

Pharmacist Contributions to the U.S. Health Care System

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ABSTRACT

Objective: The overall goal for this study was to conduct a segment analysis of the pharmacist workforce during 2009 based upon time spent in medication providing and in patient care services.

Methods: Data for this study were obtained from the 2009 National Pharmacist Workforce Survey in which a random sample of 3,000 pharmacists was selected. Cluster analysis was used for identifying pharmacist segments and descriptive statistics were used for describing and comparing segments.

Results: Of the 2,667 surveys that were presumed to be delivered to a pharmacist, 1,395 were returned yielding a 52.3% overall response rate. Of these, 1,200 responses were usable for cluster analysis. Findings from this study revealed five segments of pharmacists: (1) Medication Providers, (2) Medication Providers who also Provide Patient Care, (3) Other Activity Pharmacists, (4) Patient Care Providers Who also Provide Medication, and (5) Patient Care Providers. The results showed that, in 2009, 41% of U.S. pharmacists were devoted wholly to medication providing (Medication Providers). Forty-three percent of pharmacists contributed significantly to patient care service provision (Medication Providers who also Provide Patient Care, Patient Care Providers who also Provide Medication, and Patient Care Providers) and the remaining 16% (Other Activity Pharmacists) contributed most of their time to business / organization management, research, education, and other health-system improvement activities.

Conclusions: Based on the findings, we propose that the pharmacy profession currently has, and will continue to build, capacity for contributing to the U.S. health care system in new roles for which they have been identified. However, as shifts in professional roles occur, a great deal of capacity is required related to new service provision. Resources are scarce, so an understanding of the most appropriate timing for making such changes can lead to cost-effective use of limited resources for improving patient care.

Acknowledgements

The preparation of this manuscript was based upon research funded by the American Pharmacists Association (APhA) through an unrestricted grant from Wyeth Pharmaceuticals and by a grant from the Pharmacy Manpower Project (PMP), Inc., Alexandria, VA. We gratefully acknowledge APhA staff (Anne Burns, Maria Gorrick, Judy Lofton, James Owen, Deborah Ruddy, and Margaret Tomecki) and PMP staff (Arlene Flynn, Lucinda Maine, and Whitney Zatzkin) with whom we collaborated for this project. We appreciate the useful comments on earlier versions of this paper from Ronald Hadsall, Donald Uden, and Akeem Yusef, University of Minnesota.

Introduction

Health care cannot function without medicines and pharmacists serve important roles for helping assure that the use of medicines results in the highest likelihood of achieving desired health and economic outcomes. In addition to the safe and efficient distribution and provision of medications, pharmacists have provided clinical expertise regarding selection, handling, preparation, procurement, and utilization of medications in patients [1] and, more recently, making sure that drugs reach their full potential for patients in

society [2]. This implies a use of medications that is safe, effective, appropriate, affordable, cost-effective, efficient, and specific to the needs of a given patient [3-6]. Pharmacists have been identified as important contributors to the healthcare system serving such expanded roles as (1) medication care coordinators for patient-centered medical homes [7-8] and primary care teams [9-12], (2) members of chronic disease management teams that focus on 'episodes' of care in which related services are packaged together [11, 13-14], and (3) being the healthcare professional responsible for ensuring optimal medication therapy outcomes through

medication therapy management (MTM) service provision [3, 11, 15-22].

Continued growth in medication use by society and the expansion of the pharmacist's role in direct patient care continue to generate demand for pharmacist expertise and services [23]. At the same time, increased efficiencies for pharmacists' medication providing roles have been achieved through the use of advanced logistics (e.g. centralized fill), technicians, and technology (e.g. bar code scanning, e-prescribing, robotics) [23]. It appears that the pharmacy profession has reached a point in which new roles for pharmacists are being adopted [1-22] and traditional roles are being filled by other workers, systems, or technology [23].

As such points are reached, a great deal of capacity is required related to new service provision as well as strategic decisions regarding educational training, professional training and redeployment, updates to practice acts and regulations, new documentation and billing systems, enhanced information exchange, infrastructure, technology, policy, and new business models [24, 25]. Resources are scarce, so an understanding of the most appropriate timing for making such changes can lead to cost-effective use of limited resources for improving patient care [25].

To help ensure the profession's capacity for its emerging roles in health care, the pharmacy profession has become more patient focused resulting in reforms for both pharmacy education and practice [26]. On June 30, 2004, the Accreditation Council for Pharmacy Education standards for five-year Bachelors of Pharmacy programs expired and the six-year Doctor of Pharmacy (Pharm.D.) became the sole accredited professional degree for pharmacy in the United States (www.acpe-accredit.org). In addition to the Pharm.D. as the entry-level professional degree for pharmacists, specialized residency training for pharmacists has increased (www.ashp.org). It is estimated that 2,300 (23 percent) of the roughly 10,000 pharmacy school graduates in 2008 sought residency training after graduation (www.ashp.org).

As a result of the evolution in pharmacy education, pharmacists are now trained with a focus and level of expertise in medication therapy management that exceeds any other health care provider's [15]. Individuals graduating with a Pharm.D. degree have the knowledge, skills and expertise to optimize therapeutic outcomes and improve the medication use system. As a result, pharmacists have gained recognition as "medication therapy experts" [15].

