Global survey of hospital pharmacy practice

FRED DOLORESCO AND LEE C. VERMEULEN

For decades, hospital pharmacists have contributed substantially to the overall advancement of pharmacy practice worldwide. Hospital pharmacy leaders and practitioners continue to make important contributions that elevate the entire profession. However, as is the case throughout the profession of pharmacy, significant threats exist that may limit the pharmacist’s role within organized health care delivery settings. Efforts aimed at developing and expanding the role of pharmacists in hospitals should be guided by information on the breadth and scope of current practice.

Surveys examining hospital pharmacy practice, the effectiveness of hospital pharmacy services, and the pharmacy work force have been conducted. These surveys have typically evaluated practice only within individual countries or regions, have sampled at the level of individual pharmacists or hospitals, and have been limited in their focus. Both the American Society of Health-System Pharmacists and the European Association of Hospital Pharmacists (EAHP) have conducted and published broad surveys of institutional pharmacy practice. Pedersen and colleagues1-4 have published several surveys examining a wide range of hospital pharmacy practices, but those studies have been limited to hospital practice in the United States.

Purpose. The current state of hospital pharmacy practice around the globe and key issues facing international hospital pharmacy practice were studied.

Methods. This survey assessed multiple aspects of hospital pharmacy practice within each of the Member States recognized by the United Nations. An official respondent from each nation was identified by a structured nomination process. The survey instrument was developed; pilot tested; translated into English, French, and Spanish; and distributed in July 2007.

The nature, scope, and breadth of hospital pharmacy practices in medication procurement, prescribing, preparation and distribution, administration, outcomes monitoring, and human resources and training were evaluated. Descriptive statistics were used to characterize the responses.

Results. Eighty-five countries (44% of the 192 Member States) responded to the survey. The respondent sample of countries was representative of all nations in terms of population, geographic region, World Health Organization region, and level of economic development. In addition to qualifying the nature of hospital pharmacy practice, the survey highlighted numerous challenges facing the profession of pharmacy in the hospital setting around the globe, including access to medicines and adequately trained pharmacists.

Conclusion. While the practice of hospital pharmacy differs from country to country, many nations face similar challenges, regardless of their population, location, or wealth. These survey results provide a basis for identifying opportunities for growth and development, as well as for international collaboration, to advance the profession of pharmacy and ensure that patients worldwide receive the care that they deserve.

Index terms: Data collection; Drug distribution; Education, pharmaceutical; Pharmaceutical services; Pharmacists, hospital; Pharmacy, institutional, hospital


Fred doloresco, pharm.d., m.s., is Clinical Assistant Professor, Department of Pharmacy Practice, School of Pharmacy, and Research Assistant Professor HS, Department of Social and Preventive Medicine, School of Public Health and Health Professions, University at Buffalo, Buffalo, NY. Lee C. Vermeulen, m.s., FCCP, is Director, Center for Drug Policy, University of Wisconsin Hospital and Clinics, Madison, and Clinical Associate Professor, School of Pharmacy, University of Wisconsin—Madison.

Address correspondence to Mr. Vermeulen at the Center for Drug Policy, University of Wisconsin Hospital and Clinics, 600 Highland Avenue, M/C 9475, Madison, WI 53792 (lc.vermeulen@hosp.wisc.edu).

This study was sponsored, in part, by grants from the International Pharmaceutical Federation (FIP) Board of Pharmaceutical Practice and Cardinal Health. The authors would like to acknowledge the offices of the FIP Hospital Pharmacy Section, the Steering Committee of the FIP Global Conference on the Future of Hospital Pharmacy, and the dozens of survey respondents around the globe who contributed to this survey.

A more exhaustive technical report will be published separately and made available through the FIP website (www.fip.nl/globalhosp/). Investigators interested in obtaining a deidentified data file of survey responses for bona fide research purposes should contact the corresponding author.

The authors have declared no potential conflicts of interest.

