

# **The State of the World's Pharmacy: A Portrait of the Pharmacy Profession**

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## **Introduction**

Today, therapeutic medicines are the cornerstone of much of health care throughout the world. Indeed, they have been described as the 'personal technology' of our time (Davis, 1997). They play a major part in the alleviation of suffering and the suppression of pain, and they offer the promise of treatment or cure to millions of people. A vast global industry now exists to develop, produce and market pharmaceuticals. There are, however, enormous variations between medicine use in developed and developing countries. Whilst spending on pharmaceuticals represents less than ten per cent of health spending in most developed countries, it represents between fifteen and thirty per cent in transitional economies, and between twenty five and sixty six per cent in developing countries (WHO, 2001a).

Responsibility for ensuring the safe, effective and rational use of medicines lies with pharmacists. Pharmacists stand at the interface between the developer and producer of pharmaceuticals on the one hand, and the consumer of their products on the other: they are society's experts on medicines. Pharmacy is the health profession concerned with therapeutic medicines. According to the 1968 Medicines Act, a therapeutic substance is 'any substance or article (not being an instrument, apparatus or appliance) administered to human beings or animals for a medicinal purpose'. Such a purpose may include 'the diagnosis, treatment or prevention of disease, and otherwise preventing or interfering with the normal function of the body processes, either permanently or temporarily'. This definition covers a broad range of items, including not only over the counter and prescription medicines but also blood products and vitamins. It has recently been extended to include homeopathic and herbal products.

The pharmacist's involvement in therapeutic drugs extends from the initial development of new chemical entities, their formulation into medicines, their testing, marketing and distribution, their supply to patients, and ultimately to the monitoring of patients taking them.

Today, pharmacists practice in a situation of rapid development, where it is difficult for health professionals to keep up with all the latest knowledge, where patients themselves increasingly go to their doctor armed with information gleaned from the internet, and where the consequences of error are increasingly great. Pharmacy, no less than medicine or nursing, is a profession in which lack of

care can result in patient harm or death. This may result, for example, through failure to spot a dosage error, or through the supply of the wrong drug (Barber, Smith and Anderson, 1994).

### **The Functions of the Pharmacist**

The role of pharmacists is to promote and support the safe, effective and rational use of medicines amongst the people that they serve. However, this role takes different forms in different parts of the world. In recent years the orientation of the pharmacist in many countries has shifted from the product to the patient. The focus of attention is now firmly on the pharmaceutical needs of the patient rather than the preparation of an elegant product. These patient-focused activities have evolved into the concept of 'pharmaceutical care', which has been defined as 'the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life' (Hepler and Strand, 1990). Pharmaceutical care involves pharmacists being directly accountable to patients for the outcomes of drug therapies.

The developing clinical role of the pharmacist has been one of the most exciting and encouraging developments in recent years. The pharmacist has shifted from a focus on the preparation and supply of medicines to a focus on the sharing of pharmaceutical expertise and knowledge with doctors, nurses and patients. This has placed greater emphasis on the clinical training of pharmacists, and ensures that they make the greatest possible contribution to the rational use of medicines. Developments in pharmaceutical care are occurring in both the hospital and community settings. In some countries it is acknowledged that this responsibility is shared with other health professionals, and the term 'medicines management' is preferred (Panton and Chapman, 1998). Despite these developments, however, both pharmaceutical care and medicines management remain largely aspirational in many parts of the world.

### ***Pharmacy Practice in the Community***

In the community, the precise role of pharmacists is dictated largely by the economic, regulatory and organisational frameworks in which they operate, and hence differs from country to country. For example, pharmacy practice is strongly influenced by the way in which medicines are controlled: whether all medicines are freely available through any outlet, whether some are restricted to sale from registered pharmacies only, and whether some are only available on prescription. Such regulation varies widely. The economic framework of health care is also a key determinant of the nature of pharmacy practice. Most countries have a mix of public and private provision of health care, and this is reflected in the provision of pharmacy services. There are also fundamental differences in how medicines are paid for, and specifically whether patients pay for

their medicines in full, in part, or not at all. Countries differ widely as to who can own pharmacies. Some allow corporate ownership, resulting in chains and multiples: some restrict pharmacy ownership to pharmacists alone, and some allow individual pharmacists to own one pharmacy only.

