

Presenting clinical pharmacology and therapeutics: general introduction

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Education of future clinicians in clinical pharmacology and therapeutics needs intensive reconsideration for two main reasons which are perhaps interlinked. The first is evidence that medical students are not always trained adequately in pharmacotherapy, and the second that less than optimal prescribing of drugs still occurs, and is difficult to correct. A greatly extended range of potent, effective and potentially toxic drugs has become available in the last two decades. As a result patients can often be provided with adequate drug treatment, but a large body of literature shows that it is difficult to choose rationally from the wide range of drugs now available (*rational* is defined operationally as effective, safe, convenient and economic). For example, there is evidence that doctors prescribe more drugs each year, and expensive drugs are prescribed when cheaper alternatives are available (Dukes & Haaijer-Ruskamp, 1987; Haaijer-Ruskamp & Dukes, 1991; World Health Organization, 1988). Irrational prescribing occurs both in developed and developing countries (Azarnoff, 1983; Haaijer-Ruskamp, 1984; Walker, 1987; World Health Organization, 1988). As a consequence of this prescribing behaviour some treatments are not effective, cause unnecessary side effects, and even result in admission to hospital (Avorn *et al.*, 1989; Bergman & Wiholm, 1981; Bigby *et al.*, 1987; Cartwright, 1979; d'Arcy, 1986; George & Kingscombe, 1980; Hutcheon *et al.*, 1978; Martys, 1979; Mulroy, 1973; Ray *et al.*, 1987).

Many measures have been taken to improve prescribing behaviour (Soumerai *et al.*, 1989), but they have produced conflicting results. One possible explanation is that the causes of irrational prescribing are still not fully known. Several factors have a negative influence on rational prescribing, but only part of the variation in prescribing can be explained, for example, by differences in the characteristics of the physician, in the type of practice, or by differences in culture (Payer, 1989; Soumerai, 1988). Recent studies have focussed on physicians' decision-making process (Denig & Haaijer-Ruskamp, 1992). More knowledge about how doctors choose drugs may help in finding more effective intervention strategies.

Undergraduate training deserves scrutiny because this should lay the foundation for choosing and prescribing drugs rationally. Though there is no direct evidence of a relation between the quality of undergraduate teaching and poor prescribing practice, medical students who are not trained adequately in pharmacotherapeutics will probably be more vulnerable to influences that

cause irrational prescribing. An increasing number of authors have called for an improvement in the teaching of pharmacology and therapeutics (de Vries, 1988; Herxheimer, 1976, 1983; Joubert, 1976; Nierenberg, 1986, 1990a,b; Sicé, 1975; Snell, 1992; Spector & Roberts, 1983; World Health Organization, 1993). A central issue in the opinion of most is a failure to change the teaching of pharmacology and therapeutics in the majority of medical schools over recent decades, despite a tremendous increase in the body of therapeutic knowledge. According to several authors too much emphasis is placed on transferring this knowledge to students, with little attempt to train them in its application. There is evidence that training in therapeutics is uncommon in Europe and North America (Brody, 1985; Fisher *et al.*, 1980; Orme *et al.*, 1990). In the Netherlands two committees came to the same conclusion. The first, set up by the minister of Education and Science, concluded after visiting all eight medical faculties in 1991 that therapeutic teaching was satisfactory in only two faculties, those of Leiden and Groningen (Visitatie Commissie, 1992). In a second committee, pharmacology and therapeutics teachers from all medical faculties analyzed their teaching programs and concluded that positive developments had occurred, but that therapeutic teaching was still far from satisfactory (Werkgroep Farmacotherapie Onderwijs, 1993). There is also evidence that medical students need such training. Without it they encounter great difficulty in applying knowledge of pharmacology to therapeutics (Collins, 1971; Nierenberg & Stukel, 1986; Peck & Halkin, 1981; Walson *et al.*, 1981). Several initiatives have been taken to improve the teaching of therapeutics, but evidence of improvements in the rational choice and prescribing of drugs by medical students is scarce (Bleys, 1983; Ellison *et al.*, 1990; Feldman *et al.*, 1987; Kalsbeek, 1983; Nierenberg & Stukel, 1986; Williams, 1990).

Since 1968 the curriculum of the Medical Faculty in Groningen has been divided into a four-year first phase and a two-year second phase. In this so-called traditional curriculum, theoretical aspects of medical specialties are taught first, followed by the teaching of clinical practice. This is in contrast to 'problem-based' or 'organ-system-based' curricula.

Pharmacology and Clinical Pharmacology teaching consisted of (and still largely consists of) lectures and some electives, with approximately 30 lectures on basic pharmacology and 50 on clinical pharmacology during the first phase. For examination purposes students had

to learn pharmacology facts by heart, and had to reproduce them in an examination consisting of multiple-choice and short essay questions.