Due to changes in how pharmacists have been trained over time, not all pharmacists currently possess the same set of

competencies and experiences. In addition, pharmacists differ in terms of their work activities [27]. In light of the recognition of pharmacists' expanded roles and the need for strategic decisions regarding the cost-effective use of limited resources, our goal for this study was to conduct a segment analysis of the pharmacist workforce during 2009. Such a segmentation approach would identify key clusters (segments) of the pharmacist workforce and provide a description of their characteristics so that projections could be made regarding future pharmacy profession capacity as cohorts of pharmacists exit the workforce and newly trained pharmacists join the workforce. In light of the expansion of the pharmacist's role in direct patient care and congruent training in such roles, our segment analysis was based upon pharmacists' time devoted to medication provision (their traditional role) and to patient care services (their emergent role).

Study Objectives

The overall goal for this study was to conduct a segment analysis of the pharmacist workforce during 2009. The objectives were to:

1. Identify segments of pharmacists based upon time spent in medication providing and patient care services.
2. Describe segments according to demographic characteristics.
3. Describe segments according to work contributions.
4. Describe segments by work setting.
5. Describe segments according to work activities.
6. Describe age cohorts and year of licensure cohorts to identify trends that may impact future pharmacist capacity for contributing to the U.S. health care system.

Methods

Data for this study were obtained from the 2009 National Pharmacist Workforce Survey in which a random sample of 3,000 pharmacists was selected for a national, cross-sectional, descriptive survey. [27]. Questions comprising each section of the survey were taken from previous workforce surveys conducted by members of the project team [28-29].

We obtained a random sample of 3,000 licensed pharmacists in the United States from KM Lists, Inc., a company that maintains a list of licensed pharmacists in the United States from every state. At the time of our study, this list contained 249,381 unduplicated licensed individuals and was cleaned and updated whenever a state board of pharmacy provided an updated file. They have no states that refuse to give them

the information. A randomly selected sample of 3,000 names and mailing addresses from this file was selected and provided to us in electronic format. We incorporated this file into a database program to generate mailing labels for the survey.

A mailed questionnaire with multiple follow-up was designed using principles from Dillman [30] in which a four-contact approach was utilized: (1) pre-notification letter, (2) survey packet, (3) postcard reminder, and (4) survey packet mailed to non-responders. Surveys were returned to the University of Minnesota, College of Pharmacy and processed for data entry. A database structure was created and responses coded according to the survey code book. Data were extracted from the database and analyzed for this report using a two-step cluster analysis, with SPSS version 16.0 statistical software. The SPSS two-step cluster analysis uses a scalable cluster algorithm. The first step of the analysis is to 'pre-cluster' each case (record) into many small sub-clusters through a sequential clustering approach. The second step of the analysis is to 'cluster the sub-clusters' resulting from step one into the final cluster solution using an agglomerative hierarchical clustering method. The log-likelihood distance measure (a probability-based distance) is applied for each step of the analysis so that both continuous and categorical variables can be used if so desired.

For our analysis we utilized two continuous variables for defining clusters: (1) percent time spent in medication providing activities and (2) percent time spent in patient care activities at each respondent's primary place of employment. These were two of the six work activities we included for the 2009 survey which were defined as:

- **Medication Providing:** preparing, distributing, and administering medication products, including associated consultation, interacting with patients about selection and use of over-the-counter products, and interactions with other professionals during the medication providing process.
- **Patient Care Services:** assessing and evaluating patient medication-related needs, monitoring and adjusting patients' treatments to attain desired outcome, and other services designed for patient care management.
- **Business / Organization Management:** managing personnel, finances, and systems.
- **Research:** discovery, development, and evaluation of products, services, and/or ideas.

- **Education:** teaching, precepting, and mentoring of students/trainees.
- **Other Activities:** any activities not described in other categories.

Our primary goal was to identify pharmacist segments and describe them using descriptive statistics within the context of the new roles for pharmacists that we mentioned in the introduction of this paper. It should be noted that medication providing is an important patient care service and our use of the terminology "patient care services" may be confusing. For clarification, it should be noted that "**medication providing**" primarily uses the medication as the unit of focus for service provision. It is typically focused on prescription order fulfillment but includes an array of professional activities in which pharmacists are responsible to the technical functions of providing a prescription product, assuring that the correct drug product is provided, identifying and resolving drug-drug interactions, conversing with prescribers about dose or directions, and patient counseling about proper use.

For the purpose of this study, the designation "**patient care services**" uses the patient as the unit of focus and can be provided independent from any medication being provided to the patient. This service typically is a team-based clinical role providing patient-centered medication therapy management, health improvement, and disease prevention services [31].

After pharmacist segments were identified, we described them using Chi-Square and Analysis of Variance (ANOVA) statistics.

Results

Of the 3,000 individuals contained in our random sample, 333 (11%) were considered "undeliverable or not applicable" for the study. Of the 2,667 surveys that were presumed to be delivered to a pharmacist, 1,395 were returned yielding a 52.3% overall response rate. Responses received on August 15, 2009 or later were not included for analysis. Thus, 1,391 surveys were entered into our data file (52.2% usable response rate).

