations, which was done without reference to a diagnosis. The diagnosis thus might be labelled afterwards perhaps in an arbitrary way.

Changes in the proportion of patients allocated a specific diagnosis comparing data from 2000 and 2002 must be interpreted with caution. The registration only lasted 1 week each year and a difference might depend on a change in epidemiology. The possible changes in allocated diagnoses might be due to changed illness perceptions in the population, new routines for telephone advice given by the nurses in the health centres, or a shift in the diagnostic criteria used by the GPs. Our studies indicate that change in the behaviour of population might be more easier to attain than change in the prescription patterns of physicians. Hence the possible impact of information to the population should not be underestimated.

Use of near-patient diagnostic tests

There are many possible explanations for the extensive use of diagnostics; for example organisational routines, where tests are performed before the examination by the GP, a quest for certainty or a simplification of the clinical assessment. Strep A and CRP tests seemed to be performed mostly to exclude conditions, where antibiotic treatment could be beneficial. However, this would be possible without the extensive testing described in these studies (III, IV).

In Sweden, the current guideline from 2001 recommends testing patients without signs of viral infection and with at least 2-4 out of 4 Centor criteria (5). In paper III, Strep A was performed extensively in 39% of all patients. In patients allocated the diagnoses streptococcal tonsillitis or acute pharyngitis the use of Strep A seemed to decrease the proportion of patients treated with antibiotics. The proportion of patients tested with Strep A decreased between the years studied and so did the proportion with positive results. If performed in adequately selected patients the proportion of positive tests would have increased to approach 50% (162). During the years studied almost half of the Strep A tests were performed in patients allocated diagnoses other than streptococcal tonsillitis or acute pharyngitis, i.e. in patients not likely to have fulfilled the recommended criteria for testing. Most countries

have not introduced near-patient antigen tests to probe *S. Pyogenes*, since these tests might encourage people with self-limiting disorders to visit their GP and induce unnecessary costs (207). Moreover, it has been shown that when the test was negative, GPs changed their decisions to prescribe in only relatively few cases (208).

In Paper IV, a CRP test was performed in 42% of patients allocated an RTI diagnosis and significantly more often among older patients, patients with longer duration of symptoms and patients making revisits. Although significant, the decrease in antibiotic prescribing in patients tested with CRP compared to those not tested was overall minor, which was in line with other studies (209-211).

In the Swedish recommendations, CRP could be used in lower RTI to identify pneumonia (87). This has been questioned. Even though raised level of CRP correlated to chest radiographic changes of acute pneumonia it was not related to outcome, registered as reconsultations (212). Raised CRP values have been proposed as a diagnostic tool also in upper RTIs, but not been recommended in Sweden (5, 87, 127, 202, 213). Nevertheless, two-thirds of the CRP tests were ordered for patients allocated diagnoses of upper RTIs, which might explain the high proportion of low values (III, IV). As many as one-third of children <15 years old were exposed to testing (IV) although recent studies showed that the result of CRP tests could not differentiate between viral and bacterial lower RTIs in children (214, 215). Consequently, primary importance must be given to the clinical judgment of children with lower RTIs.

In patients allocated an RTI diagnosis both antibiotic prescribing and the use of CRP tests increased significantly with increased duration of symptoms at the same time as the overall value of CRP decreased (III, IV). Patients allocated a diagnosis of lower RTI of presumed viral origin were prescribed broad-spectrum antibiotics to a high degree when symptoms had prevailed for more than two weeks (Table 3:8). Increasing length of symptoms was one factor reported by GPs to increase their inclination to prescribe antibiotics (216, 217). Notably, symptoms in patients with lower RTI and low values of CRP seemed to prevail longer than symptoms in patients with high CRP, independent of antibiotic prescribing (209, 210, 212). Symptoms were not recorded in our study, but studies have shown that prevailing cough is one of the major complaints in patients with acute bronchitis for whose symptoms there was no immediate cure to offer (218-220). CRP testing in patients allocated an RTI diagnosis of presumed viral origin and with long duration of

symptoms might have been performed to obtain an objective measurement and seemed to help the GP to restrain from antibiotic prescribing (IV).