In the second phase (the fifth and sixth years) students entered the hospital and embarked on clinical clerkships, during which they had bedside teaching and learned to apply the theory they had been taught. Apart from a therapeutics course, 1 h per week during the 6-week Internal Medicine clerkship, there was no specific pharmacotherapy training in the Groningen curriculum. The final exam on each clinical subject was at the end of the relevant clerkship. Students had to examine one or two patients and discuss their findings with a clinician. Drug treatment was not a structured part of these examinations.

In 1980 the Department of Pharmacology and Clinical Pharmacology of the Faculty of Medicine, University of Groningen, initiated a Pharmacotherapy Project which aimed to improve pharmacotherapeutic teaching. This

was developed in three steps:

1. the process of rational pharmacotherapy was defined and described so that the thinking process and logic of choosing and prescribing drugs was mapped out for medical students,
2. a course in pharmacotherapeutics for senior medical students was developed on the basis of that process,
3. improvement in rational choice of drug treatments was sought by assessing trained and non-trained students.

The course was introduced to the medical curriculum in 1983, and the effect of the problem-solving approach adopted on the rational choice and prescribing of drugs by medical students has been studied continuously since then. The model and the course are described in the two papers which follow, and the results of a study of the outcome are presented in the third paper.

References

- Avorn, J., Dreyer, P., Connelly, K. & Soumerai, S. B. (1989). Use of psychoactive medication and the quality of care in rest homes. Findings and policy implications of a statewide study. *New Engl. J. Med.*, **320**, 227–232.
- Azarnoff, D. L. (1983). Do we achieve rational drug therapy? In *Handbook of clinical pharmacology*, ed. Bochner, F. Boston: Little, Brown and Company.
- Bergman, U. & Wiholm, B. E. (1981). Drug related problems causing admission to a medical clinic. *Eur. J. clin. Pharmacol.*, **20**, 193–200.
- Bigby, J., Dunn, J., Goldman, L., Barclay-Adams, J., Jen, P., Landefeld, C. S. & Kanaroff, A. L. (1987). Assessing the preventability of emergency hospital admissions. A method for evaluating the quality of medical care in a primary care facility. *Am. J. Med.*, **83**, 1031–1036.
- Bleys, F. C. (1983). Het farmacotherapieonderwijs; werkelijk zo'n probleem? *Bull. Med. Onderwijs*, **2**, 11–14.
- Brody, J. (1985). Teaching of pharmacology in North American medical schools. In *Knowledge objectives in medical pharmacology*, eds Fischer, J. N., Gourly, D. R. H. & Greenbaum, L. M. Washington: Association for Medical School Pharmacology.
- Cartwright, A. (1979). Adverse reactions to drugs in general practice. *Br. med. J.*, **2**, 1437.
- Collins, I. S. (1971). Therapeutics, a neglected specialty? *Med. J. Austr.*, **2**, 526–528.
- D'Arcy, P. F. (1986). Epidemiological aspects of iatrogenic disease. In *Iatrogenic diseases*, eds D'Arcy, P. F. & Griffith, J. P. Oxford: Oxford University Press.
- Denig, P. & Haaijer-Ruskamp, F. M. (1992). Therapeutic decision making of physicians. *Pharm. Weekbl. (Sci.)*, **14**, 9–15.
- de Vries, T. P. G. M. (1988). Teaching prescribing, a new approach. Essential drug monitor. *World Health Organization Geneva*, **7**, 18.
- Dukes, M. N. G. & Haaijer-Ruskamp, F. M. (1987). More health for less money. *Lancet*, **ii**, 91–92.
- Ellison, M. J., Cummings, D. M., Worthington, R. C. & Bremer, C. C. (1990). Clinical pharmacology and therapeutics in primary care: an elective for fourth-year medical students. *J. clin. Pharmacol.*, **30**, 489–493.
- Feldman, R. D., Spector, R., Park, G. D., Albanese, M. & Roberts, R. (1987). Clinical pharmacology and therapeutics education for senior medical students. *J. clin. Pharmacol.*, **27**, 682–684.
- Fisher, J. W., Bianchine, J. & Palmer, R. (1980). Survey of clinical pharmacology programs in US and Canadian medical schools. *J. med. Educ.*, **55**, 168–172.
- George, C. F. & Kingscombe, P. M. (1980). Can adverse drug reactions be prevented? *Adv. Drug React. Bull.*, **80**, 288–290.
- Haaijer-Ruskamp, F. M. (1984). *Het voorschrijfgedrag van de huisarts* (thesis). Groningen: University of Groningen.
- Haaijer-Ruskamp, F. M. & Dukes, M. N. G. (1991). *Drugs and money; the problem of cost containment*. Groningen: Styx Publications.
- Herxheimer, A. (1976). Educating doctors to use drugs well. *Br. J. clin. Pharmacol.*, **3**, 111–112.
- Herxheimer, A. (1983). Teaching practical prescribing and therapeutics. *Medical Teacher*, **5**, 16–18.
- Hutcheon, A. W., Lawson, D. H. & Jick, H. (1978). Hospital admissions due to adverse drug reactions. *J. clin. Pharmacol.*, **3**, 219–224.
- Joubert, P. (1976). Pharmacology as a basic science in the medical curriculum: an illogical anachronism. *S.A. med. J.*, 567–568.
- Kalsbeek, F. (1983). Een wekelijkse oefening in praktische farmacotherapie. *Bull. Med. Onderw.*, **2**, 7–20.
- Martys, C. R. (1979). Adverse reactions to drugs in general practice. *Br. med. J.*, **2**, 1194–1197.
- Mulroy, N. (1973). Iatrogenic disease in general practice: its incidence and effects. *Br. med. J.*, **2**, 407–410.
- Nierenberg, D. W. (1986). Clinical pharmacology instruction for all medical students. *Clin. Pharmac. Ther.*, **40**, 483–487.
- Nierenberg, D. W. (1990a). Consensus for a core curriculum in clinical pharmacology for medical students. *Clin. Pharmac. Ther.*, **48**, 603–605.
- Nierenberg, D. W. (1990b). A core curriculum for medical students in clinical pharmacology and therapeutics. *Clin. Pharmac. Ther.*, **48**, 606–610.
- Nierenberg, D. W. & Stukel, T. A. (1986). The effects of a required fourth-year clinical pharmacology course on student attitudes and subsequent performance. *Clin. Pharmac. Ther.*, **40**, 488–493.
- Orme, M., Sjoqvist, F., Bircher, J., Bogaert, M., Dukes, M. N. G., Eichelbaum, M., Gram, L. F. & Huller, A.