For inclusion in cluster analysis, respondents needed to report both their percent time devoted to medication providing and to patient care services. Respondents who reported that they were: (1) retired, do not practice pharmacy at all, (2) employed in a career not related to pharmacy, or (3) unemployed were not asked the work activity questions and, thus, not included for analysis. Respondents who were included for analysis were those who

reported that they were: (1) practicing as a pharmacist, (2) employed in a pharmacy-related field or position, or (3) retired, but still working in pharmacy or employed part-time as a pharmacist. A total of 1,200 respondents provided usable responses for cluster analysis.

Cluster analysis identified five segments of pharmacists that we labeled as: (1) Medication Provider, (2) Medication Provider who also provides Patient Care, (3) Other Activity Pharmacist, (4) Patient Care Provider who also Provides Medication, and (5) Patient Care Provider. Figure 1 shows the proportion of pharmacists in each of the five segments and Table 1 provides a description of each segment in terms of time devoted to medication providing and patient care services.

Table 2 provides summary comparisons among the five segments in terms of (1) demographic characteristics, (2) work contributions, (3) work settings by column %, (4) work settings by row %, (5) time currently spent in work activities, and (6) time desired to spend in work activities. Chi-square and Analysis of Variance statistics were used for describing the segments. In light of the exploratory nature of our cluster analysis to identify segments, we treated ANOVA findings as exploratory as well. Complete results (including post hoc analysis ANOVA testing) are available from the corresponding author. The five pharmacist segments are discussed next.

MEDICATION PROVIDERS

In our study, this group (41% of pharmacists employed in pharmacy or in a pharmacy-related field) devoted an average of 88% of their time to medication providing and only 5% to patient care services as defined in this study. Table 2 shows that they were the oldest of the five segments, on average. Fifty-nine percent of this segment were male, only 17% had a PharmD degree, and only 3% had residency training. This segment contributed the fewest hours worked per week of any segment and 79% were working in urban areas with a population over 50,000. This segment of pharmacists primarily worked in community pharmacy practice settings (78%) and 60% of respondents who worked in community practice settings were identified as being in the "Medication Provider" segment of pharmacists. The findings showed that the Medication Providers would like to decrease the proportion of time they devote to medication providing (from 88% to 71%) and increase the proportion of time they devote to patient care services (from 5% to 16%).

MEDICATION PROVIDERS WHO ALSO PROVIDE PATIENT CARE

This segment (25% of pharmacists employed in pharmacy or in a pharmacy-related field) devoted an average of 65% of their time to medication providing and 19% to patient care

services as defined in this study. Table 2 shows that they were the second oldest of the five segments, on average. Fifty-two percent of this segment were male, only 17% had a PharmD degree, and only 4% had residency training. This segment contributed an average of 38 hours worked per week and 79% were working in urban areas with a population over 50,000. Two-thirds of this segment of pharmacists worked in community pharmacy practice settings (67%) and one-quarter (25%) worked in hospital practice settings. The results showed that the Medication Providers who also Provide Patient Care would like to decrease the proportion of time they devote to medication providing (from 65% to 52%) and increase the proportion of time they devote to patient care services (from 19% to 31%).

OTHER ACTIVITY PHARMACISTS

This segment (16% of pharmacists employed in pharmacy or in a pharmacy-related field) devoted an average of only 5% of their time to medication providing and only 3% to patient care services as defined in this study. Table 2 shows that they were the third oldest of the five segments, on average. Sixty percent of this segment were male, 42% had a PharmD degree, and 19% had residency training. This segment contributed the most hours worked per week of any segment and 93% were working in urban areas with a population over 50,000. The findings showed that 45% of this segment of pharmacists worked in 'other, setting not licensed as a pharmacy,' and 30% worked in a hospital setting. In addition, 83% of respondents who worked in 'other, setting not licensed as a pharmacy' were identified as being in the "Other Activity Pharmacist" segment of pharmacists. Other Activity Pharmacists are currently spending about their desired time in the various work activities we studied.

PATIENT CARE PROVIDERS WHO ALSO PROVIDE MEDICATION

This segment (12% of pharmacists employed in pharmacy or in a pharmacy-related field) devoted an average of 33% of their time to medication providing and 43% to patient care services as defined in this study. Table 2 shows that they were the youngest of the five segments, on average. Sixty-four percent of this segment were female, 40% had a PharmD degree, and 25% had residency training. This segment contributed the second fewest hours worked per week of any segment and 88% were working in urban areas with a population over 50,000. The results showed that 54% of this segment of pharmacists worked in hospital settings, 23% worked in community pharmacy practice settings, and 16% worked in 'other, licensed pharmacy settings.' The Patient Care Providers Who Also Provide Medication would like to decrease only slightly the proportion of time they devote to medication providing (from 33% to 26%), keep the time they devote to patient care about the same (43% actual and 44%

desired), but increase slightly the proportion of time they devote to research and education.