One or more diagnostic test was performed in 98% of consultations with suspected lower UTI (V). Most frequently used were dipstick tests (nitrite test and leukocyteteras tests). In Sweden, use of diagnostic tests is recommended in all cases of suspected UTIs, to increase diagnostic accuracy and reduce antibiotic use (88). In our study, most patients received an antibiotic treatment even though all tests were negative; thus in these situations the test results did not seem to have influenced the treatment decision (V). A urine culture is recommended in UTI in children, males and in upper UTI, but these recommendations were not followed, since in only approximately one-third of these patients a urine culture was performed (V) (88).

A further point of concern is that the prevalence of a disease is of importance for the effectiveness of a test. When prevalence decreases the share of false positive tests will increase and in turn the positive predictive value will decrease. In a study of Melbye the predictive value of CRP > 60 mg/L to identify acute pneumonia decreased from 0.43 when used in patients with suspected pneumonia to 0.12 when performed in all RTI patients (221). A review calculated that an otherwise healthy woman with dysuria and increased frequent voiding of urine and without vaginal discharge had a probability of 96% of having a UTI questioning the benefit of urine examination in daily practice (222). However, the prevalence of UTI in patients consulting with one or more of the above-mentioned symptoms of UTI is of importance and in the above-mentioned review the pretest probability of UTI was 48% (222). In a British study, with much lower pretest probability (25-29%) the symptoms only raised the probability to 30% (223). Therefore, the use of urine tests can be questioned and further studies in Swedish primary care are needed.

This thesis indicates the need for critical appraisal before introduction of a new diagnostic tests as well as continuing surveillance when used in daily practice. When in practical use, the test might soon be used as a routine without deliberate thinking. Since the prevalence of disease is crucial, the selection of patients tested must be considered. Near-patient CRP was introduced without proceeding studies in primary care (131) (IV). Two clinically important questions were not answered, when CRP test was introduced (224): Does test result distinguish patients with and without the target disorder in whom it is clinically reasonable to suspect that the disease is present? Do patients who undergo this diagnostic test fare better than similar patients who are not tested? (224) Such appraisal has to use principles from norma-

tive decision-making, incorporating not only statistical reasoning but also clinical knowledge of the target disorders. Since the use of diagnostics are closely linked with treatment this is a concern not only on account of unnecessary expenses for diagnostics, but also due to unnecessary use of antibiotics.

Management of uncertainty

Many problems in primary care are minor illnesses that are resolved without a definitive diagnosis and the task of the GP is to rule out any serious disease (2, 66, 67, 70). Most of Strep A and CRP tests seemed to be performed to exclude conditions, with possible bacterial origin (III, IV). Many rules were expressions of risk assessment and seemed to influence the relative preference given to the generalizing and individualizing process (I, II). It seemed that risk avoidance concerning somatic disease influenced the work of the GPs, whereas the risk for somatic fixation was not correspondingly outspoken (83).

Management of uncertainty is central in the work of the GP. Evidence-based medicine has been appreciated because variation in ‘the style of practice’ of physicians was most pronounced in areas where no general agreements of best practice existed (16). However, in spite of the evidence-based knowledge uncertainty will remain for the particular situation because statistical probabilities may not be true for the individual patient (199, 225).

The use of rules of thumbs and intuitive knowledge in the daily work seemed to serve as tools for the GPs to manage uncertainty and could explain a higher degree of decisiveness and confidence among the experienced GPs (226). The rules of thumb for somatic problems were expressed as axioms and overall there were only sparse objections given, not even when conflicting rules were stated by different GPs (I). The rules of thumb given in telephone interviews were stated without any hesitation (Additional unpublished data). However, the demand for caution was expressed by rules for not using rules of thumb (I), which were in line with the competing maxims described by Hunter (55).