- (1990). The teaching and organisation of clinical pharmacology in European medical Schools. *Eur. J. clin. Pharmac.*, **38**, 101–105.
- Payer, L. (1989). *Medicine and culture*. London: Victor Gollancz Ltd.
- Peck, C. C. & Halkin, H. (1981). Therapeutic decision-making for second year medical students. *J. med. Educ.*, **56**, 1024–1026.
- Ray, W. A., Griffin, M. R., Schafener, W., Baugh, D. K. & Melton, H. J. (1987). Psychotropic drug use and the risk of hip fracture. *New Engl. J. Med.*, **316**, 363–369.
- Sellers, E. M., Somer, G. & Rothman, A. I. (1988). Defining the true therapeutics and clinical pharmacology curriculum in a Canadian medical School: implications for change. *Clin. Pharmac. Ther.*, **44**, 629–633.
- Sicé, J. (1975). Objectives of pharmacological education. *J. med. Educ.*, **50**, 773–778.
- Snell, B. F. (1992). Rational prescribing: the challenge for medical educators. *Med. J. Austr.*, **156**, 352–354.
- Soumerai, S. B. (1988). Factors influencing prescribing. *Aust. J. Hosp. Pharm.*, **18**, 9–16.
- Soumerai, S. B., McLaughlin, T. J. & Avorn, J. (1989). Improving drug prescribing in primary care: a critical analysis of the experimental literature. *Milbank Quarterly*, **67**, 268–317.
- Spector, R. & Roberts, R. J. (1983). Physician education and drug therapy. *J. clin. Pharmac.*, **23**, 491–493.
- Visitatie Commissie (1992). *Onderwijsvisitatie Geneeskunde en Gezondheidswetenschappen*. Utrecht: VSNU.
- Walker, G. (1987). *Introducing concepts of essential drugs/limited lists of drugs*. World Health Organization (Role of Uni; E19/370/2).
- Walson, P. D., Hammel, M. & Martin, R. (1981). Prescription-writing by pediatric house officers. *J. med. Educ.*, **56**, 423–428.
- Werkgroep Farmacotherapie-Onderwijs (1993). *Het Farmacotherapie-onderwijs: van kennis naar kunde*. Utrecht: Stichting MFR (in press).
- Williams, P. B. (1990). Incorporation of clinical pharmacology into the fourth year of the medical curriculum: teaching clinical pharmacology without a clinical pharmacologist. *J. clin. Pharmac.*, **30**, 1065–1073.
- World Health Organization (1988). *The world drug situation*. Geneva: WHO.
- World Health Organization (1993). *Report 18th Symposium on Clinical Pharmacological Evaluation in Drug Control (Bad Neuenahr, 10–13 Dec 1991)*. Copenhagen: Regional Office for Europe.

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