Copyright © 2009, American Society of Health-System Pharmacists, Inc., and International Pharmaceutical Federation. All rights reserved. 1079-2082/09/0301-0S13$06.00.
DOI 10.2146/ajhp080674
Similar surveys have been conducted by EAHP focusing on European practice; the most recent was conducted in 2005 and is available via the EAHP website.\textsuperscript{5} Other surveys include those conducted in the United Kingdom,\textsuperscript{6,7} Australia,\textsuperscript{8} and Puerto Rico.\textsuperscript{9} In addition to examinations of hospital pharmacy practice, investigators have examined the effectiveness of hospital pharmacy and the pharmacy work force in individual countries, both in hospitals and other areas of the profession.\textsuperscript{10,11}

In 2005, as part of the initial planning for the International Pharmaceutical Federation (FIP) Global Conference on the Future of Hospital Pharmacy, this survey was commissioned to better understand the current state of hospital pharmacy practice around the globe, identify key issues facing international hospital pharmacy practice, and create a benchmark against which to compare changes in international hospital pharmacy practice. These results were used in the development of the initial consensus statements for the Global Conference and provided an important reference during deliberations leading to the final Global Conference consensus statements (the Basel Statements). This report summarizes the survey’s methods and initial findings.

Methods

The survey was designed to assess multiple aspects of hospital pharmacy practice within each of the 192 Member States recognized by the United Nations (UN). An additional response was accepted from China–Taiwan due to the large number of pharmacists in hospitals in that region. For purposes of analysis, the actual population of China–Taiwan was used, but for all other analyses, the demographic characteristics of China were applied to China–Taiwan. The survey methods were developed in collaboration with the FIP Hospital Pharmacy Section officers and the steering committee for the Global Conference on the Future of Hospital Pharmacy. An exemption for this study was received from the University of Wisconsin Health Sciences Institutional Review Board.

Survey instrument development.

An iterative development process was used to create the survey instrument used in this study. An initial list of potential questions was drawn from several sources, including items related to medicine use from the Joint Commission International accreditation standards for hospitals\textsuperscript{12} and the 2005 EAHP survey.\textsuperscript{3}

After review and revision of the draft instrument, the English version of the survey was pilot tested in the United States and in three non-English-speaking countries (France, Uruguay, and China), and comments regarding its content and format were incorporated into a final version. The final survey instrument was then translated into French and Spanish.

The final survey instrument consisted of 75 questions. The majority of the questions ($n = 62, 83\%$) examined at least one of several areas related to the medication-use process: medication procurement, medication prescribing, medication preparation and distribution, medication administration, and outcomes monitoring. The format for each of these questions was identical. Each item consisted of a statement regarding a particular area of hospital pharmacy practice and definitions (drawn from a variety of sources, including various World Health Organization [WHO] and FIP documents) for any terms used in the statement that might not be universally understood or might be open to misinterpretation.

Each item required two responses, examining the scope and the breadth of the pharmacy practice described in each statement. Respondents were asked to describe the scope of each hospital pharmacy practice by indicating if, in their country, each activity was (1) not within the scope of hospital pharmacy practice, (2) within the scope of practice but not a legal or regulatory requirement, or (3) required by a legal or regulatory body. Respondents described the breadth of implementation of each pharmacy practice by indicating the percentage of hospitals in their country that performed each activity, using categorical ranges of hospitals: (1) $<3\%$ of hospitals (very few), (2) $3–40\%$ of hospitals, (3) $41–60\%$ of hospitals, (4) $61–97\%$ of hospitals, or (5) $>97\%$ of hospitals (nearly all).

Additional questions related to human resources and training, practice models used in hospital pharmacies, and estimations of health care spending on specific high-priority diseases were also included. Specific questions regarding the percentage of total national health care spending devoted to the management of human immunodeficiency virus (HIV) infection and acquired immune deficiency syndrome (AIDS), tuberculosis, and malaria were asked to determine the influence these diseases had on individual nations’ ability to develop advanced hospital pharmacy practices.