PATIENT CARE PROVIDERS

In our study, this group (6% of pharmacists employed in pharmacy or in a pharmacy-related field) devoted an average of just 5% of their time to medication providing and 82% to patient care services as defined in this study. Table 2 shows that they were the second youngest of the five segments, on average. Fifty-nine percent of this segment were female, 53% had a PharmD degree, and 26% had residency training. This segment contributed the second highest number of hours worked per week of any segment and 92% were working in urban areas with a population over 50,000. Almost two-thirds (64%) of this segment worked in hospital pharmacy practice settings and less than 1% of respondents who worked in community practice settings were identified as being in the "Patient Care Provider" segment of pharmacists. Patient Care Provider Pharmacists are currently spending about their desired time in the various work activities we studied.

AGE AND YEAR OF LICENSURE COHORTS

Tables 3 and 4 summarize comparisons for U.S. pharmacist age and year of licensure cohorts and provide insight regarding future pharmacy profession capacity as cohorts of pharmacists exit the workforce and newly trained pharmacists join the workforce. For example, Table 3 shows that pharmacists over the age of 60 are typically male, not likely to hold a PharmD degree, and not likely to have residency training. In comparison, pharmacists who are 35 years old or younger are very different, with most being female, holding a PharmD degree, and a significant proportion having residency training. It is not surprising that younger pharmacists are more likely to comprise the 'Other Activity Pharmacist,' 'Patient Care Provider who also Provides Medication,' and 'Patient Care Provider' segments and that older pharmacists are more likely to comprise the 'Medication Provider' and 'Medication Provider who also Provides Patient Care' segments in light of trends in pharmacist training. Table 4 shows similar findings when Year of Licensure cohorts are described. The transformations that took place among years of licensure cohorts are particularly striking for the gender, holding a PharmD degree, and residency training variables.

Discussion

We identified five pharmacist segments using data from a survey of a random sample of pharmacists conducted in 2009. The findings showed that recent transformations in pharmacy education regarding the Doctor of Pharmacy (Pharm.D) degree as the sole accredited professional degree

for pharmacy in the United States and the increase in pharmacist residency training has created new competencies which translate into capacity in the pharmacy profession for taking on expanded responsibility for optimizing medication use in the U.S. health care system.

The findings showed that, in 2009, 41% of U.S. pharmacists were devoted wholly to medication providing (Medication Providers). Forty-three percent of pharmacists contributed significantly to patient care service provision (Medication Providers who also Provide Patient Care, The Patient Care Providers who also Provide Medication, and The Patient Care Providers) and the remaining 16% (Other Activity Pharmacists) contributed most of their time to business/organization management, research, education, and other health-system improvement activities. However, pharmacists who are most visible to the public work in community pharmacy practice settings and almost eight out of 10 pharmacists who are "Medication Providers" work in these publicly visible and accessible settings. Such visibility of Medication Providers may give a public impression that is not completely accurate regarding the capacity for pharmacist provision of patient care and for the complete scope of pharmacist contributions to the U.S. health care system.

The findings also showed that older pharmacists, who are more likely to exit the workforce before younger pharmacists will, are most likely to be in the "Medication Provider" segment of pharmacists. Thus, as over 10,000 new pharmacists are being licensed each year under the new paradigm of training and the older pharmacists exit the workforce, the capacity of the pharmacist workforce for provision of patient care is likely to be even more pronounced.

The findings also suggest that pharmacists who may be in the "Medication Provider" or the "Medication Provider who also Provides Patient Care" segments, but not likely to exit the workforce in the near future, would be open to retraining and redeployment. These pharmacists reported that they would like to spend less time in medication providing and more time in provision of patient care services (see Tables 3 and 4). We propose that the majority of these pharmacists would be willing to move into more patient care services roles as training and opportunities for redeployment present themselves. These findings are consistent with the Holland-Nimmo practice change model [32-36] and guidance for making this transition already exists for the pharmacy profession [32-36].

Based on our findings, we propose that the pharmacy profession currently has, and will continue to build, capacity

for contributing to the U.S. health care system in roles for which they have been identified which include: (1) medication care coordinators for patient-centered medical homes [7-8] and primary care teams [9-12], (2) members of chronic disease management teams that focus on ‘episodes’ of care in which related services are packaged together [11, 13-14], and (3) being the healthcare professional responsible for ensuring optimal medication therapy outcomes through medication therapy management (MTM) service provision [3, 11, 15-22]. However, as shifts in professional roles occur, a great deal of capacity is required related to new service provision as well as strategic decisions regarding educational training, professional training and redeployment, updates to practice acts and regulations, new documentation and billing systems, enhanced information exchange, collaborative practice models, infrastructure, technology, policy, and new business models. Resources are scarce, so an understanding of the most appropriate timing for making such changes can lead to cost-effective use of limited resources for improving patient care [25]. In the next section of this paper, we propose several ideas to consider as pharmacist capacity is further developed and integrated into the U.S. healthcare system.

Ideas for Consideration as Pharmacist Capacity is Developed and Integrated into Healthcare

Our findings identified five clusters (segments) of pharmacists and our description of these segments provided insight regarding how the pharmacist workforce might evolve in terms of capacity for patient care over time. In light of these findings, we offer eight ideas for consideration as pharmacist capacity is further developed and integrated into the U.S. healthcare system.

