

Professionally Determined Need for Pharmacy Services in 2020¹

David A. Knapp^{2,3}

School of Pharmacy, University of Maryland, 20 North Pine Street, Baltimore MD 21201-1180

EXECUTIVE SUMMARY

The Pharmacy Manpower Project, Inc., convened a conference in the fall of 2001 to delineate and project the professionally determined need for pharmacy services in the U. S. over the next twenty years. Two dozen experts in the profession of pharmacy met for three days to discuss drug-related health care problems in the population and system failures in the delivery of pharmaceutical care services. They considered changes in the demographics of the population, drug use trends, advances in information technology, the evolution of drug therapy, and the direction of health care organization and financing. Estimates were made of the need for pharmacists in medication order fulfillment, primary patient care, secondary and tertiary care, and non patient care areas. Although workforce estimates were projected at the meeting, they were not intended to be definitive and were used as a means to focus discussion on workforce issues.

The conference projections should be interpreted as one group's estimate of the professionally-determined need for pharmacy services for the U.S. population in twenty years. This is not a forecast of the demand for pharmacy services, which is influenced by a host of other factors, not the least of which is a payment system that rewards the provision of pharmacy services. The conference concluded that the supply of pharmacists will fall short of the need by a significant amount by 2020 (see Table I). The precise size of the shortfall cannot be determined, but it will be large. No doubt that the numbers presented here lack precision. The same group could come together tomorrow and end up with somewhat different results. But the magnitude and direction of the projections are valuable in pharmacy workforce planning and deserve serious scrutiny by the profession.

Conference participants wrestled with the quantity of pharmaceutical services that they believed would best serve the health care needs of the nation in 2020. It is to be expected that the numbers generated are larger than the marketplace currently supports. However, they should not be dismissed out of hand as unrealistic without considering the context. The opportunity for improving the quality of drug use, and thus the quality of patient outcomes and quality of life in this country is staggering. Anyone who has experienced an encounter with the health

Table I. Conference estimates: Current use and projected need for pharmacists in the United States (full-time equivalents)

	Current use of pharmacists 2001	Projected need for pharmacists 2020 ^a
Order fulfillment	136,400	100,000
Primary services	30,000	165,000
Secondary/tertiary services	18,000	130,000
Indirect/Other services	12,300	22,000
Total	196,700	417,000
Total estimated supply		260,000
Shortfall		157,000

^aThese figures are estimates of the need for pharmacists in 2020 and forecasts of market demand or jobs for pharmacists.

care system knows full well the uncoordinated chaos of the current system, despite the well-meaning efforts of today's health professionals to provide the best clinical services. The prospect of more individualized drug therapy through biotechnology may increase the need for drug therapy management even further.

The conference participants concluded that:

- the health care of the public would be improved if the amount of high quality pharmaceutical care services provided to patients was increased significantly, either by pharmacists or some other means;
- the total amount of such services needed over the next twenty years will exceed the supply of pharmacists, even if the maximum redeployment of pharmacists from order fulfillment functions to patient care is accomplished.

Therefore, the profession of pharmacy needs to move even more rapidly to re-deploy its members from medication order fulfillment to patient care, and decide how ambitiously to strive to increase its workforce. By using information technology, automation and robotics, and supportive personnel to the fullest, the conference participants believe that the order fulfillment productivity of pharmacists can be improved by a factor of five.

The Conference participants concluded that pharmacists can take responsibility for major improvements in patient care stemming from better drug therapy management in ways that the members of no other health profession are able. Expansion of pharmacy roles will depend heavily upon changes in methods of payment, improvements in electronic communication (which can also improve productivity), changes in the regulatory environment, support from other health professions and health system leaders, and the willingness of pharmacists

¹Report of a Conference Sponsored by the Pharmacy Manpower Project, Inc.

²Conference Facilitator and Reporter.

³David A. Knapp was a visiting scholar at the Agency for Healthcare Research and Quality at the time of the conference and during the preparation of this report. The views reported herein are those of the conference participants and not necessarily of those of the Agency or the Department of Health and Human Services. The author acknowledges with thanks the contributions of the planning committee: Daniel Ashby, Lucinda Maine, Colleen Metge, Richard Penna and William Zellmer.

Am. J. Pharm. Educ., 66, 421-429(2002); received 10/1/02.

themselves to accept broader challenges.

Even if the order fulfillment productivity of pharmacists were to increase three-fold, the projected growth in drug utilization (as measured by outpatient prescriptions and drug orders for patients in institutions) will free up a net of only about 25 percent of the FTE pharmacists currently engaged in this function. Thus, there will be relatively few existing pharmacists available to re-deploy to primary, secondary and tertiary patient care services. But the Conference participants projected that these services will require almost 300,000 FTE pharmacists by 2020 in order to fully meet projected needs. The balance must come from new graduates, foreign pharmacists, and improvements in productivity in patient care. In the meantime, pharmacists must carefully organize their activities to meet the needs of the highest priority patients and functions.

To sum up, the Conference participants concluded that the profession of pharmacy should not only continue to emphasize improved utilization of its members, but also move rapidly to increase the overall size of its enterprise. To the extent that the workforce of pharmacists does not expand fast enough to meet professionally-determined needs for pharmaceutical care, that care will either not be provided or will be provided through other means.

INTRODUCTION⁵

A significant shortage of pharmacists exists today. Employers of pharmacists in all practice settings report higher than usual pharmacist vacancy rates, escalating salaries, and difficulty coping with service demands from increased medication use. Community pharmacies and other retail outlets (including mail service pharmacies and internet suppliers) dispensed three billion prescriptions in 2001. The growth of drug insurance coverage has not only improved access and spurred use of prescription drugs, but has also burdened the system with complex and varied coverage requirements.