The transformation of scientific facts to certain statements was earlier described in a social context by Ludwig Fleck, a Polish microbiologist (227). When the researcher published his results in the scientific journals the hypotheses were postulated as preliminary and with caution. In the published handbook, which expressed the acceptance by the thought collective, the

results were presented as certain and part of a settled system (227). Katz proposed that the denial of uncertainty served to maintain professional power, i.e. an aura of infallibility, and to make action possible (228). It seemed that this process could be reinforced by the use of rules of thumb in the consultation and could be in accordance with the reluctance of physicians to disclose uncertainty in talking to and about patients (228). What seemed irrational from a decision perspective could thus be rational in an action perspective (229).

Implications for change and further research

Implementation of evidence-based medicine has been difficult (58, 59). The existence of rules of thumb might explain the fact that practice remained unchanged when knowledge and competence increased as a result of continuing medical education activities (13, 230). Because the rules did not seem to be really conscious, they could stay unaltered even though more elaborate knowledge was developing. A crucial question is whether confident practical knowledge is compatible with critical knowledge formation and critical justification of knowledge. A belief or trust does not require justification, but when in doubt reasons are required (53). Hence the obstacle for change might not be perceived uncertainty but the development of idiosyncratic, partly conscious patterns of behavior, not available for criticism. In the rules of thumb simplification seemed to be linked with certainty.

The Centor criteria useable for prediction of infection with *S. pyogenes* in acute tonsillitis is an example of a decision rule derived from normative decision research (112). The Centor criteria changed performance of GPs, when GPs had to mark the symptoms on a paper questionnaire during the consultations (231). However, knowledge of the rule did not by themselves change practice (61, 149). Compared to the characteristics of the rules of thumb, the Centor criteria are far more complex. The implementation might have been more successful if the rule had been divided into different simple steps such as firstly: If there is cough there is no streptococcal tonsillitis. Secondly: Only patients with fever $>38.5^{\circ}\text{C}$ benefit from antibiotics. Thirdly: Presence of tender cervical glands or tonsillar exudates has to be confirmed.

The interpretation of the results of the CRP tests seemed to be a further example of simplification. It seemed that the many GPs had adopted as a rule to prescribe antibiotics when CRP was ≥ 25 (IV) because this was done for 59% of the patients allocated diagnoses of presumed viral origin. Possibly

CRP was interpreted as a dichotomous variable, normal or abnormal, in line with the binary semantic associations that characterize the expert (194). The rule of thumb given in Table 3:3; ‘when CRP is less than 10 then it is a virus’ was expressed in an even simpler way. Therefore, if the evidence-based knowledge is to be adapted to the reasoning of GPs, the message has to be simplified, perhaps expressed as a rule of thumb and shared by word-of-mouth (232). Hence, scientific rigour has to be abandoned even if the knowledge base is complex.

Decision rules often concern signs and symptoms for diagnosis (112, 233). Besides symptoms and signs for diagnosis of acute sinusitis the rules of thumbs given by the GPs for antibiotic treatment concerned the perceived patient expectations and the management of the consultations; issues recognised from interview studies with GPs (Additional unpublished data) (107, 150). Therefore, in their rule of thumb the GPs seemed to integrate their medical knowledge with their experience of patient consultations. Evidence-based knowledge seemed to be implemented in an evolving process with reciprocal contributions from both the doctor and the patient rather than in a simple linear way (234). Hence it seems important to include not only biomedical factors in guidelines but also items about patient perception and management of the patient problem. However, guidelines very seldom includes the perceptions of the patients, rules for communication or advice to manage the consultation. To implement evidence-based guidelines, not only strategies to deliver explicit formalised knowledge but also a language for valuing and externalising the tacit knowledge processed by the GPs seems to be needed (235). One way to start would be to identify rules of thumb used by GPs to evaluate them and share rules which are in line with evidence-based knowledge as well as aim to patient-centre the consultation.