First, what are future training needs for pharmacists to connect their capacity with future health care system needs? We suggest that continual improvements to Doctor of Pharmacy (Pharm.D.) training will be needed; especially the development of team-based, interprofessional training that will help health care providers learn about and experience team-based patient care. Also, expansion of pharmacy residencies (with suitable funding for such training) could help meet the advanced training needs for pharmacists. We propose that efforts to create “industry norms” that would require pharmacy residency training as a condition for certain types of pharmacist employment would help position such residencies for legitimate consideration of graduate medical education (GME) funding. Such norms also could provide assurances to other healthcare professionals regarding pharmacists’ competence for providing patient care.

Second, community pharmacy practice business models are still focused primarily on medication providing. There are new models emerging in community pharmacies that utilize advanced logistics (e.g. centralized fill), technology (e.g. bar code scanning, e-prescribing, robotics), technicians, specialty pharmacy services, corporate (in-house) pharmacies, and new patient care service models. However, we believe that it is important to monitor the rate of discontinuance for some community pharmacy business models as well as monitoring the adoption of new business models that would help pharmacists fulfill their potential in the health care system [24-25]. Where and how pharmacists might contribute to ensure access to medications and associated services are questions that will need to be addressed. In addition, supply and demand balance or imbalance for pharmacists should be monitored as these changes occur.

Third, pharmacy practice acts and other health profession practice acts (that define scope of practice) will need updating on an ongoing basis to reflect and accommodate new roles for health professionals and for team-based care. In pharmacy, the National Association of Boards of Pharmacy (www.napb.net) could take the lead for updating the Pharmacy Model Practice Act that could be utilized by state boards of pharmacy as they develop their states’ practice acts. New thinking about what embodies pharmacy practice in the health care system is continually needed. Agreement on such things as provider status and scope of practice is needed, including consensus from other health care fields and systems.

Fourth, significant work and progress are needed regarding the alignment of payment policies for not only supporting new roles and services but also to provide adequate payment for the providers of these services and evidence of cost-effectiveness for payers of these services. According to the 2008, 2009, and 2010 Medication Therapy Management Digests and Environmental Scans [37-40], the most significant barriers to offering Medication Therapy Management services for pharmacist providers were related to billing, staffing adjustments, and payment levels. For the payers of these services, the most significant challenges to overcome were related to getting patients to engage in the service offerings, evidence of tangible outcomes, and having sufficient numbers of service providers in their patient population service areas. Alignment of payment policies would help overcome some of these barriers for both providers and payers.

Fifth, we propose that flexibility in medical / health care home designs could create innovative and responsive practice structures that integrate pharmacist expertise for

medication therapy coordination and management under varying geographic regions, practice setting types, and patient population types [8]. Balancing such flexibility with the need for standards of care is a challenge that needs to be addressed in the reforming health care system.

Sixth, all members of collaborative health care teams, including pharmacists, must have access to necessary patient health and treatment records to support and inform their patient care service and decision-making functions [8]. Such access should include both the authority and responsibility to input information into these records to facilitate team-based collaborative care. Coming to consensus about what information is (1) proprietary, (2) related to business functions, and (3) related to patient health and treatment is not an easy task. However, we believe it will have immense impact on the ability of pharmacists to contribute their full capacity to the developing health care system.

Seventh, discussion regarding pharmacists' contributions to patient care that is comprised of bundles of services into "episodes of care" will be important. By packaging related services together in a way that supports high-quality, lower-cost care, providers, payers, and patients could begin to view episodes of care as a unified patient care experience rather than a series of disparate services. For example, products and services associated with the treatment of diabetes could be bundled in a way to influence overall pay-for-performance outcome measures. Pharmacist capacity for medication coordination throughout the whole episode of care could be valuable for improving quality and avoiding waste in medication therapy. As mentioned previously, payment redesign in addition to care redesign will need to be addressed to bring pharmacists' full capacity to fruition.

Finally, we suggest that efforts to help bring the U.S. health consumer's perceptions of pharmacists and the roles they play in health care more in line with pharmacists' true capacity for patient care would be helpful in making transformations in health care. We believe that consensus within the pharmacy profession and collaborative health care teams overall regarding processes of pharmacist-provided patient care and language that is used as care is provided to patients would have more impact on changing patients' perceptions than public service campaigns or advertising. For example, pharmacists who hold a Pharm.D. degree could be referred to as the patient's Doctor of Pharmacy. This would not only identify the practitioner's training but also identify his or her area of expertise. This idea is similar to telling patients that they will see their Doctor of Internal Medicine or their Doctor of Orthopedics.

Another example of building consensus for the purpose of creating clear expectations to patients would be to refer to medication therapy and coordination visits in a common way. Currently, the term "Medication Therapy Management" is being used. Bringing consensus to the term used and placing it into common usage would help advance the public's perception of pharmacists' roles in the health care system. We believe that the public should be clear regarding the different roles that their prescription order fulfillment pharmacist has in comparison to their medication therapy management pharmacist. This is similar to the different roles that are identified with different physicians (e.g. internal medicine physician and surgeon).

Limitations

The results and our interpretation of them should be tempered with the limitations of the study. The results are based on respondents' self reports, raising questions regarding the extent to which respondents gave socially desirable responses.

Pharmacist respondents were geographically diverse in that all regions of the United States were represented in proportion to the U.S. population and in proportion to our sampling frame [27]. However, some individual states were over-represented (e.g. Montana) and some states were under-represented (e.g. New Mexico) [27]. Thus, while we achieved good geographic coverage, some states were disproportionately represented in this study. To overcome this limitation, we analyzed only aggregate data and not state- or region-specific data.