Hospitals are treating only the sickest patients, who require multiple and more complex drug therapies. Drug use in nursing homes and assisted living facilities has always been high. Demand for pharmacy services for patients with specialized needs for pain management, end-of-life care, and other drug therapy is growing rapidly. Pharmacy-trained individuals are in short supply for positions that do not involve direct patient care, such as pharmaceutical research and development, medical service liaisons, drug informatics, regulatory affairs, and teaching. The federal Health Resources and Services Administration reports that demand for pharmacists nationwide has outstripped supply, and that a shortage exists now and will continue in the foreseeable future.

The Institute of Medicine of the National Academy of Sciences has highlighted the national embarrassment of medication errors and drug therapy misadventures that both lead to patient harm and unnecessary costs. These medication problems occur in all settings, and at all stages of the drug use process, from determination of the need for drug therapy, through selection of appropriate entity, dosage form, strength and regimen, source of manufacture, dispensing, administration, adherence, monitoring and assessment of outcomes. Changes in the education of pharmacists, as well as changes in their role, have prompted new demands for pharmacy services.

When forecasting future workforce parameters for the profession of pharmacy, it is not enough to rely solely on projections of prescriptions and hospital drug orders and relate them to the projected supply of pharmacists. We know we have

a shortage now and are likely to have one for many years. But in the words of APhA Executive VP John Gans "A shortage of pharmacists to do what?"(1) Will increases in supply resulting from increased class sizes and the opening of new schools of pharmacy merely perpetuate an inefficient system of order fulfillment, or will pharmacy respond by rationalizing order fulfillment and embracing patient drug therapy management?

With the long-festering need for prescription drug coverage under Medicare and the recent upsurge in expenditures for prescription drugs has come renewed attention to medication misuse. Recently reported new studies have revisited the territory of medication misadventuring so well documented in Henri Manasse's monograph(2) of over a decade ago. In a recent JAMA editorial(3), long-time investigator of drug prescribing Jerry Avorn lamented the results of still another national study discovering the poor quality of drug prescribing for the elderly(4). He cites the development of improved criteria for prescribing, systems for online prescribing incorporating reminders for best practices, informatics to track patient adherence, and targeted educational outreach to correct sub-optimal prescribing for the elderly. And yet the problems persist.

THE CONFERENCE

As part of its ongoing mission to better understand pharmacy workforce issues, the Pharmacy Manpower Project, Inc. (PMP)⁴ commissioned a conference to address one aspect of these issues. The Conference brought together two dozen experts⁶ to delineate and forecast the *need* for pharmacists in the United States twenty years from now. By *need* we mean the number and types of pharmacists that experts in the field think will be required to deliver high quality pharmaceutical care to the population. This approach differs from projecting the *supply* of pharmacists by extrapolating data on new entrants into the field, subtracting expected losses due to death, retirement and withdrawal, and correcting for part time and moonlighting practitioners. It also differs from projecting *demand* by measuring and forecasting the number and type of pharmacy positions the marketplace will support.

No topic in the pharmacy profession has engendered as many books, studies, articles and reports as the role of the pharmacist. Conference participants were provided a notebook containing selected background readings on this and other topics pertinent to workforce issues. Pharmacy is not only a central health profession, it is one of great complexity and challenge. It is uniquely positioned to influence the use of medica-

⁴The Pharmacy Manpower Project is a nonprofit corporation consisting of all major national, pharmaceutical professional and trade organizations. Its mission is to serve the public and the profession by developing data regarding the size and demography of the pharmacy practitioner workforce and conducting and supporting research in areas related to that workforce. Current membership of the PMP includes the Academy of Managed Care Pharmacy, American Association of Colleges of Pharmacy, American College of Apothecaries, American College of Clinical Pharmacy, American Pharmaceutical Association, American Society of Consultant Pharmacists, American Society of Health-System Pharmacists, Bureau of Health Professions (HRSA), Healthcare Distribution Management Association, National Association of Chain Drug Stores, National Community Pharmacists Association, National Council of State Pharmacy Association Executives, National Pharmaceutical Association, Pharmaceutical Research and Manufacturers of America, and the Pharmacy Technician Certification Board.

⁵Most of the information in this section is drawn from the set of background materials provided to participants prior to the conference. A list of these materials is appended to this report. Other information was provided by participants at the conference.

⁶A list of conference participants is appended to this report.

tions, the most frequently employed and preferred of all medical interventions save perhaps consultation and advice. Yet pharmacy has always struggled with its identity because of confusion over its position in the constellation of health care and its frequent setting in a retail environment.

Pharmacy is not alone in this struggle. Each of the health professions straddles two prime value systems in American society. The first is the capitalistic system, which relies on the market to settle supply/demand issues. The second is the health care system, which is rooted in the paternalistic belief that knowledgeable professionals will determine what is best for patients without selfish motivation.

Neither system alone has been able to satisfactorily achieve balance between the supply of pharmacists and the services needed or demanded by society. We seem perpetually to either have too many pharmacists doing the wrong things, or not enough doing the right ones! We continue to face both old and new critical issues:

- the explosive demand for prescriptions,
- the aging of the population,
- increasing educational requirements for pharmacists,
- growing career opportunities in many new areas,
- the almost total conversion to some form of managed care,
- pending coverage of pharmaceuticals under Medicare,
- the growth of the Internet, and
- more educated patients.

Thus, the profession of pharmacy itself needs to reassess where it is going.

This conference is a small piece of that effort. The Conference depended entirely on the participation and contributions of the attendees. There were no presentations or special background papers prepared, although a set of reports, articles and other information was provided in advance. Over three days, the participants reviewed the wide range of issues facing the profession of pharmacy. After a day of plenary discussions, focus groups examined subsets of pharmacy functions. Each group described the parameters of the aspect of pharmacy it examined and forecast and commented upon the number and types of pharmacists necessary to provide the defined functions in the year 2020. Finally, the participants reconciled the numbers, and prepared this report.