Within these constraints the pharmacist's contribution to health care in the community centres around five broad themes (RPSGB, 1997). These are summarised in Table 1. In the management of prescribed medicines, pharmacists work to help patients gain maximum benefit from their medication, and are involved in every stage of the chain from drug development and manufacture to providing medicines, information and support. In the management of long-term conditions, they not only supply the medicines and support that patients need, but are increasingly involved in the development of locally agreed shared care protocols, ensuring that patients use prescribed medicines to best advantage, and helping them to improve the outcomes of treatment.

In the management of common ailments, pharmacists play a vital role in supporting responsible self-medication, by giving people advice and re-assurance, supplying non-prescription medicines when appropriate, and referring people to other health care professionals where necessary. In the promotion and support of healthy lifestyles, they help people to maintain good health by providing health screening, advice on healthy living, and other services. Pharmacists are now involved in a range of such services, including blood pressure measurement, testing body fluids, cholesterol testing, pregnancy testing, smoking cessation advice and diabetes guidance (RPSGB, 2001). Finally, pharmacists contribute their expert knowledge of medicines and their use for the benefit of other health care workers, including both doctors and nurses.

### ***Pharmacy Practice in the Hospital Setting***

Around the world substantial numbers of pharmacists are employed in hospitals. Here too the service has become increasingly patient focussed, although the essence of the service provided remains the provision of the medicines needed by inpatients. Many will also supply the medicines for outpatients, together with advice and information about their use. Larger hospital pharmacy departments often have manufacturing units for both sterile and non-sterile products, which have the facilities to make those items that are not commercially available. Others will have supporting services such as quality control laboratories and computer services. As hospital pharmacists have become increasingly involved in the development of new drugs, and the rational and effective use of existing ones, so their role in bigger hospitals has become more specialised. Individual pharmacists now specialise in such areas as medicines information, formulary development, and

clinical trials. The range of activities undertaken within hospital pharmacies in many countries is illustrated in Table 2.

One of the most significant events in the development of hospital pharmacy has been the shift in the location of practice, from within the confines of the pharmacy, to the ward or clinic setting. Pharmacists began visiting wards to check prescription sheets, and to initiate supply, to avoid the need for prescriptions having to be sent to the pharmacy, and hence not being available at all times on the ward. As pharmacists became more involved on the wards, in advising doctors on what might be prescribed, and helping nurses with problems in drug administration, this 'ward pharmacy' evolved into a more patient-orientated 'clinical pharmacy'. Indeed, pharmacy in virtually all developed countries has progressively shifted from product-orientation to patient-orientation.

### ***Pharmacists in the pharmaceutical industry***

The range of opportunities available to pharmacists in the pharmaceutical industry is as diverse as the industry itself. However, the main areas in which pharmacists are employed are listed in Table 3. Many new graduates entering the industry choose a post where the pharmacist's skills and knowledge are of direct relevance and value (Ecclestone, 1998). These include research, formulation development, quality control and production. Later on, having gained in experience and confidence, some choose to move on to areas such as product registration, medical information and clinical trials, and a small number move into the more commercial areas of sales and marketing.

### ***Other occupations of pharmacists***

Pharmacists are also to be found in a wide range of institutions such as prisons, and in some countries substantial numbers of pharmacists are employed in the armed forces, in naval, military and air force establishments. A more recent development in some developed countries has been the growth in the number of pharmacies providing advice to local health authorities, usually developing local formularies and monitoring doctors prescribing. A few are now employed directly by general practitioners to advise on the rational and cost-effective use of drugs.

Most countries now have agencies dealing with drug safety and control, including licensing and regulation. These include the Food and Drugs Agency in the United States, the Medicines Control Agency in Great Britain, and multi-national agencies such as the European Medicines Evaluation Agency. All employ substantial numbers of pharmacists. Indeed, the pharmacy degree provides a sound training in medical science, and pharmacists are to be found scattered across a wide range of

less obvious activities. These include medical publishing, such as journal and newsletters, as well as national formularies and pharmacopoeias.

### **The Education of the Pharmacist**

In most countries prospective pharmacists are trained to degree standard, followed by a period of pre-registration training, typically of one year's duration. The degree course is science based, with a strong emphasis on the pharmaceutical sciences, social and administrative pharmacy, and forensic pharmacy. These are summarised in Table 4. The exact syllabus varies substantially from country to country.

In recent years the period of study has tended to become longer, and the competencies required for registration have become more rigorous. In the United Kingdom there are currently sixteen schools of pharmacy. These now offer a four-year undergraduate degree course leading to the Master of Pharmacy degree. The pre-registration year is now highly structured, and at the end of it candidates sit a pre-registration examination. In the United States a professional doctorate qualification, the Pharm.D. programme, has become the norm, and this qualification is now being offered by a number of institutions within Europe. American students also undertake a period of pre-registration training, which in the institutional setting is known as a residency programme. This is usually a one-year programme of formal education and training in all aspects of pharmacy practice.