The variation between different GPs reporting different sets of symptoms and signs as well as rules of thumb was striking (Additional unpublished data) and could be interpreted as exemplifying idiosyncratic memory structures of the expert (45). These idiosyncratic patterns probably get reinforced by the early hypothesis, which in turn influences which further cues will be recognised (40, 236). The combination of cues chosen might then determine the prevalence of the diagnoses and in the end antibiotic prescription of the individual GP (104, 237).

Further research is therefore important to explore the relation between rules of thumb, behaviour and outcome. Moreover, the perceptions of the patients about common infections, diagnostic testing and antibiotic treatment need to be studied, because they seem to influence the behaviour of the GP. The

influence of diagnostic tests in diagnosis and antibiotic prescribing needs to be further explored with special regard to CRP in patients with RTI.

This thesis has discussed the relation between the infectious problem presented by the patient, statements given in medical guidelines and the practice of GPs. In some areas the practice of the GPs were according to guidelines but in others areas practice varied and guidelines were not adhered to (III, IV, Additional unpublished data). The thesis indicates that the use of rules of thumb by GPs might partly explain variation in practice and irrational prescribing of antibiotics in patients with infectious conditions. Exploration of problem solving among GPs is important, because the consequences of their decisions are considerable. One researcher discussing antibiotic prescribing thus concludes: "Further research into individual prescribing habits and their determinants could well be more important than collecting rational arguments based on clinical evidence" (104). This thesis contributes one piece in the puzzle, exploring rules of thumb of physicians for the first time and discussing their relation to the management of infections.

Conclusions

- General practitioners (GPs) were able to verbalize their rules of thumb, which were recognized as an immediate and semiconscious kind of knowledge that could be called tacit knowledge. The use of rules of thumb might explain why practice remains unchanged although educational activities result in more elaborate knowledge.
- A specific set of rules of thumb seemed to be used for rapid assessment, when emergency and psychosocial problems were identified. In the further consultation the rules of thumb seemed to be used by the GPs in an act of balance between the individual and the general perspective.
- There was considerable variation between the rules of thumb of different GPs for patients with acute sinusitis and prevailing cough. In their rules of thumb GPs seemed to integrate their medical knowledge and practical experience of the consultation.
- A high number of Strep A and CRP tests were performed in patients, where current guidelines did not recommend testing; they seemed to be performed to exclude conditions, where antibiotic treatment could be beneficial.
- CRP tests were significantly more used among older patients, patients with longer duration of symptoms and in patients making re-visits. There was only a minor decrease in antibiotic prescribing in patients allocated a diagnosis of respiratory tract infection examined with CRP in comparison with patients not tested.
- In general, the GPs in Sweden adhered to current guidelines for antibiotic prescribing. Phoxymethylpenicillin (PcV) was the preferred antibiotic for most patients allocated a diagnosis of respiratory tract infection.
- The use of rules of thumb by GPs might partly explain variation in practice and irrational prescribing of antibiotics in patients with infectious conditions.

Sammanfattning (in Swedish)

Tumregler och handläggning av vanliga infektioner i primärvård

Bakgrund

Denna avhandling belyser allmänläkares beslut utifrån olika aspekter. I avhandlingen ingår studier om allmänläkares tumregler och om deras handläggning av luftvägsinfektioner och urinvägsinfektioner. Allmänläkares beslut är viktiga eftersom de får stora konsekvenser både i fråga om effekter och i fråga om kostnader. Tidigare studier har visat att allmänläkares beslut inte alltid överensstämmer med det som är rekommenderat i riktlinjer och evidensbaserad kunskap. Bland annat har flera studier visat på onödig antibiotikaförskrivning. Allmänläkare beslut skiljer sig också åt sinsemellan för patienter med i stort sett samma problem. Dessa handlingsmönster tycks vara stabila över tid och förändras inte alltid trots att utbildning givit ny kunskap.

I primärvården är de flesta patientproblemen mindre allvarliga och självläkande, även om det alltid finns risk att patienten kan ha en allvarlig sjukdom. Psykosociala bekymmer är vanligt. Inom allmänmedicinen har ett patientcentrerat arbetssätt utvecklats, där allmänläkaren underlättar för patienten att berätta om sina förväntningar och farhågor. Allmänläkarens uppgifter kan ses som tudelade, dels förstå patienten och dels bedöma patientens medicinska problem.