General Approach

The Conference participants⁶ began by setting ground rules for the discussion. They decided to:

- identify, describe and quantify the current delivery model of pharmacy services in four functional areas;
 - outpatient prescription and inpatient drug order fulfillment,
 - primary pharmaceutical care services,
 - secondary and tertiary pharmaceutical care services, and
 - non-patient care functions requiring pharmacists.
- use Institute of Medicine Crossing the Quality Chasm criteria (safe, effective, patient centered, timely, efficient and equitable) to identify best-practice models for the delivery of pharmaceutical care;
- forecast future pharmacy needs for the year 2020 based upon the Chasm criteria and the best-practice models identified; and
- develop recommendations for consideration by the leader-

ship of the organizations sponsoring the Pharmacy Manpower Project.

Initial Discussions

Conference participants adopted the "ABCs" model of pharmacy services developed by Knowlton(5) to differentiate in broad terms between the order fulfillment elements of dispensing and the direct patient care services of pharmacists:

- A. Assessment** of the patient and the prescribed drug therapy. This includes evaluation of the appropriateness of drug therapy, selection of therapeutic agent, dosage, regimen, source of supply, and necessary consultation with prescriber and/or others.
- B. Bottling** or physically packaging and preparing the medication and delivering it to the patient or the patient's agent for administration. Nonprofessional personnel and automated equipment, using electronic information systems, may carry out this function almost entirely, under the direction of licensed pharmacists. The function is also referred to as order fulfillment and occurs both in ambulatory and institutional settings.
- C. Counseling** the patient or caregiver to assure complete understanding of how to use the medication and what to expect from the therapy.
- D. Surveillance** of the patient and the drug use to assure adherence, and to adjust or change therapy due to adverse events, therapeutic response, etc.

Participants recognized that pharmaceutical care is much more complex than this. However, this model provides operational definitions of order fulfillment and pharmacist patient care services that are more clear than, for example, using the term dispensing, which in common usage includes both an order fulfillment and a patient care component. In the discussions that follow, the patient care functions of the pharmacist that are associated with dispensing in the community or drug distribution in hospitals are not included in order fulfillment but are subsumed into primary, secondary and tertiary patient care services. Order fulfillment is used here to mean the non direct patient care functions involved in dispensing. The literature contains more sophisticated descriptions and analyses of pharmacy functions, but this shorthand was useful to a group that was well aware of the nuances of the topic.

FUNCTIONAL AREA ONE: ORDER FULFILLMENT (BOTTLING)

The profession of pharmacy is responsible for devising and supervising systems to guarantee the safety, accuracy and quality of medication order fulfillment in all patient care settings, *e.g.*, community pharmacy, central fill units, mail service, institutions, and nursing homes. Oversight and quality control of order fulfillment systems are professional functions of pharmacists that cannot be delegated. However, the implementation steps of order fulfillment, once a prescription or drug order has been validated, may be carried out by automated systems using modern information technology, robotics, and supportive personnel with little or no hands on pharmacist involvement with each order. A properly designed system does not require a personal final check by a pharmacist of every fulfilled order. The order fulfillment process is, of course, only part of dispensing. Direct patient care pharmacy services provided in association with order fulfillment, such as assessment, counseling, or surveillance are not treated in this section.

Description of the Order Fulfillment Process for Outpatient Prescriptions

New prescriptions are generated by a prescriber and are transmitted to a pharmacy. Most often, this is via a handwritten prescription carried, mailed or faxed to the pharmacy, or via a telephone order from the prescriber's office. The prescription order must be entered into a computer system for processing. Significant time is spent simply clarifying the specific content of the prescription, *i.e.*, interpreting handwriting or orally transmitted orders. The prescription is then adjudicated to determine patient eligibility and conformity with payment plan coverage parameters and limitations such as formulary choices, prior authorization, co-payment requirements, etc. Electronic drug use review procedures screen the prescription for potential drug use issues such as interactions or questionable dosage, and to assure conformance with payment plan formulary or other guidelines. Adjudication and drug use review frequently require administrative or professional intervention to resolve problems before the order can be released. Finally, the order is physically prepared, packaged, and delivered, using pharmacists, technical personnel, and/or automated equipment.

Renewal prescription orders are subject to much the same processing, although these repeat orders are more often received by telephone, mail, or electronic communication. About half of outpatient prescriptions dispensed are renewals.

The predominant current model for outpatient prescription order fulfillment uses pharmacists to perform functions that can be handled legitimately and appropriately by technical or administrative personnel and/or by automated technology. Conference participants pointed to inefficient use of pharmacist time when clarification of orders is necessary because of poor handwriting. Some 40 percent of new prescriptions require clarifying calls before data entry. Ten percent of new prescriptions require calls to verify health plan eligibility, and 20 percent require calls about formulary or coverage issues. An analysis by Arthur Anderson(6) reports that about 20 percent of the community pharmacist's time is spent on third-party-related administrative tasks that could be handled by others. Electronic drug use review signals include high rates of false positive reports, which, coupled with a lack of relevant patient information, either require clarifying calls or invite skepticism.

Description of the Order Fulfillment Process for Institutionalized Patients

The process of drug order fulfillment in the hospital differs from that of the outpatient setting. Adjudication is unnecessary for drug orders, but billing is a complex process that occurs after fulfillment. Order entry and clarification pose major issues in some institutional settings and consume significant pharmacist time. Orders made at the patient bedside in the absence of the chart may be posted to the wrong chart (and thus patient), or transcribed incorrectly, leading to possible patient safety errors. The use of electronic data entry with personal digital assistants (PDAs), and automated dispensing are growing. Since all drug orders in hospitals are "new," renewal prescriptions do not exist as known in the community setting. In addition, most medications dispensed to inpatients are in single-unit packaging. Many medications are injectables. Practice standards promulgated by the American Society of Health-Systems Pharmacists and the Joint Commission on Accreditation of Healthcare Organizations require a pharmacist review every new medication order before the first dose is administered.