### ***Education in Continental Europe***

There remain substantial differences in the education and training of pharmacists within the European Union. In the Netherlands, for example, it takes six years to qualify as a pharmacist. There is no formal pre-registration year: instead, there is a six month period of practical experience which is undertaken during the final year of pharmacy school. The first two years of study have a strong emphasis on basic and pharmaceutical sciences. Practical skills are taught during the last two years. Students can take an interim examination after four years, leading to the award of a master's degree. However, most opt to complete the six-year programme and qualify as pharmacists. They are awarded a diploma similar to the US Pharm.D qualification. Once qualified, community pharmacists can legally be in charge, although in practice most complete at least two years as an assistant pharmacist first. However, Dutch pharmacists must complete at least three years of on-the-job training before being in charge of a hospital pharmacy.

In Germany federal law regulates the pharmacy curriculum, and any change needs to be agreed by all sixteen federal states. However, clinical pharmacy and pharmacotherapy have recently entered

the curriculum, and pharmacists are being encouraged to develop critical thinking and clinical problem solving skills. The Scandinavian countries, including Norway, Sweden and Finland, offer two pharmaceutical qualifications. The master of pharmacy degree takes from five to six years to complete, and includes six months of practical experience in a pharmacy (Mason, 2000). The other qualification is the bachelor of pharmacy degree, which takes three years to complete. In Norway and Sweden this is the qualification of prescriptionists. Pharmacists with masters and bachelors degrees have the same responsibilities in relation to the dispensing of prescriptions and the giving of advice to patients and customers, but those with the bachelor's degree cannot own and run a pharmacy.

### ***Pharmacy Education Elsewhere***

Pharmacy education in the former soviet countries has undergone substantial development in recent years. In Slovakia, for example, pharmacists are educated in the faculty of pharmacy at Comenius University in Bratislava. This is the only pharmacy faculty in Slovakia, and was the only one in the whole of Czechoslovakia between 1960 and 1969. Of the thousand students in the faculty, most are from Slovakia. Pharmacy is studied in English (Mason, 1998). The undergraduate degree course lasts five years. After completion of the course pharmacists are qualified to practice as assistants in either community or hospital pharmacy, but they cannot be in sole charge of a pharmacy. To be in charge of a community pharmacy, the pharmacist must work as an assistant for two years, and then take a further examination. To be in charge of a hospital pharmacy five years postgraduate experience are required, together with successful completion of a second examination.

Many developing countries now have the capacity to train their own pharmacists (WHO, 1997)). In Indonesia, for example, the pharmacy undergraduate course has recently been reduced from five to four years duration (Tan and Aslam, 2000). The course is followed by a year's pre-registration training. The pharmacy curriculum is heavily biased towards pharmaceuticals (the preparation of appropriate dosage forms), pharmacognosy (the study of medicinal substances of natural origin), and laboratory work. Pre-registration trainees have to attend lectures as well as gaining experience in all spheres of pharmacy practice, including hospital, community, industry, and with the ministry of health. Indonesian pharmacists therefore tend to have a wide knowledge of all areas of pharmacy practice but insufficient experience of any one branch of practice. Pre-registration trainees then have to complete both written and oral examinations. There are sixteen faculties of pharmacy in Indonesia, of which eight are part of private universities. Pharmacy education is regulated by the ministry of education.

### ***Post-graduate and Continuous Education***

Most countries now provide opportunities for the post-graduate education of pharmacists, leading to a variety of higher qualifications such as certificates, diplomas, and master's courses in clinical and community pharmacy, as well as professional doctorates. Other specialist qualifications are available for pharmacists choosing a specific area of practice such as information management, production and quality control.

Continuing professional development has become a feature of pharmacy practice in most countries. In Great Britain the Royal Pharmaceutical Society expects its members to undertake at least thirty hours of continuing professional development per year (RPSGB, 2001). A College of Pharmacy Practice was established in 1981 to promote the highest professional standards in pharmacy. The College exists 'to promote professional and personal development through education, examination, practice and research, benefiting patients and health care provision' (CPP, 2001).