Sampling method and fielding.

The sample frame for this survey was all UN Member States plus China–Taiwan. A single response was accepted from each nation. This sampling method was chosen to capture the broadest scope of hospital pharmacy practice, with the understanding that intranational variability in practices would not be accurately captured. Specific respondents willing to complete the survey and capable of reflecting on the general nature of hospital pharmacy practice within their country were recruited. Most were nominated by their national pharmacy organizations after a solicitation was sent to all FIP member organizations. Other respondents were recruited from membership of the FIP Hospital Pharmacy Section and on the recommendation of the
Section. To the extent possible, the qualifications of each respondent were vetted through national pharmacy organizations to ensure that the respondent could accurately reflect on the nature of hospital pharmacy practice in their country. Once a respondent was identified and committed to completing the survey, he or she was sent the survey instrument by e-mail, fax, or traditional mail as a Word (Microsoft Corp., Redmond, WA) document, portable document format (pdf) file, or hard copy per the respondent's stated preference. Responses were returned via these same methods.

Instructions were provided to the respondent with the survey, including the requirement that responses reflect, as accurately as possible, the nature of hospital pharmacy practice in his or her entire country. Respondents were instructed to consult with other experts in hospital pharmacy practice within their country to obtain more accurate answers to the questions if they wished or to draw from other sources of information (e.g., published or unpublished national surveys, new data collection within their country) to compile their responses. Respondents who wished to collect new data by surveying others in their country were required to compile the results of their subsurvey before submitting the final response so that only one response was received. No compensation or remuneration was offered to any survey respondent.

Data collection, management, and analysis. The English, French, and Spanish language versions of the survey were initially distributed in July 2007, and respondent recruitment and response collection continued through April 2008. After the receipt of each completed questionnaire, responses were reviewed and clarification sought from the respondent if any response was unclear. Responses were entered into a relational database (Access, Microsoft Corp.) to facilitate storage and analysis.

Results
A total of 85 survey responses were received (Table 1). One additional nation supplied a statement that there were currently no pharmacists involved in the hospital setting and did not submit a completed survey. No data on this nation were included in the analysis of responses. This nation was from the WHO Regional Office for Africa (AFRO) region, the high-medium population quartile, and the medium Human Development Index (HDI) category. An evaluation of demographic characteristics of the respondent nations is provided in Table 2. In total, the re-

<table>
<thead>
<tr>
<th>Table 1. Nations From Which Survey Responses Were Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria, Argentina, Australia, Austria, Bahamas, Belgium,</td>
</tr>
<tr>
<td>Bosnia and Herzegovina, Brazil, Brunei Darussalam, Canada,</td>
</tr>
<tr>
<td>Chad, China, China-Taiwan, Costa Rica, Côte d'Ivoire,</td>
</tr>
<tr>
<td>Croatia, Czech Republic, Democratic Republic of the</td>
</tr>
<tr>
<td>Congo, Denmark, Ecuador, Eritrea, Estonia, Ethiopia,</td>
</tr>
<tr>
<td>Finland, Germany, Ghana, Greece, Guyana, Hungary, India,</td>
</tr>
<tr>
<td>Indonesia, Iran (Islamic Republic of), Iraq, Ireland,</td>
</tr>
<tr>
<td>Japan, Kenya, Latvia, Lebanon, Lesotho, Luxembourg,</td>
</tr>
<tr>
<td>Madagascar, Malta, Mexico, Namibia, Nepal, Netherlands,</td>
</tr>
<tr>
<td>New Zealand, Nigeria, Norway, Pakistan, Paraguay, Peru,</td>
</tr>
<tr>
<td>Philippines, Poland, Portugal, Qatar, Republic of Korea,</td>
</tr>
<tr>
<td>Romania, Russian Federation, Rwanda, Saint Kitts and Nevis</td>
</tr>
<tr>
<td>Serbia, Sierra Leone, Singapore, Slovakia, Slovenia,</td>
</tr>
<tr>
<td>South Africa, Spain, Sudan, Suriname, Sweden, Switzerland</td>
</tr>
<tr>
<td>Thailand, The former Yugoslav Republic of Macedonia,</td>
</tr>
<tr>
<td>Timor-Leste, Trinidad and Tobago, Turkey, Uganda,</td>
</tr>
<tr>
<td>United Arab Emirates, United Kingdom of Great Britain</td>
</tr>
<tr>
<td>and Northern Ireland, United Republic of Tanzania,</td>
</tr>
<tr>
<td>United States of America, Uruguay, Venezuela (Bolivarian)</td>
</tr>
<tr>
<td>Republic of, Viet Nam</td>
</tr>
</tbody>
</table>
sponding countries represented 83% of the world’s population (5.4 billion of 6.5 billion people worldwide).