Tumregler

I forskning om beslut, beslutsteori, har tumregler (heuristiker) tidigare setts som en orsak till felaktiga beslut men har i modern tvärvetenskaplig forskning uppfattats som en adaptiv mekanism, nödvändig för djurs och människors överlevnad. Heuristiker gör det möjligt att fatta snabba beslut på be-

gränsad information och är förvånansvärt korrekta jämfört med statistiska beräkningar. Heuristiker uppfattas som mentala genvägar, som förenklar informationen och minskar den mentala påfrestningen. Studier om användning av heuristiker bland läkare är begränsad. Det finns inga studier som beskriver om allmänläkare kan formulera tumregler och hur de i så fall ser ut.

Handläggning av infektioner

Luftvägs- och urinvägsinfektioner är de vanligast förekommande infektionerna. Evidensbaserad kunskap har visat att effekten av antibiotikabehandling vid de flesta vanliga infektioner är begränsad, även om allvarliga infektioner med snabbt förlopp fortfarande förekommer. En hög förskrivning av antibiotika ökar risken för spridning av resistenta bakterier i samhället. Beräkningar har gjorts som antyder att hälften av all antibiotikabehandling sker i onödan. Allmänläkares antibiotikaförskrivning påverkas i hög grad av upplevda patientförväntningar, medan däremot patienternas tillfredsställelse med läkarbesök oftast är beroende på om de fått en förklaring på sina problem. Nya riktlinjer för handläggning av patienter med akut media otit och pharyngotonsillit gavs ut år 2000 respektive 2002. Vid okomplicerad akut media otit, hos barn > 2 år, kan man avvakta med antibiotika i 3 dygn. Vid pharyngotonsillit rekommenderas provtagning med snabbtest (Strep A) för att påvisa *S. Pyogenes* (Group A beta-haemolytic streptococci) om patienten har 2-4 av de s.k. Centor kriterierna (frånvaro av hosta och snuva, feber >38,5, beläggning på tonsiller och ömma och svullna lymfkörtlar på halsen). CRP rekommenderas vid diagnostiska svårigheter vid nedre luftvägsinfektioner.

Syftet med studierna var att beskriva och analysera allmänläkares tumregler och allmänläkares handläggning av patienter som diagnostiserats med luftvägs- eller urinvägsinfektioner och jämföra handläggningen med gällande riktlinjer och evidensbaserad kunskap.

Metod och resultat

Tumregler

Fyra fokusgruppsintervjuer med 23 allmänläkare från olika delar av Dalarna genomfördes. En tumregel definierades som en mental schablon, kopplad till handling, som användes oavsett om bakgrunden förstods eller inte och inte byggde på aktuell kunskap om patienten som individ. Intervjuaren gav exempel på sina egna tumregler ”När man kan stå på benet är det inte brutet”

och ”Strep A positiv – V-penicillin”. I intervjuerna användes en guide med frågorna: Känner ni igen att ni använder tumregler? Kan ni ge exempel? Nyttan och faror med tumregler? Varifrån kommer de? Intervjuerna bandades, skrevs ut ordagrant och analyserades, till att börja med utifrån intervjuguiden. Tumregler identifierades av två av författarna, som normativa uttalanden och kategoriserades utan en i förväg uppgjord klassificering.

Allmänläkarna kunde ge många exempel på tumregler. Reglerna kategoriserades i regler för somatiska och psykosociala problem samt regler för att inte använda tumregler. Reglerna var uttryckta som förenklad kunskap och tycktes vara opåverkad av de få invändningar som kom. Tumreglerna karakteriserades som en omedelbar och halvt omedveten kunskap, som skulle kunna kallas för tyst kunskap. En särskild grupp tumregler identifierades som tycktes användas mycket tidigt i konsultationen för att urskilja dels akut, svårt sjuka patienter och dels psykosociala problem. Somatiska problem tycktes vara det förväntade. Efter denna första kategorisering av konsultationens innehåll användes omväxlande tumregler för somatiska och psykosociala problem både för att kategorisera patientens problem (en generaliserande process) och för att patientcentrera konsultationen (en individualiserande process). I värderingen av resultatet krävs dock försiktighet. Många situationer som är vanliga i allmänläkararbetet nämndes inte i fokusgruppsintervjuerna.