### **The Regulation of Pharmacy**

In virtually all countries pharmacy is a self-regulating profession with its own regulatory and disciplinary bodies. In Great Britain, for example, the Royal Pharmaceutical Society combines three roles: it acts as registration authority, representative body and inspection service. The Society's powers are embodied in statutes, and registration with the Society is a legal requirement in order to practice pharmacy. It publishes an annual Register of Pharmaceutical Chemists. The Society's second role is to promote the profession of pharmacy and to represent its members. Finally, it has statutory responsibilities with regard to the inspection of pharmacy premises and the testing of medicines. The Society itself is governed by a Council, which includes elected members together with Privy Council nominees.

The cornerstone of the pharmacist's professional status is educational attainment. Although there remain considerable discrepancies between the educational attainment of pharmacists in different countries, there is increasing mobility of pharmacists between them. There are, for example, mobility agreements between the countries of the European Union, subject to competence in the relevant language, although the actual number of pharmacists who have taken advantage of this facility is so far low. Pharmacists who have qualified in other countries can apply for registration with the Royal Pharmaceutical Society of Great Britain, for example, in order to work in the United Kingdom. This usually involves attendance at a course lasting up to one year. There are also reciprocal agreements operating between a number of countries, such as that between Great Britain, Australia, New Zealand and Northern Ireland.

Most countries now have written standards of practice for pharmacists, usually established by the appropriate professional body. The Royal Pharmaceutical Society of Great Britain, for example, issues such guidance to its members at regular intervals (RPSGB, 2001). Those who contravene these standards may find themselves before the Statutory Committee, which has the power to remove individuals from the Register of Pharmaceutical Chemists. Similar arrangements, including registration and inspection of premises, exist in most other countries, although the extent to which they are enforced is variable. Problems of enforcement tend to be greater in developing countries. Less than one in three developing countries have fully functioning drug regulatory authorities, and between ten and twenty per cent of sampled drugs fail quality control tests (WHO, 2001a).

### **The International Context of Pharmacy**

The World Health Organisation (WHO) has played an important part in promoting and supporting the role of pharmacists in improving health world-wide. Indeed, the important contribution which pharmacists can make to effective health care has long been recognised at the international level. In 1988 the WHO identified particular problems in relation to the supply and use of drugs in developing countries, and it encouraged governments to make the best use of pharmacists in promoting the safe and appropriate use of medicines (WHO, 1988). Later, at the forty eighth World Health Assembly held in Geneva in 1994, WHO called on pharmacists throughout the world to support its drug strategy. It urged governments to more clearly define the role of pharmacists, and to make full use of their skills in national drug strategies (WHO, 1994).

WHO has also played an important part in emphasising the importance of pharmacy education, ensuring that it is designed to equip pharmacists for their future roles in both hospital and community settings. Their document on Good Pharmacy Practice (WHO, 1996) emphasised the need for training of pharmacists in health promotion, disease prevention, the supply and use of prescribed medicines, and skills in influencing prescribing and promoting the rational use of medicines. WHO has been keen to emphasise that the potential contribution of pharmacists extends far beyond simply the supply of medicines, to all levels of planning and provision of services.

In practice, pharmacy internationally is characterised by diversity and variability. In carrying out the duties outlined by the WHO, countries are hampered by limited access to the services of pharmacists. There are enormous disparities between the numbers of pharmacists per 100,000 population in developed versus developing countries. Even within Europe there are large differences between countries in the numbers of pharmacists available. The number of pharmacists per 100,000 population for a range of higher income countries is shown in Table 5.



### ***Pharmacy Practice in Europe***

In their detailed review of the role and function of both community and hospital pharmacists in the health care systems of Europe, Lunde and Dukes (1989) found large variations in both. In the decade since, pharmacy practice in Europe has undergone rapid change. Current information about the state of the pharmacy profession in all fifty-one countries of the WHO European Region is available at the European Observatory on Health Care Systems (WHO, 2001b). The key drivers of change have been commercial pressures, government policy, and therapeutic advances (van Mil, 2001). Governments are increasingly looking at ways of controlling the costs of medicines, and of passing these onto the consumer. In the United Kingdom, for example, several hundred medicines have been deregulated from prescription-only status to pharmacy sale status in recent years. Patients are now able to purchase for themselves items that were previously only available on a doctor's prescription. This policy has been repeated in most European countries. Its impact on the practice of pharmacy has been substantial: patients are increasingly seeking advice from the pharmacist about medical conditions where previously they would have visited the doctor.