About four percent of dollar sales for prescription drugs are for patients in long-term care facilities. Order fulfillment issues

are similar to those in hospitals, coupled with delivery issues.

Best-Practice Assumptions for Medication Order Fulfillment

- Reduce or eliminate rework by moving clinical decision-making upstream in the distribution process:
 - use electronic order entry by prescribers to reduce the need for drug order clarification;
 - use administrative personnel to deal with adjudication and program controls such as formularies and brand-generic switches;
 - use primary care pharmacists to handle clinical issues such as drug interaction screening, drug use review, and therapeutic interchange;
- Maximize the use of technical personnel and automation in filling, labeling, packaging, checking and shipping.
- Use professionals (pharmacists and other health care personnel) only for supervision of the order fulfillment process.

Forecast of Future Needs

About three billion outpatient prescriptions were dispensed in 2001 by about 101,400 FTE pharmacists(7). This amounts to about 30,000 orders per pharmacist per year. These figures include mail service pharmacy, which employs several hundred pharmacists, dispensed about 160 million prescriptions in 2001, and fulfilled about 114,000 prescriptions per pharmacist per year.

Hospitals recorded 1.898 billion drug orders in 2001. ASHP estimates that about 35,000 FTE pharmacists are used to fulfill these orders, or about 54,000 orders per pharmacist per year. Thus, a total of about 136,400 FTE pharmacists were engaged in order fulfillment in 2001 in all settings.

Automated order fulfillment installations currently in place are fulfilling about 2,500 prescriptions per week per pharmacist, or about 125,000 prescriptions per year. Order fulfillment error rates are lower than in systems using less organized approaches to dispensing. These installations are found in mail service pharmacies, VA settings, and in central fill operations for chain stores. Systems improvements are planned that will increase the number of prescription orders per week per pharmacist to 5,000 in the near future.

Forecasting the future need for pharmacists in the order fulfillment function in the year 2020 requires estimating the growth of outpatient prescription orders. An annual growth rate of five percent for outpatient prescription orders was used, based upon historical data. The annual growth rate will probably change from year to year, and the rate of growth for different segments of the market will probably differ. Most recently the growth has been six percent per year. A five percent annual growth rate would lead to a prescription volume of 7.2 billion in 2020. The participants noted that the effects of the aging population had not yet had a significant influence on the prescription growth rate. The largest impact of age will be felt in the next twenty years, as the large baby boom generation begins reaching 60. Historically, individuals over 65 use three times as many prescriptions as do younger adults. Order fulfillment needs for nursing home patients and other special groups as provided by conference participants are included in these estimates.

If outpatient pharmacist productivity in order fulfillment were tripled, to 90,000 orders per pharmacist per year, 80,000 FTE pharmacists would be needed for outpatient order fulfillment in 2020. More conservatively, if only six billion outpatient prescriptions are dispensed in 2020, and productivity increases are the same, about 67,000 FTE pharmacists would be needed for

order fulfillment alone in 2020.

Hospital drug orders were projected to increase 2.5 percent per year, to a total of 3.5 billion in 2020. If hospital pharmacist productivity were doubled to 108,000 orders per pharmacist per year, 32,400 pharmacists would be needed.

Thus, with a conservative estimate of drug order growth in the next twenty years, and an ambitious estimate of productivity gains of three times in the outpatient arena and twice in institutions, about 100,000 pharmacists would be needed in 2020 for order fulfillment functions alone. Any greater growth in drug use or slower gain in productivity would increase the need for pharmacists.

Full implementation of these assumptions will necessarily require concentration of order fulfillment in large central-fill facilities such as those now operated by mail service pharmacies, the Veterans Administration and large drug chains. The assumptions can be met to a lesser extent by hospital pharmacies and larger community pharmacies. All settings can benefit from systems that move managed care adjudication functions from the pharmacist to supportive personnel. Regulatory changes will be necessary to fully implement best-practice models. Pharmacists need to accept and utilize new technology and supportive personnel, requiring, in many cases, retraining and attitude changes. Some pharmacists are reluctant to relinquish long-time dispensing practices that directly involve the pharmacist in every step of the process and have difficulty appropriately delegating responsibility to others.

Patient preference for personal service will continue to support point-of-care community pharmacy settings for order fulfillment. Certain prescriptions involving urgent care or special handling are not amenable to central fill or mail-service fulfillment, thus limiting the opportunity for automated dispensing, although electronic order entry and screening can still be applied. Conference participants estimate that of the fifty percent of all prescriptions that are new, about half are for acute care, a chronic problem flare up, or pre- or post-surgery (25 percent of total prescriptions). About 38.4 percent of new prescriptions are for chronic conditions and 11.4 percent for non-illness care (mostly birth control). These characteristics of the marketplace will make it difficult to increase productivity to the level of central order fulfillment units, but will make possible greater access to primary pharmaceutical care services.

Conference participants took note of the possibility of much greater individualization of dosage forms with advances in biotechnology and the development of pharmacogenomics. The number of biotech products in the pipeline is very large, and will challenge traditional delivery methods. Although the full impact of these therapies cannot yet be forecast, it will be in addition to rather than as a substitute for traditional drug therapy(viii).

FUNCTIONAL AREA TWO: PRIMARY CARE PHARMACY SERVICES

Most primary care pharmacy services involve patients obtaining prescription or nonprescription medicines in community settings. Primary care services involve the pharmaceutical care necessary to manage simple and complex medicine use in ambulatory patients. These services include patient assessment, advising providers and patients on elements of the drug use process, patient counseling, and surveillance or monitoring for appropriate therapeutic response. These services are often offered in community practice today as a direct part of prescription drug order fulfillment, but they can be provided separately, either in the same or different locations, provided that proper coordination and communication are maintained.