Som en del i ett kvalitetsutvecklingsarbete genomfördes också en strukturerad telefonintervju med 52 allmänläkare från olika delar i Dalarna med syfte att belysa variationen av tumregler mellan olika läkare. De tillfrågades om sina tumregler och vilka symtom och kliniska tecken de använde sig av för att diagnostisera en patient med akut maxillarsinuit samt vilka tumregler de hade för att antibiotikabehandla en patient med akut maxillar sinuit respektive en frisk vuxen person med 3 veckors hosta. Svaren skrevs ned ordagrant, utan att några uppföljande frågor ställdes. Alla intervjuade allmänläkare uppgav att de hade tumregler för dessa tillstånd. För diagnosen akut sinuit bestod den av ett komplex av symtom och kliniska tecken som varierade läkare emellan. Ingen allmänläkare ifrågasatte antibiotikabehandling vid akut sinuit. För patienten med 3 veckors hosta svarade en tredjedel av allmänläkarna att deras tumregel var att aldrig ge antibiotika i dessa fall medan tumregeln för de övriga var att utreda med provtagning på misstanke om bakteriell infektion. De flesta tumregler stämde överens med riktlinjer och evidensbaserad kunskap men inte alla. Förutom symtom och tecken för diagnos berörde tumreglerna handläggning av konsultationen och patientens förväntningar.

Handläggning av patienter med luftvägs- och urinvägsinfektioner

För att utvärdera handläggningen av infektioner i primärvård i förhållande till riktlinjer och evidensbaserad kunskap krävs fortlöpande kunskap om praxis. Därför genomfördes en diagnos-receptstudie under en vecka i november i fem län (Jämtland, Dalarna, Uppsala, Östergötland, Kronoberg) år 2000 vilken upprepades år 2002. Länen valdes utifrån Apoteket AB:s uppgifter om antibiotikaförskrivning, så att de tillsammans motsvarade ett riksgenomsnitt. Alla patienter som sökte allmänläkare i primärvården med symptom på infektion registrerades på en särskild blankett. Antibiotikaförskrivning som skedde efter indirekta kontakter, efter telefonsamtal och i samband med hembesök var undantagna. Under studieperioderna uppskattades att 60% respektive 70%, år 2000 och 2002, av antibiotikarecepten fångades i registreringen. Av återstående recept, motsvarade förskrivning genom Apo-Dos cirka 6% de studerade perioderna. Det finns inga svenska uppgifter på hur stor andel antibiotikarecept som förskrevs indirekt eller på telefon

I studierna år 2000 och 2002 registrerades 4 383 respektive 3 796 patientbesök för luftvägsinfektion samt 869 respektive 698 patientbesök för urinvägsinfektion. Den vanligaste diagnosen var förkylning. Andelen streptokocktonsilliter minskade, andelen akuta media otiter var konstant och andelen förkylningar och sinuiter ökade mellan undersökningarna. Andelen patienter som antibiotikabehandlades per diagnos var oförändrad mellan åren. Phenoxymethylpenicillin (pcV) valdes i 63% av besöken där antibiotika förskrevs för luftvägsinfektion. För kvinnor med nedre urinvägsinfektion ökade förskrivningen av nitrofurantoin signifikant medan förskrivningen av kinoloner minskade signifikant mellan åren i enlighet med gällande rekommendationer.