The implementation of competition directives has also had an impact. In the UK, resale price maintenance (which meant that medicines available without prescription had to be sold at the same price through all outlets) has ended, with the result that many pharmacy chains and supermarkets now offer 'three for the price of two' and related offers. Together with the fact that many general sales list medicines can be sold through any retail outlet, this imposes a financial strain on small independent pharmacies, and it is likely that the numbers of these will diminish. Other countries are moving in a similar direction. From October 2001 a selected list of 250 medicines became available in Denmark from a number of retail outlets, including petrol stations. Pharmacists in Germany are fortunate in having a near monopoly in relation to the supply of medicines. Only three per cent of medicine turnover is outside of pharmacies, and there are no dispensing doctors. However, Germany operates a strict one-pharmacy one-pharmacist owner rule, so multiples are unlikely to become established in the foreseeable future (Mason, 1999).

### ***Pharmacy Practice in North America***

Pharmacy practice in the United States today is characterised by its diversity (Serradell and Wertheimer, 2001). Community pharmacy in the US is a small but important component of the overall health care system, and its recent development has been most influenced by the rapid increase in the use of prescription drugs. In the US there are only two categories of pharmaceutical: those that require a prescription from a medical practitioner, and those which may be sold anywhere, without any professional supervision. This last group may be sold in any type of store,

from vending machines, by mail order, and from service stations. As in most countries, drugs such as narcotics are controlled more stringently than others. Unlike some others, such as the UK, there is no category of pharmacy only medicines, which can only be sold through registered pharmacies. Nevertheless, US independent pharmacies continue to thrive.

Pharmacy is practised differently in every state of North America, reflecting different social, political and economic characteristics, as well as differences in customs and traditions. There are substantial differences in both regulation and efficiency, but there remains a firm commitment to development of the role. Independent pharmacies on both sides of the Atlantic face similar problems. Both find it hard to obtain payment for providing care rather than products, and both face intense retail competition. Both face increasing costs and lower margins, making them less profitable than other retail businesses. The challenge for all pharmacists is to meet the ever-increasing expectations of the public everywhere, and to demonstrate a significant added value to medicine usage.

### ***Pharmacy Practice in Developing Countries***

In most developing countries health care is a mixture of public and private provision. Pharmacists are usually small businessmen, making a living out of the sale of medicines. In developing countries urban populations tend to be wealthier than those living in the countryside. As a result, health professionals such as pharmacists tend to prefer to work in cities, and private sector health care tends to be concentrated in urban rather than rural areas (Smith, 2001). In Ghana, for example, eighty per cent of all registered pharmacists live and work in Greater Accra. In many urban areas of developing countries retail pharmacies are numerous. Pharmacists have an important role to play in promoting safe and appropriate use of products. Characteristics of pharmacies shown to be important include ease of access, the ready availability of medicines, affordable products, and the availability of credit (Goel et al, 1996).

In many rural areas pharmacists are scarce, and pharmaceutical services are denied to these populations. For example, eighty per cent of the population of Tanzania does not have access to pharmaceutical services. Eritrea in East Africa, which has a population of around 3,500,000, is served by a total of just fifty-three pharmacists, a ratio of one pharmacist per 60,000 population (Health Action International, 1997). The number of pharmacists per 100,000 population for a range of middle and lower income countries is shown in Table 6.

From Table 6 it can be seen that least developed countries rarely have more than one or two registered pharmacists per 100,000 population. However, these figures need to be treated with some

caution. Firstly, the figures are taken from registration lists, and give no indication of the actual number of practising pharmacists. Secondly, the numbers of pharmacists is no indication of the numbers or distribution of pharmacies. Thirdly, in some countries pharmaceutical expertise is substantially supported by pharmacists from other countries. The Gambia, for example, has recently had the services of six Nigerian pharmacists providing technical support. Fifthly, the contribution that pharmacists can make is largely determined by the availability of pharmaceuticals, and where these are not available, for whatever reason, the need for pharmacists is reduced. Finally, many countries make substantial use of traditional remedies, and have large numbers of traditional healers involved with the making and supply of medicines. These are not of course reflected in figures for numbers of registered pharmacists.

In many developing countries pharmacists play a crucial role in the procurement of pharmaceuticals. The importance of appropriate procurement practices has been emphasised by WHO's Essential Drugs and Medicines Policy Department, which has shown that some developing countries routinely pay 150 per cent to 250 per cent of world market prices for essential drugs (WHO, 2000). With their specialist knowledge, pharmacists are in an excellent position to ensure that the most cost-effective drugs are bought in the most appropriate quantities from reputable suppliers, and that they are delivered where and when they are required. By arranging purchases at the lowest possible total cost, making use of generic rather than branded products where appropriate, they can help to ensure that as many people as possible benefit from the limited resources available for the acquisition of medicines.