Conference participants estimated that about 30,000 FTE pharmacists are currently providing primary pharmacy care services. This estimate was obtained by starting with the approximately 200,000 practicing pharmacists in 2001 and subtracting the estimated FTEs employed in order fulfillment, secondary and tertiary services, and non direct patient care services.

Estimated need for primary care services in 2020 were built in two ways. First, the Conference participant agreed that not all patients require the same level of primary care pharmacy services. About two-thirds of the population receive at least one prescription per year, but close to 40 percent receive four or more. The latter group was identified as requiring complex primary care services that would call for one FTE pharmacist per 1000 patients, or about 130,000 FTEs in 2020 to serve a total population of 325 million. With the assumption that the remaining portion of the population (195 million) could be appropriately served with a ratio of one pharmacist to 5,500 persons, the total estimated need for primary care pharmacists in 2020 comes to about 165,000 FTEs.

A second approach to estimation was to examine the use of pharmacists in a highly organized setting. A current service model that meets this description is Kaiser Permanente/Denver. This organization is a closed system that provides its 350,000 patients with a highly managed drug therapy plan (HMDTP). About one-third of the patients fall into high-risk groups. This organization plans to serve about 520,000 enrollees in 2006 with 550 pharmacists in patient care (another 50 are to be employed in information technology and automation applications). These pharmacists do not provide order fulfillment or inpatient services. This translates into a pharmacist/enrollee ration of 1.1 pharmacists per 100,000 enrollees. If this ratio were extended to the entire projected population in 2020, about 358,000 pharmacists would be required for primary patient care. For purposes of this report, the conference chose to use the lower projection of 165,000 pharmacists as a more conservative estimated need for primary pharmacy care services in 2020

FUNCTIONAL AREA THREE: SECONDARY AND TERTIARY PHARMACY SERVICES

The Conference considered secondary and tertiary pharmacy services to include mainly acute care services offered to institutionalized patients. Also included were hospital-based pharmacy services involving the entire patient population, such as the establishment and oversight of medication safety systems and drug policy issues.

Pharmacist functions needed in this area include:

- involvement in initial inpatient patient assessment;
- involvement and responsibility for;
 - selecting therapy,
 - monitoring response to therapy,
 - adjusting therapy,
 - transfer of care (hand offs) among providers or units, and
 - long-term assessment of chronic therapy.

To accomplish these functions, pharmacists will:

- need broad knowledge across diseases,
- make decisions within treatment protocols,
- be responsible for patient medication use safety,
- be responsible for drug-use policy, and
- need to be present on every unit.

Table II. Conference estimate of secondary and tertiary pharmacist care

	2001 FTEs ^a	2020 FTEs ^b
Drug use safety and policy	5,000	10,000
Acute care	10,000	100,000
Nursing facilities	1,800	2,700
Intermediate care/mental retardation/ psychiatric	300	400
Hospice	200	3,200
Home health	200	9,000
Assisted living	100	2,500
Continuing care retirement communities	100	200
Correctional facilities	50	150
Nuclear pharmacy	300	600
Total	18,050 ^a	128,750 ^b

^aEstimated current deployment of pharmacists.

^bEstimated needs (not forecasts of market demand).

Table III. Conference estimates for non-patient care pharmacy needs

	2001 FTEs ^a	2020 FTEs ^b
Industry		
Scientists (R&D, QA & Manufacturing)	3000	4,000
Economist/Outcome Researchers	200	600
Marketing/Sales	300	300
Medical Service Liaison	1,200	3,600
Drug Information	600	1,200
Regulatory Affairs	200	200
Academia		
Deans/Faculty with pharmacy degrees	2,600	3,250
Regulatory/Government Policy	2,000	4,000
Pharmacy Informatics	2,000	4,000
Consulting	200	600
Total	12,300	21,750

^aEstimated current deployment of pharmacists.

^bEstimated needs (not forecasts of market demand).

The Conference projections of need for nursing home, assisted living, continuing care and other extended care facilities are based upon data and forecasts from the American Society of Consultant Pharmacists. Hospice and home health figures are from workers in the field, as are forecasts for correctional facilities and nuclear pharmacy.

It is estimated that one FTE pharmacist performs patient safety and policy-related functions concerning drugs in each of the nation's 5,500 hospitals. The Conference believes that this number should be doubled to address adequately these patient-care issues in hospitals.

Projections for the need for pharmacists to provide secondary and tertiary services in hospitals are based primarily upon extensive surveys by ASHP of current medication-related services being provided to patients now and estimates of unmet need in each area. Several significant clinical functions with major potential impact upon patient care are seldom performed by pharmacists in hospitals today.

Some examples include:

- patients who get medication admission histories: – now 5%; needed 100%;
- discharge medication education: – now about 20%; needed about 75%;

- prospective regimen design: – now very low; needed 100%;
- outcome monitoring /regimen adjustment: – now very low; needed 100%;
- decentralized pharmacists: – now very low; needed 100%.

Thus, as summarized in Table II, the conference projects a need for about 130,000 pharmacists to perform secondary and tertiary functions in the year 2020.

FUNCTIONAL GROUP FOUR: NON PATIENT CARE PHARMACY SERVICES

This work group examined the current deployment of pharmacists in areas not involving direct patient care but requiring persons with pharmacy expertise. The group systematically discussed needs by sector and made the following assumptions as projections were developed:

- Number of pharmacy schools will expand by 15, each with classes of 50 students.
- Scientific and technology developments will lead to more complex, costly, and individualized therapies, which in turn will require persons with pharmacy training for:
 - the drug information area, in order to present and interpret evidenced-based data;
 - decreased need for sales and marketing professionals;
 - positions in basic and pharmaceutical sciences research;
 - pharmaceutical outcomes research;
 - drug manufacturing, dosage form development, and quality control; and
 - managing care in populations of patients (PBMs and health plans).
- A Medicare drug benefit will be implemented, increasing the need for pharmacists in the federal government.
- Government involvement in pharmacy will continue and increase, requiring more pharmacists in government agencies.
- Information technology will continue to grow, and pharmacists with IT training will be in great demand.
- Other combinations of pharmacy training and related areas such as human factors engineering, business, law, and administration will be needed.