Ett stort antal Strep A och CRP prover utfördes, också på patienter där provtagning inte rekommenderas. Nästan hälften (40% respektive 47% år 2000 respektive 2002) av Strep A proverna togs på patienter som varken fick diagnosen streptokocktonsillit eller akut pharyngit. Majoriteten av CRP proverna (69%) utfördes på patienter som fick en övre luftvägsdiagnos, där provtagning inte är rekommenderat. CRP användes signifikant oftare hos äldre patienter, patienter på återbesök och patienter som haft sina symptom en längre tid. När CRP hade tagits förskrevs en något mindre andel antibiotika till patienter med luftvägsinfektion än när CRP inte utförts. Till patienter med sannolikt virusorsakad luftvägsinfektion och långdragna symptom, förskrevs antibiotika i signifikant mindre utsträckning om CRP utförts jämfört med patienter som inte undersökts med CRP. Nästan alla patienter (98%) med urinvägsinfektionsdiagnos undersöktes med urinprov. Kvinnor med nedre urinvägsinfektion förskrevs antibiotika även om alla prover var negativa.

Urinodling togs enbart på en tredjedel av de patienter där odling rekommenderas.

Diskussion

De identifierade tumreglerna och beskrivningen av deras användning överensstämmer med tidigare forsknings beskrivning av experters kunskap och problemlösning. Relationen mellan tumregler och beteende kartlades inte i studierna, men allmänläkarnas tumregler för antibiotikabehandling av sinuit och långvarig hosta överensstämde med antibiotikaföreskrivningen vid diagnoserna sinuit respektive akut bronkit och ospecificerad luftvägsinfektion. Allmänläkarna beskrev hur de omväxlande använde tumregler för somatiska respektive för psykosociala problem och uttryckte därmed hur de i sitt arbete förenar ett biomedicinskt med ett humanistiskt förhållningssätt. Tumreglerna uttryckte både allmänläkarnas medicinska kunskaper och deras erfarenheter av patientarbete och kan därför ses som en länk mellan teori och praktik.

Allmänläkare i Sverige följer i hög grad vårdprogram och riktlinjer i sitt val av antibiotikaklass. Många patienter behandlas dock med antibiotika trots att de erhållit en diagnos där effekten av antibiotika har visats vara mycket liten. Mellan mätillfällena ändrades diagnosfördelning något, men sådana förändringar måste tolkas med försiktighet. Trots de nya rekommendationerna för behandling av akut media otit behandlades nästan alla med antibiotika. Det finns data som visar att antalet konsultationer för diagnosen otit har halverats mellan 1999 och 2003. Detta antyder att befolkningen hade ändrat besöksmönster, men att läkarna behållit sitt föreskrivningsmönster. Hos allmänläkarna tycktes diagnos och behandling tycktes vara starkt sammankopplade, nästan som en enhet, och ibland uttryckta som en tumregel. Laboratorieprover användes i hög utsträckning bland patienter med infektionssjukdomar, där det inte är rekommenderat, sannolikt för att utesluta tillstånd när antibiotika skulle kunna göra nytta. Det kan finnas flera skäl till den omfattande användningen av laboratorieprover, men en klinisk bedömning borde i många fall vara tillräcklig. Studierna understryker vikten av att all laboratoriediagnostik måste värderas både innan en ny diagnostik införs och när de blivit ett rutinprov, för att minska risken för felaktiga beslut, onödiga kostnader och för onödig antibiotikaföreskrivning.

Användning av tumregler kan ses som ett sätt att hantera osäkerhet i allmänläkarens arbete. Det skulle också kunna förklara varför allmänläkare inte förändrar sitt beteende trots ökade kunskaper efter fortbildning. Variationen mellan tumregler hos olika allmänläkare var stor och allmänläkares använd-

ning av tumregler skulle kunna vare en förklaring till variationer i praxis och till irrationell förskrivning av antibiotika. Ny kunskap bör sannolikt anpassas till allmänläkares sätt att resonera, såsom det kommer till uttryck i de beskrivna tumreglerna. Ett sätt att förändra praxis skulle kunna vara att kartlägga allmänläkares tumregler, värdera dem och sedan sprida de tumregler som är evidensbaserade och samtidigt syftar till att patientcentrera konsultationen.

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