Poor people spend a higher proportion of their income on drugs than do other groups. In promoting rational drug use by giving appropriate advice, pharmacists are able to reduce purchases of unnecessary and inappropriate products. There has however, been criticism in the past of pharmacists and their staff, both trained and untrained, for selling pharmaceuticals without questioning or advising clients on the suitability of particular products. There is still some way to go before the practice of the best becomes the practice of the majority.

## **Conclusions**

Pharmacists are society's experts on medicines. This paper has described some of the many medicines-related activities with which pharmacists are involved. It has highlighted some of the areas of divergence of pharmacy education and practice around the world, but has also demonstrated the increasing convergence of pharmacy practice, education and training around the rational use of drugs, medicines management and pharmaceutical care.

Pharmacists have long occupied an indeterminate terrain in health and welfare, falling somewhere between business and professionalism, and between professional care and lay care (Anderson and Berridge, 2000) and this tension between business and profession continues today. The exact location of pharmacists in the health care system continues to change, and varies from country to country. In some they act as 'gatekeepers' to primary care: in others they are increasingly taking on roles previously undertaken by general medical practitioners.

Patients in many countries are today exhorted to 'ask the pharmacist' in relation to a whole host of minor conditions. In some countries medicines which were formerly available only on prescription are now available from local pharmacies. This gradual transfer of responsibility for the prescribing as well as the supply of medicines continues, and pharmacists are increasingly being given prescribing rights in their own right. At the beginning of the twenty-first century the profession of pharmacy faces many challenges, but there are also many opportunities. This paper has demonstrated that pharmacy around the world is well placed to take them.

## References

- ANDERSON, S.C. & BERRIDGE, V.S. (2000). *The Role of the Community Pharmacist in Health and Welfare 1911 to 1986*, pp.47-73 in J. BORNAT, R.B. PERKS, P. THOMPSON & J. WALMSLEY (Eds) *Oral History, Health and Welfare*, London: Routledge.
- BARBER, N., SMITH, F. & ANDERSON, S. (1994). Improving Quality of Health Care: The Role of Pharmacists, *Quality in Health Care*, 3, 153-8.
- Compendium of Health Statistics, (1999), Eleventh Edition, London: Office of Health Economics.
- CPP (2001), *The College of Pharmacy Practice*, [www.collpharm.org.uk/main](http://www.collpharm.org.uk/main).
- DAVIS, P. (1997). *Managing Medicines: Public Policy and Therapeutic Drugs*, Buckingham: Open University Press.
- ECCLESTONE, B. (1998). *Careers in Pharmacy*, London: The Pharmaceutical Press.
- GOEL, P., ROSS-DEGNAN, D., BERMAN, P. & SOUMERAI, S. (1996). Retail Pharmacies in Developing Countries: A Behaviour and intervention Framework. *Social Science and Medicine*, 42, 1155-1161.
- Health Action International (1997), *Fragile Economies, Flooded Markets: Networking for Rational Drug Use in East Africa*, Amsterdam: Health Action International.
- HEPLER, C.D. & STRAND, L.M. (1990), Opportunities and Responsibilities in Pharmaceutical Care. *American Journal of Hospital Pharmacy*, 47, 533-543.
- LUNDE, I. & DUKES, G. (Eds) (1989), *The Role and Function of the Community and Hospital Pharmacist in the Health care Systems of Europe*, WHO Collaborating Centre for Clinical Pharmacology and Drug Policy Science, The Netherlands: Groningen.
- MASON, P. (1998). Pharmacy in Slovakia. *Pharmaceutical Journal*, 261, 826-827.
- MASON, P. (1999). Pharmacy in Germany. *Pharmaceutical Journal*, 262, 926-927.
- MASON, P. (2000). Pharmacy in Finland. *Pharmaceutical Journal*, 265, 827-829.
- van MIL, F. (2001). *Community Pharmacy in Europe*, pp.61-70 in K. TAYLOR & G. HARDING (Eds), *Pharmacy Practice*, London: Taylor and Francis.

OFFICE FOR HEALTH ECONOMICS (2001). *The Compendium of Health Statistics*, thirteenth edition, OHE, London.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (2001). *OECD Data Base*. Paris.

PANTON, R. & CHAPMAN, S. eds. (1998), *Medicines Management*, London: BMJ Books.

RPSGB (1997), *Building the Future: A Strategy for a Twenty-first Century Pharmaceutical Service*, London: Royal Pharmaceutical Society of Great Britain.

RPSGB (2001), *Medicines, Ethics and Practice: A Guide for Pharmacists*, Number 26, London: Royal Pharmaceutical Society of Great Britain.