Non-response bias is another limitation. It is possible that responders were more interested in the topic we studied or had stronger opinions about the questions we asked than those who chose not to respond. Our evaluation of non-response bias showed that late responders were more likely to be: working as a pharmacist, younger, and having a PharmD degree than early responders. These same characteristics are likely to be reflected in the non-responders to this study and should be considered when interpreting the reported findings.

For our analysis, usable data from respondents working in pharmacy or a pharmacy related field were used. While our findings are representative of pharmacists working in pharmacy or a pharmacy related field, it should be noted that our analysis did not include licensed pharmacists who were outside of these domains (retired, unemployed, or working outside of a pharmacy related field).

The definitions we used for medication providing and patient care services were newly developed for the 2009 survey and differed from previous national pharmacist workforce surveys conducted in 2000 and 2004 [27-29]. Thus, no comparisons were possible to previous years. However, we developed the work activity definitions based upon what we learned from earlier surveys, namely that pharmacists view medication providing and associated patient counseling as a unified process and service. We reflected that notion for our 2009 survey and defined patient care services as being separate from the medication providing process. Our findings suggest that responders were able to interpret our new definitions in the manner in which we developed them and that our findings can be considered an accurate reflection of pharmacist work.

Our cluster analysis was based upon one national sample of pharmacists. In order to test the stability of our cluster analysis, we replicated our analysis using data from the 2009 Minnesota Pharmacy Workforce Survey [41]. Using those data, the same five clusters were achieved with extremely similar results for the descriptions of each cluster. Findings from that analysis are available from the corresponding author.

Finally, all of the respondents to this survey were first licensed before 2007. Therefore, even though our survey was conducted in 2009, our sampling frame had a lag time so that pharmacists newly licensed from 2007 through the present were not included in the sample. This limitation must be considered, especially when interpreting findings related to year of licensure, age, or other time dependent variable. Thus, it is likely that we underestimated the proportion of pharmacists working in patient care areas since younger pharmacists typically took on those roles.

Conclusions

Findings from this study revealed five segments of pharmacists: (1) Medication Providers, (2) Medication Providers who also Provide Patient Care, (3) Other Activity Pharmacists, (4) Patient Care Providers who also Provide Medication, and (5) Patient Care Providers. The findings showed that older pharmacists, who are most likely to exit the workforce before younger pharmacists do, are most likely to be in the "Medication Provider" segment of pharmacists. Thus, as over 10,000 new pharmacists are being licensed each year under the new paradigm of training and the older pharmacists exit the workforce, the capacity of the pharmacist workforce for provision of patient care will be even more pronounced. We conclude that recent

transformations in pharmacy education regarding the Doctor of Pharmacy (Pharm.D) degree as the sole accredited professional degree for pharmacy in the United States and the increase in pharmacist residency training has built capacity in the pharmacy profession for taking on expanded responsibility for optimizing medication use in the U.S. health care system.

The findings also suggest that pharmacists who may be in the "Medication Provider" or "The Medication Provider who also Provides Patient Care" segments, but not likely to exit the workforce in the near future, would be open to retraining and redeployment. These pharmacists reported that they would like to spend less time in medication providing and more time in provision of patient care services. We propose that the majority of these pharmacists would be willing to move into more patient care services roles as training and opportunities for redeployment present themselves.

Based on our findings, we propose that the pharmacy profession currently has, and will continue to build, capacity for contributing to the U.S. health care system in new roles for which they have been identified. However, as shifts in professional roles occur, a great deal of capacity is required related to new service provision as well as strategic decisions regarding educational training, professional training and redeployment, updates to practice acts and regulations, new documentation and billing systems, enhanced information exchange, collaborative practice models, infrastructure, technology, policy, and new business models. Resources are scarce, so an understanding of the most appropriate timing for making such changes can lead to cost-effective use of limited resources for improving patient care.