The Conference estimates and projections for pharmacist need in this miscellaneous, non patient care functional category are shown in Table III. The Conference projects a need for about 22,000 pharmacists in this area in the year 2020.

SUMMARY AND CONCLUSIONS

The conference projected the professionally-determined need for pharmacy services for the U.S. population in twenty years. It is the best estimate of 24 people discussing the situation from their viewpoints over three days. The conclusion is that the supply of pharmacists will fall short of the need by a significant amount over the next few years. The precise size of the shortfall is arguable. But its magnitude and direction and the underlying thought processes would be the same. The summary of conference estimates is shown in Table IV.

The estimates for need are based upon a framework of assumptions held by the conference participants. In the case of order fulfillment, the estimates are based upon projections of the volume of outpatient prescriptions and inpatient drug orders in 2020. In turn, drug order volume was assessed by

Table IV. Conference estimates: Current use and projected need for pharmacists in the United States (full-time equivalents)

	Current use of pharmacists 2001	Projected need for pharmacists 2020 ^a
Distribution	136,400	100,000
Primary services	30,000	165,000
Secondary/tertiary services	18,000	130,000
Indirect/Other services	12,300	22,000
Total	196,700	417,000
Total supply		260,000
Shortfall		157,000

^aThese figures are estimates of the need for pharmacists in 2020 and forecasts of market demand or jobs for pharmacists.

considering historical trends, the demographics of the population, and qualitative discussions of anticipated changes in the nature of drug therapy stemming from gene therapy and progress in biotechnology.

The projected need for pharmacists in the order fulfillment process is 100,000 in 2020, lower than today despite a projected significant increase in medication utilization. This conclusion stems from the belief that pharmacists will be used much more appropriately in order fulfillment in the future. Advances in the application of information technology and automated systems to drug order fulfillment will permit substantial improvements in pharmacist productivity.

Accomplishment of the aggressive projections of the conference assumes:

- continued improvements in the application of information technology and automated systems;
- refinement of order fulfillment systems to assure patient safety;
- changes in the regulatory environment to permit the expanded use of properly designed order fulfillment systems;
- changes in the culture of the practice of pharmacy that will encourage pharmacists to pull back from hands-on order fulfillment functions as appropriate;
- successful adaptation to the HIPPA requirements regarding patient privacy and medical records confidentiality.

The projected need for pharmacists in patient care functions in 2020 is almost 300,000, which is fifty percent larger than the entire population of practicing pharmacists today. This is the Conference estimate of professionally determined need for pharmacist-provided patient care services. It is not an estimate or forecast of demand. The assessment of need is based upon the patient care services that the population will require in 2020 given the Conference projections of medication utilization and the characteristics of the population. It is also based upon a projection of the unmet need of today as defined by the serious shortcomings of the health care system in providing for safe and effective medication management.

Some of the assumptions underlying the conference projections of the growth of the need for patient care needs for pharmacy services include:

- shorter life cycles for drug products;
- emergence of gene therapy and individualized treatments;

- improved and increased screening, leading to increased specificity of therapy;
- growth in "distance therapy" through telemedicine and telepharmacy;
- growth in specialty drug protocol management of high-risk therapies;
- increased intensity of hospital care, along with growth in the size and complexity of hospital systems;
- increased requirements for coordination of patient care and health care teams;
- continued shortage of nursing personnel.

The projected need for pharmacists in non-direct patient care areas is almost 22,000, or almost double the number of pharmacists engaged in these areas today. This need, although comparatively small, is critical because of the leadership nature of many of the jobs identified. Many of these positions require post-PharmD training. Because of the shortage in other areas of pharmacy today, the marketplace has driven up salaries and diverted some pharmacists away from these positions.

In summary, the conference participants project a professionally-determined need for 417,000 pharmacists in 2020. This number could vary by as much as 100,000 in either direction. But even if it is as low as 300,000 pharmacists, the projection still far exceeds a liberal projection of the supply of pharmacists in 2020. The conference estimate of 260,000 practicing pharmacists in 2020 is based upon a standard supply projection accounting for new graduates adjusted for those leaving practice due to retirement, death or other reasons. The supply projection assumes a 20 percent enrollment growth in existing schools as well as the addition of three new schools beyond those already planned to open in the near future. Since the projections of need discussed above already account for productivity increased in order fulfillment, the supply of pharmacists is likely to fall short even if conservative projections of need are to be met.

The purpose of the Conference was to delineate and estimate the amount of professionally-determined need for pharmacy services in 2020. Several assumptions will need to be met if pharmacists will be able to provide the needed services:

- Improved information technology and compatible systems will exist throughout the health care system.
- Improved patient and treatment information dissemination will occur in real time and be available at the point of care.
- Increased use will be made of interprofessional health care teams.
- Evidence-based treatment protocols with latitude at important decision points will be adopted.
- Improved systems of patient safety will be achieved, along with better indicators for quality of care.
- Financial incentives will be aligned with patient care outcomes.

Pharmacy itself must find the will to move even more strongly from direct order fulfillment functions to patient care functions. However, control and oversight of order fulfillment systems must be retained and improved. The sheer volume of drug orders provided demands professional pharmacy oversight to assure safety and quality. Fully realizing patient care ambitions will require:

- a supporting payment mechanism;
- provider status for pharmacists under Medicare;
- a commitment to obtaining and maintaining the knowl-

edge, skills and abilities required by increased patient care demands;

- fully embracing the tenets of pharmaceutical care;
- expansion of both professional and post-PharmD educational programs in order to grow the total size of the profession.