SERRADELL, J. & WERTHEIMER, A. (2001). *Pharmacy in North America*, pp.71-80 in K. TAYLOR & G. HARDING (Eds), *Pharmacy Practice*, London: Taylor and Francis.

SMITH, F. (2001). *Pharmacy in Developing Countries*, pp. 81-101 in K. TAYLOR & G. HARDING (Eds), *Pharmacy Practice*, London: Taylor and Francis.

STONE. P. & CURTIS, S.J. (1995). *Pharmacy Practice*, Second Edition, London: Ferrand Press.

TAN, C.K. & ASLAM, M. (2000). The Development of Clinical Pharmacy in Indonesia. *Pharmaceutical Journal*, 264, 817-819.

UNITED NATIONS (2001). *World Population Prospects: The 2000 Revision Highlights*, United Nations Population Division, UN Secretariat, New York (ESA/P/WP.165).

WORLD HEALTH ORGANISATION (1988). *The Role of the Pharmacist in the Health Care System: Report of a WHO Consultative Group*, New Delhi, India, and *Report of a WHO Meeting*, Tokyo, Japan, (WHO/Pharm/94.596).

WORLD HEALTH ORGANISATION (1994). *Role of the Pharmacist in Support of the WHO Revised Drug Strategy*, (WHA/47.12).

WORLD HEALTH ORGANISATION (1994). *Proceedings of the Forty Eighth World Health Assembly*, World Health Organisation, Geneva.

WORLD HEALTH ORGANISATION (1996). *Good Pharmacy Practice: Guidelines in Community and Hospital Pharmacy Settings*, World Health Organisation, Geneva.

WORLD HEALTH ORGANISATION (1997). *The Role of the Pharmacist in the Health Care System: Preparing the Future Pharmacist*, WHO, Geneva. (WHO/Pharm/97/599).

WORLD HEALTH ORGANISATION (2000). *Better Quality at Lower Prices*, WHO, Geneva, Switzerland (Press Release WHO/26).

WORLD HEALTH ORGANISATION (2001a). *Essential Drugs and Medicines Policy*, WHO Geneva. [www.who.int/medicines/edm-concept](http://www.who.int/medicines/edm-concept).

WORLD HEALTH ORGANISATION (2001b). *European Observatory on Health Care Systems*, WHO Regional Office for Europe, Denmark: Copenhagen. [www.observatory.dk](http://www.observatory.dk).

WORLD HEALTH ORGANISATION (2001c). *Health for All Data Base*, WHO Europe, Copenhagen, Denmark.

**Table 1: Range of Services and Activities; Community Pharmacy**

<b>Service</b>	<b>Activity</b>
The management of prescribed medicines:	Pharmacists dispense prescribed medicines and advice patients on their use: pharmacists sometimes monitor this use over time
The management of long-term conditions:	Many patients seek advice from pharmacists on how to take or use their medicine, and on avoiding unwanted side effects
The management of common ailments:	Many people make use of pharmacists for a wide variety of healthcare advice and help, as pharmacies are usually conveniently located and pharmacists can usually be seen without an appointment.
The promotion and support of healthy lifestyles:	Both well and ill people visit pharmacies, so pharmacists are well placed to offer health information and advice, and to refer people to specialist support and help when needed
Advice and support for other healthcare professionals:	Pharmacists provide medicines information and advice to a wide range of health care personnel

*Source:* RPSGB (1997)

**Table 2: Areas of Specialist Practice; Hospital Pharmacy**

<i>Area</i>	<i>Function</i>	<i>Role</i>
Product services:	sterile products	making injections and infusions
	non-sterile products	making mixtures, creams, drops
	pre-packaging	packing tablets, capsules, liquids
	radiopharmacy	preparing diagnostic radioisotopes
	parenteral nutrition	preparing intravenous feeds
	quality control	testing manufactured products
	quality assurance	testing manufacturing processes
Support services:	purchasing	acquiring drugs from suppliers
	inpatient services	supplying drugs for inpatients
	outpatient services	supplying drugs for outpatients
	education and training	supporting pharmacy staff
	formulary services	list of recommended drugs
	computer services	supporting pharmacy systems
	research and development	developing knowledge
Clinical pharmacy:	medical specialties	advising doctors and nurses
	medicines information	providing drug information
	therapeutic drug monitoring	optimising drug therapy

*Source:* Stone and Curtis (1995)