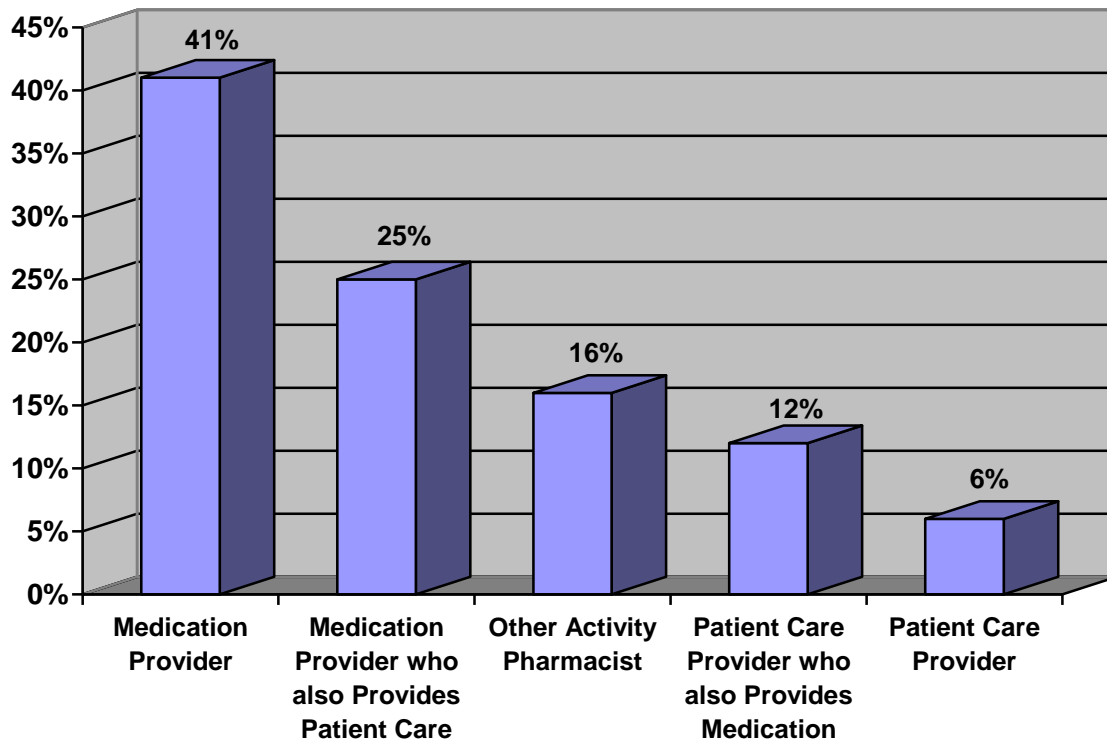
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Figure 1: Proportion of U.S. Pharmacists by Segment in Descending Size

Table 1
Description of Pharmacist Segments

Pharmacist Segment	Segment Size (% of total)	Mean Percentage Time (+/- s. d.) Devoted to Medication Providing	Mean Percentage Time (+/- s. d.) Devoted to Patient Care
1: Medication Provider	n = 496 (41%)	88% +/- 9	5% +/- 4
2: Medication Provider who also Provides Patient Care	n = 303 (25%)	65% +/- 11	19% +/- 7
3: Other Activity Pharmacist	n = 193 (16%)	5% +/- 8	3% +/- 6
4: Patient Care Provider who also Provides Medication	n = 142 (12%)	33% +/- 17	43% +/- 11
5: Patient Care Provider	n = 66 (6%)	5% +/- 8	82% +/- 13
Total	N = 1,200	58% +/- 34	17% +/- 21

Table 2
Comparison of U.S. Pharmacist Segments

	Medication Provider (n = 496)	Medication Provider who also provides Patient Care (n = 303)	Other Activity Pharmacist (n = 193)	Patient Care Provider who also Provides Medication (n = 142)	Patient Care Provider (n = 66)	Overall (n=1,200)
Demographic Characteristics						
Mean Age (years) ANOVA p< 0.001	52.0	50.2	49.2	45.6	47.4	50.1
Female Gender (%) χ^2 p < 0.001	41%	48%	40%	64%	59%	47%
Hold PharmD Degree (%) χ^2 p < 0.001	17%	17%	42%	40%	53%	26%
Mean Year of First Licensure ANOVA p< 0.001	1982	1983	1984	1988	1988	1983
Residency Training (%) χ^2 p < 0.001	3%	4%	19%	25%	26%	9%
White/Caucasian Ethnicity (%) χ^2 p = 0.047	88%	85%	87%	77%	86%	86%
Work Contributions						
Mean Hrs Worked /Wk ANOVA p< 0.001	35.6	38.0	44.7	37.2	39.8	38.1
Work Part Time (30 hrs per week or less) (%) χ^2 p < 0.001	29%	20%	13%	30%	18%	24%
Work in Urban Area with Population Over 50,000 (%) χ^2 p = 0.002	79%	79%	93%	88%	92%	83%
Practicing as a Pharmacist (%) χ^2 p < 0.001	89%	93%	45%	94%	97%	84%
Current Work Setting (Column %) χ^2 p < 0.001						
Community Pharmacy ^a	78%	67%	10%	23%	1%	-
Hospital Setting	15%	25%	30%	54%	64%	-
Other, Licensed Pharmacy Setting ^b	7%	7%	15%	16%	27%	-
Other, Setting Not Licensed as a Pharmacy ^c	<1%	1%	45%	7%	8%	-
Current Work Setting (Row %) χ^2 p < 0.001						
Community Pharmacy ^a (n = 645)	60%	32%	3%	5%	<1%	-
Hospital Setting (n = 325)	23%	24%	17%	23%	13%	-