The profession of pharmacy should not only continue to emphasize improved utilization of its members, but also move rapidly to increase the overall size of its enterprise. To the extent that the workforce of pharmacists does not expand fast enough to meet professionally-determined needs for pharmaceutical care, that care will either not be provided or will be provided through other means.

References

- (1) Gans, J.A., A shortage of pharmacists to do what? *Pharmacy Today*, (February 2001) p.3.
- (2) Manasse, H.R. *Medication Use in an Imperfect World*, ASHP Foundation, Bethesda MD (1989).
- (3) Avorn, J., "Improving drug use in elderly patients: Getting to the next level," *JAMA*, **286**(22), 2866-2868(2001).
- (4) Zahn, C., Sangi, J., Bierman, A.S., et al., "Potentially inappropriate medication use in the community-dwelling elderly: Findings from the 1996 Medical Expenditure Panel Survey," *JAMA*, **286**(22), 2823-2829(2001).
- (5) Knowlton, C.H., "The practice of community pharmacy," in *Remington: The Science and Practice of Pharmacy* (edit. Gennardo, A.R.) Mack Publishing Company, Easton, PA (1995) p. 27.
- (6) Anderson, A., *Pharmacy Activity Cost and Productivity Study*, National Association of Chain Drug Stores, Alexandria VA (1999).
- (7) *Industry Profile 2001*, National Association of Chain Drug Stores, Alexandria VA (2001).
- (8) Millonig, M.K., Salvatore, P. and Weintraub, D.S., *Preparing for the Biotech Pipeline Explosion: The Imminent Impact on Healthcare Delivery*, HDMA Healthcare Foundation, Reston VA (2001).

APPENDIX A. BACKGROUND READINGS

Workforce Forecasting and the Context of Health Care

Reinhardt, U.E., "Health manpower forecasting: The case of physician supply," in: *Health Services Research: Key to Health Policy*, (Ginsberg, E.) Harvard University Press, Cambridge MA, (1991) pp. 234-283.

"Demographic trends," in: *Informing the Future: Critical Issues in Health Care*, Institute of Medicine. Washington DC (2000) pp. 25-31.

Committee on Quality of Health Care in America, *Crossing the Quality Chasm: A New Health System for the 21st Century*, National Academy Press, Washington DC (2001).

Green, L.A., Fryer, G.E. Jr., Yawn, B.P., Lanier, D. and Dovey, S.M., "The ecology of medical care revisited," *N. Eng. J. Med.*, **344**(26), 2021-2025(2001).

Millonig, M.K., Salvatore, P. and Weintraub, D.S., *Preparing for the Biotech Pipeline Explosion: The Imminent Impact on Healthcare Delivery*, HDMA Healthcare Foundation, Reston VA (2001).

General Views of Professionally-Determined Needs for Pharmacists

Educational Outcomes, American Association of Colleges of Pharmacy, Alexandria VA (1998).

American College of Clinical Pharmacy, "A vision of pharmacy's future roles, responsibilities, and manpower needs in the United States," *Pharmacotherapy*, **20**(8), 991-1022(2000).

American College of Clinical Pharmacy, "ACCP manpower white paper alternative viewpoints," *Pharmacotherapy*, **21**(1): 116-127(2001).

NACDS/APhA/NCPA, *White Paper: Implementing Effective Change in Meeting the Demands of Community Pharmacy Practice in the United States*, The Associations, Washington DC (August 1999).

Academy of Managed Care Pharmacy, *Pharmacy's Framework for Drug Therapy Management in the 21st Century*, AMCP,

Alexandria VA (2001).

Knapp, D.A., Koda-Kimble, M.A., Rutledge, C.O., Kabat, H.F., and Cohen, J.L., "Report of the 1999-2000 Argus Commission: Pharmaceutical education and the pharmacy workforce: Should we expand our programs?" *Am. J. Pharm. Educ.*, **64**, 4S-5S(2000).

Knapp, D.A., "Pharmacy practice in 2040," *Am. J. Hosp. Pharm.*, **49**, 2457-2461(1992).

Supply and Demand

Health Resources and Services Administration, *The Pharmacist Workforce: A Study of the Supply and Demand for Pharmacists*, Health Resources and Services Administration, U.S. Department of Health and Human Services, Rockville MD (2000).

Knapp, K.K., "Building a pharmacy work force mosaic: New studies help to fill in the gaps," *J. Am. Pharm. Assoc.*, **40**(1), 26-35(2000).

Shih, Y.C.T., "Trends in full-time pharmacists' labor market characteristics," *J. Am. Pharm. Assoc.*, **40**(1), 26-35(2000).

Quinones, A., and Mason, H., "Characterizing pharmacy part-time practice," *J. Am. Pharm. Assoc.*, **40**(1), 17-25(2000).

Knapp, K.K., "Studies help define new directions in pharmacy workforce research," *J. Am. Pharm. Assoc.*, **40**(5), 654-655(2000).

Schommer, J.C., and Pedersen, C.A., "Pharmacists' work activities in two Midwestern states," *J. Am. Pharm. Assoc.*, **41**(5), 760-761(2001).

Mott, D.A., Sorofman, B.A., Kreling, D.H., Schommer, J.C. and Pedersen, C.A., "A four-state summary of the pharmacy workforce," *J. Am. Pharm. Assoc.*, **41**(5), 693-702(2001)

Walton, S.M. and Cooksey, J.A., "Differences between male and female pharmacists in part-time status and employment setting," *J. Am. Pharm. Assoc.*, **41**(5), 703-708(2001).