**Table 3: Areas of Activity; Industrial Pharmacists**

<i>Area</i>	<i>Function</i>	<i>Role</i>
Technical:	Research	discovery and design of new drugs
	Development	formulation of final product
	Production	manufacture and packaging of medicines
	Quality control	testing of processes and products
Technical Support:	Product registration	registration with licensing authority
	Regulatory affairs	on-going safety monitoring
	Medical information	support to health professionals
	Clinical trials	management of study protocols
Commercial:	Wholesaling	ensuring effective distribution processes
	Distribution	maintaining adequate supplies
	Marketing	bringing to consumers attention
	Sales	maintaining competitiveness

*Source:* Ecclestone (1998)



**Table 4: The Pharmacists' Education; Core Pharmaceutical Subjects**

<b>Subject</b>	<b>Description</b>
Pharmaceutical chemistry	Study of the chemistry of medicinal substances including their synthesis and analysis
Pharmacology	Study of the actions and uses of medicines including absorption, distribution and excretion from the body
Pharmaceutics	The conversion of medicinal substances into suitable dosage forms such as tablets, injections and inhalers
Pharmacognosy	The study of medicinal substances of natural origin
Social and administrative pharmacy	Study of the social, political and economic aspects of the use of medicines
Forensic pharmacy	The law in relation to medicines and pharmacy

**Table 5: Number of Registered Pharmacists per 100,000 Population for 25 Higher Income Countries**

<b>Country</b>	<b>number of registered pharmacists</b>	<b>population (000)</b>	<b>pharmacists per 100,000 population</b>
Finland	7,500	5,172	145
Belgium	11,145	10,249	138
Iceland	340	279	122
Spain	29,820	39,910	119
France	62,800	59,238	106
Italy	60,340	57,530	105
Japan	132,180	127,096	104
South	45,340	46,740	97
Greece	8,920	10,610	84
Ireland	2,970	3,803	78
Portugal	7,165	10,016	76
United Kingdom	44,427	59,415	75
United States	201,095	283,230	71
Luxembourg	305	437	69
Sweden	6,100	8,842	69
New Zealand	2,460	3,778	65
Canada	19,070	30,757	62
Australia	11,485	19,138	60
Germany	51,050	88,017	58
Austria	4,440	8,080	55
Poland	21,235	38,605	55
Denmark	2,450	5,320	46
Hungary	4,385	9,968	44
Norway	1,925	4,469	43
Czeck Republic	4,315	10,272	42

*Sources:* All population figures are from 'World Population Prospects: The 2000 Revision', United Nations Population Division (2001). Figures for numbers of pharmacists or ratio of pharmacists to population are taken from the OECD Data Base (2001); 'The Compendium of Health Statistics', thirteenth edition (2001), Office of Health Economics; the WHO Europe 'Health for All' Data Base (2001); or from the registration authorities of specific countries. Some figures relate to 1999.

**Table 6: Number of Registered Pharmacists per 100,000 Population  
for 25 Middle and Lower Income Countries**

<b>Country</b>	<b>number of registered pharmacists</b>	<b>population (000)</b>	<b>pharmacists per 100,000 population</b>
Slovenia	695	1,988	35
Jamaica	860	2,576	33
Belarus	3,230	10,187	32
Azerbaijan	2,505	8,041	31
India	300,000	1,008,937	30
Singapore	1,135	4,018	28
Thailand	15,478	62,806	25
South Africa	10,690	43,309	23
Chile	3,000	15,211	20
Bulgaria	1,315	7,949	17
Malaysia	3,560	22,218	16
TFYR Macedonia	320	2,034	16
Tajikistan	730	6,087	12
Bosnia and Herzegovina	440	3,977	11
Georgia	438	5,262	8.3
Romania	1,600	22,438	7.1
Russia	9,340	145,491	6.4
Krgyzstan	275	4,921	5.6
Armenia	136	3,787	3.6
Uzbekistan	755	24,881	3.0
Albania	85	3,134	2.7
Zimbabwe	335	12,627	2.7
*UR of Tanzania	850	35,119	2.2
*Eritrea	53	3,659	1.4
*Gambia	10	1,303	0.8

- Included in United Nations list of 48 least developed countries

*Sources:* All population figures are from 'World Population Prospects: The 2000 Revision', United Nations Population Division (2001). Figures for numbers of pharmacists or ratio of pharmacists to population are taken from the OECD Data Base (2001); 'The Compendium of Health Statistics', thirteenth edition (2001), Office of Health Economics; the WHO Europe 'Health for All' Data Base (2001); or from the registration authorities of specific countries. Some figures relate to 1999.