Responses were received from a wide range of countries. There was representation from at least one third of nations from each of the WHO regions and HDI categories. Responses were received from nations with populations ranging from 40,000 to over 1 billion. While a significant percentage of each of these demographic categorizations (WHO region, HDI category, and population quartile) were represented, more responses represented nations from the high HDI and population quartile categories than from other categories. Because of this, data are presented both in aggregate and categorized by these items. No statistically significant difference was noted in responses when analyzed by WHO region.

The most frequently reported source of information used by respondents to complete the survey was personal impression of the nature of hospital pharmacy practice (63 of 85 responses, 74%), followed closely by the use of other experts in their country (56 of 85 responses, 65%). Published surveys, unpublished survey data, and subsample data collection were used less often by respondents (14%, 22%, and 20%, respectively).

Hospital pharmacy practice model. Different practice models were implemented to varying degrees across the globe (Table 3). The most frequently reported practice models in many nations involved pharmacists on the hospital staff who either managed product supply functions only (mean response, 41%) or managed all aspects of the medication-use process (mean response, 38%). Provision of services by pharmacists not on the hospital staff (mean response, 11%) and a lack of hospital pharmacists (mean response, 13%) were less commonly reported; however, both of these practice models were reported to be very common in the WHO Regional Office for South-East Asia (mean response, 21% and 20%, respectively) while a lack pharmacists in hospitals was reported in the low HDI category (mean response, 38%). It should be noted that the responses from the nations in the low HDI category were skewed due to three nations submitting responses to this series of questions that totaled >140% (sum of mean responses for the low HDI category = 127%).

Access to hospital pharmacists 24 hours a day, seven days a week, was not common, with only 35% of responding nations requiring that hospitals have a pharmacist present or accessible 24 hours a day to respond to emergency medication needs. A total of 43 respondents (51%) reported that >60% of hospitals in their countries have around-the-clock access to a pharmacist (Figure 1). These findings do not appear to be dependent on the level of economic resources available, as 17 (37%) of 46 countries in the high HDI category reported that fewer than 40% of hospitals in their countries had access to a pharmacist at all times. Eleven nations (13%) reported that a majority of hospitals used the pharmacy to prepare all i.v. admixture products for their patients.

Access to computers and electronic information (including drug information on the internet, etc.) necessary to provide care to hospitalized patients was also reported to be variable around the globe. A total of 16 of 37 respondents (43%) from low and medium HDI countries reported that fewer than 40% of their hospital pharmacies had access to at least one computer in their pharmacy, and 23 (62%) of 37 reported that fewer than 40% of hospitals had access internet. In high HDI countries, 28 (61%) of 46 respondents reported that virtually all hospitals in their countries had at least one computer in every pharmacy, and 21 (46%) of 46 re-