Other, Licensed Pharmacy Setting ^b (n = 126)	29%	16%	23%	18%	14%	-
Other, Setting Not Licensed as a Pharmacy ^c (n = 104)	1%	2%	83%	10%	5%	-
Mean % of Time Currently Spent in Work Activities						
Medication Providing ANOVA p< 0.001	88%	65%	5%	33%	5%	58%
Patient Care Services ANOVA p<0.001	5%	19%	3%	43%	82%	17%
Business / Organization Management ANOVA p<0.001	5%	10%	41%	9%	3%	12%
Research ANOVA p<0.001	<1%	1%	18%	4%	3%	4%
Education ANOVA p< 0.001	2%	4%	8%	8%	6%	4%
Other ^d ANOVA p< 0.001	1%	1%	25%	5%	2%	5%
Mean % of Time Desired to Spend in Work Activities						
Medication Providing ANOVA p< 0.001	71%	52%	7%	26%	6%	47%
Patient Care Services ANOVA p<0.001	16%	31%	9%	44%	81%	26%
Business / Organization Management ANOVA p<0.001	5%	8%	35%	9%	2%	11%
Research ANOVA p<0.001	21%	3%	20%	7%	4%	6%
Education ANOVA p< 0.001	5%	5%	10%	10%	7%	7%
Other ^d ANOVA p< 0.001	<1%	1%	17%	4%	<1%	4%

^a "Community Pharmacy Practice" included: independent, chain, mass merchandiser and supermarket pharmacies.

^b "Other, Licensed Pharmacy Setting" included: nursing home, long term care, health maintenance organization, nuclear, clinic-based, mail service, central fill, and home health/infusion pharmacies.

^c "Other, Setting Not Licensed as a Pharmacy" included: pharmacy benefit administration, academic, government administration, pharmaceutical industry, consulting companies, professional associations, and other organizations that were not licensed as a pharmacy.

^d Other includes activities such as: computer analysis, audit control, continuing education, grants, committee work, communications, consultation, data analysis, drug information services, formulary management, systems implementation, inspections, investigations, information technology work, manufacturing, marketing, medication safety, meetings, policy work, problem resolution, quality assurance, regulatory issues, and writing.

Table 3
Comparison of U.S. Pharmacist Age Cohorts

Age Cohort (years of age)	Female Gender	Hold PharmD Degree	Year of First Licensure	Residency Training	% in Cluster 1 Medication Provider	% in Cluster 2 Medication Provider who also provides Patient Care	% in Cluster 3 Other Activity Pharmacist	% in Cluster 4 Patient Care Provider who also Provides Medication	% in Cluster 5 Patient Care Provider
< or equal to 30 (n = 32)	78%	84%	2004	31%	41%	6%	22%	13%	19%
31 to 35 (n = 116)	64%	67%	2000	22%	33%	23%	16%	23%	5%
36 to 40 (n = 141)	70%	40%	1995	11%	37%	31%	15%	13%	5%
41 to 45 (n = 140)	69%	32%	1991	11%	38%	24%	16%	18%	5%
46 to 50 (n = 159)	54%	18%	1986	9%	36%	28%	18%	11%	7%
51 to 55 (n = 213)	49%	13%	1981	7%	44%	25%	17%	10%	5%
56 to 60 (n = 168)	26%	15%	1976	4%	41%	25%	18%	9%	7%
61 to 65 (n = 106)	16%	9%	1971	9%	42%	24%	21%	9%	6%
66 to 70 (n = 65)	9%	6%	1965	2%	63%	26%	6%	3%	2%
Greater than 70 (n = 48)	6%	9%	1958	0%	71%	21%	6%	2%	0%
OVERALL (N = 1,188)	47%	26%	1983	9%	42%	25%	16%	12%	6%
	χ^2 p < 0.001	χ^2 p < 0.001	ANOVA p < 0.001	χ^2 p < 0.001	Chi-Square p < 0.001				

N does not total 1,200 due to missing data.

Table 4
Comparison of U.S. Pharmacist Year of Licensure Cohorts

Year of Licensure Cohort (year of first licensure)	Female Gender	Age (years)	Hold PharmD Degree	Residency Training	% in Cluster 1 Medication Provider	% in Cluster 2 Medication Provider who also provides Patient Care	% in Cluster 3 Other Activity Pharmacist	% in Cluster 4 Patient Care Provider who also Provides Medication)	% in Cluster 5 Patient Care Provider
2005 to 2006 (n = 23)	70%	30.9	96%	30%	52%	4%	9%	13%	22%
2000 to 2004 (n = 101)	66%	33.7	75%	22%	33%	23%	18%	20%	7%
1995 to 1999 (n = 136)	67%	38.2	46%	13%	31%	27%	18%	19%	5%
1990 to 1994 (n = 142)	66%	42.0	30%	14%	44%	23%	12%	11%	10%
1985 to 1989 (n = 141)	58%	47.0	17%	6%	38%	26%	17%	15%	4%
1980 to 1984 (n = 164)	50%	51.2	20%	7%	35%	29%	21%	9%	6%
1975 to 1979 (n = 188)	39%	55.6	12%	6%	47%	23%	16%	9%	5%
1970 to 1974 (n = 133)	22%	60.7	7%	3%	39%	30%	17%	8%	6%
1965 to 1969 (n = 74)	10%	65.4	5%	7%	47%	24%	18%	10%	1%
1960 to 1964 (n = 41)	10%	70.0	8%	3%	71%	20%	7%	2%	0%
Before 1960 (n = 33)	6%	77.1	9%	0%	73%	21%	6%	0%	0%
OVERALL (N = 1,176)	47%	51.6	26%	9%	41%	25%	16%	12%	6%
	χ^2 p < 0.001	ANOVA p < 0.001	χ^2 p < 0.001	χ^2 p < 0.001	Chi-Square, p < 0.001				

N does not total 1,200 due to missing data.