Knapp, K., *Aggregate Demand Index: 1999-2001*, Western University of Health Sciences, Pomona CA (2001).

Dispensing and Prescription Order Fulfillment

Schneider, P., "Pharmacy's changing role in dispensing and administration," *Am. J. Hosp. Pharm.*, **57**, 1755(2000).

Ringold, D.J., Santell, J.P. and Schneider, P.J., "ASHP national survey of pharmacy practice in acute care settings: Dispensing and administration - 1999," *Am. J. Hosp. Pharm.*, **57**, 1760-1775(2000).

"Prescription drug supply system map," *Am. J. Hosp. Pharm.*, **56**, 1384(1999).

Frazier, M., "Chains turning to automation, technicians to reduce costs and answer shortage of pharmacists," *Cleveland Plain Dealer*, September 11, 2001.

Posey, M.L., "Electronic physicians order entry: Segue to a fully automated medication system," *Pharmacy Today*, September 2001.

Primary Pharmaceutical Care

Knapp, K.K., Paavola, F.G., Maine, L.L., Sorofman B. and Politzer, R.M., "Availability of primary care providers and pharmacists in the United States," *J. Am. Pharm. Assoc.*, **39**(2), 127-135(1999).

Knapp, K.K., "Charting the demand for pharmacists in the managed care era," *Am. J. Hosp. Pharm.*, **56**, 1309-1314(1999).

Knapp, K.K., "ASHP survey of ambulatory care responsibilities of pharmacists in managed care and integrated health systems - 1999," *Am. J. Hosp. Pharm.*, **56**, 2431-2350(1999)

Pedersen, C.A., Schneider, P.J., Santell, J.P., and Kelly, E.J. "ASHP national survey of pharmacy practice in acute care settings: Monitoring, patient education, and wellness - 2000," *Am. J. Hosp. Pharm.*, **57**, 2171-2187(2000).

Secondary and Tertiary Pharmaceutical Care

Murphy, J.E., Sickels, J. Bradberry, J.C., Curry, C.E., Jungnickel, P.W. and Prosser, T., "Opportunities for pharmacy specialists as the delivery of health care changes," *Am. J. Hosp. Pharm.*, **56**, 1342-1347(1999).

Seeger, D.L., "Computerized POE: Changing roles for the clinical pharmacist," *J. Am. Pharm. Assoc.*, **39**(5), 710(1999).

Lieder, T.R., "Computerized prescriber order entry changes pharmacists' roles," *Am. J. Hosp. Pharm.*, **58**, 846-851(2001).

Non Direct Patient Care Need for Pharmacists

- Hitchens K., "Few health professionals entering clinical research," *Drug Topics*, 98, (December 11, 2000):
Walker, S.E., Schafermeyer, K.W., Rickert, D.R. and Hurd, P.D., "Opportunities for pharmacists as managers: Perceptions of senior executives in the pharmaceutical industry," *J. Am. Pharm. Assoc.*, 39, 41-44(1999).
Sagraves, R., "A workforce issue: Faculty needs," *Am. J. Pharm. Educ.*, 65, 92(2001).
Penna, R.P., "Academic pharmacy's own workforce crisis," *Am. J. Pharm. Educ.*, 63, 453(1999).

Katherine Knapp
Professor and Director
Center for Pharmacy Practice Research and Development
Western University of Health Sciences College of Pharmacy
Pomona CA

Calvin Knowlton
CEO and Chairman
ExcelleRx, Inc.
Philadelphia PA

Lucinda Maine
Senior Vice President
American Pharmaceutical Association
Washington DC

Bruce McWhinney
Senior Vice President
Quality and Clinical Affairs
Cardinal Health
Dublin OH

Colleen Metge
Associate Professor
Faculty of Pharmacy
University of Manitoba
Winnipeg MB
Canada

Laura Miller
Economist
National Association of Chain Drug Stores
Alexandria VA

Marsha Millionig
Vice President, Research and Information
HDMA Healthcare Distribution Management Association
Reston VA

Deborah Neels
Assistant to the Dean
University of Maryland School of Pharmacy
Baltimore MD

John Ogden
Chief Consultant for Pharmacy Benefits Management
Department of Veterans Affairs
Veterans Health Administration
Burke VA

Richard Penna
Executive Vice President
American Association of Colleges of Pharmacy
Alexandria VA

Magaly Rodriguez deBittner
Associate Professor
University of Maryland School of Pharmacy
Baltimore MD

Robert Sikora
Vice President, Clinical Education Consultants
Pfizer, Inc.
New York NY

William Zellmer
Deputy Executive Vice President
American Society of Health-System Pharmacists
Bethesda MD

APPENDIX B. PARTICIPANT ROSTER

Lowell Anderson
Chief Executive Officer
Bel-Aire Pharmacy
White Bear Lake MN

Daniel Ashby
Director of Pharmacy
Johns Hopkins Hospital
Baltimore MD

Robert Blyskal
Vice President, Operations
Merck-Medco
Franklin Lakes NJ

Chester Bond
Professor, Pharmacy Practice
Texas Tech University School of Pharmacy
Amarillo TX

Barry Carter
Professor
Colleges of Pharmacy and Medicine
University of Iowa
Iowa City IA

Thomas Clark
Director, Professional Affairs
American Society of Consultant Pharmacists
Alexandria VA

Ronald Clerico
Vice President & General Manager
Autonomics/Amerisource Bergen
Columbus OH

Judith Cooksey
Director
Illinois Center for Health Workforce Studies
University of Maryland Baltimore,
University of Illinois at Chicago
Baltimore MD

Clarence Curry
Associate Professor
Howard University School of Pharmacy
Washington DC

Dennis Helling
Director, Pharmacy Operations
Kaiser Permanente of Colorado
Aurora CO

David Knapp
Professor and Dean
University of Maryland
School of Pharmacy
Baltimore, MD