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%) Respondents</th>
<th>No. Total Possible Responses</th>
<th>Actual Responses as % of Possible Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>85 (100)</td>
<td>193</td>
<td>44</td>
</tr>
<tr>
<td>WHO region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AFRO</td>
<td>17 (20)</td>
<td>46</td>
<td>37</td>
</tr>
<tr>
<td>AMRO</td>
<td>16 (19)</td>
<td>35</td>
<td>46</td>
</tr>
<tr>
<td>EMRO</td>
<td>7 (8)</td>
<td>21</td>
<td>33</td>
</tr>
<tr>
<td>EURO</td>
<td>29 (35)</td>
<td>53</td>
<td>55</td>
</tr>
<tr>
<td>SEARO</td>
<td>5 (6)</td>
<td>11</td>
<td>45</td>
</tr>
<tr>
<td>WPRO</td>
<td>10 (12)</td>
<td>27</td>
<td>37</td>
</tr>
<tr>
<td>HDI category</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>46 (54)</td>
<td>69</td>
<td>67</td>
</tr>
<tr>
<td>Medium</td>
<td>28 (33)</td>
<td>85</td>
<td>33</td>
</tr>
<tr>
<td>Low</td>
<td>9 (11)</td>
<td>22</td>
<td>41</td>
</tr>
<tr>
<td>HDI unavailable</td>
<td>2 (2)</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Population category (in millions)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;21.5</td>
<td>37 (44)</td>
<td>49</td>
<td>76</td>
</tr>
<tr>
<td>6.5–21.5</td>
<td>15 (18)</td>
<td>49</td>
<td>31</td>
</tr>
<tr>
<td>1.5–6.49</td>
<td>21 (25)</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>&lt;1.5</td>
<td>11 (13)</td>
<td>48</td>
<td>23</td>
</tr>
</tbody>
</table>

*AFRO = Regional Office for Africa, AMRO = Regional Office for the Americas, EMRO = Regional Office for the Eastern Mediterranean, EURO = Regional Office for Europe, SEARO = Regional Office for South-East Asia, WPRO = Regional Office for the Western Pacific, HDI = Human Development Index.
ported that virtually all had internet access.

**Spending on high-priority conditions.** Each of the three areas examined consumed a significant amount of resources in many nations (Table 4). HIV infection and AIDS were reported to consume ≥10% of 30 nations' (36% of respondents) health care resources, with 12 WHO AFRO region nations responding that the treatment of HIV infection and AIDS required greater than one third of their nations' health care resources (compared with 18 other respondents, relative risk [RR] = 2.0). Tuberculosis was reported to consume ≥10% of 32 nations' (38% of respondents) health care resources. Malaria was reported to consume ≥10% of 22 nations' (26% of respondents) health care resources, with 10 WHO AFRO region nations responding that the treatment of this disease required greater than one third of their nations' health care resources (compared with 12 other respondents, RR = 2.9).

**Human resources and training.** Many interesting trends in the pharmacy health care work force and in pharmacy training were noted. A majority of nations (54 of 85, 64%) reported that >60% of hospital pharmacists were women or that the mix of men and women was approximately equal, while fewer (32 of 85, 38%) reported that a majority of managers in the hospital pharmacy were female. WHO EURO region nations were more likely to report high percentages of female pharmacists and hospital pharmacy managers than were other regions (RR = 1.9 and 2.6, respectively). Also, fewer than half of medium HDI category nations reported a shortage of qualified pharmacists (11 of 28 respondents, 39%), compared with high or low HDI category nations (25 [54%] of 46 respondents and 7 [78%] of 9 respondents, respectively).

Shortages of health care professionals exist across the globe. Survey responses show that over half of respondent nations had a shortage of pharmacists. While this does threaten a nation's ability to provide even basic pharmacy services, nations are still working to ensure that pharmacists in hospitals are well trained. While 63 nations (74%) required at least five years of higher education to become a pharmacist, 40 nations required a pharmacist to complete at least one year of postgraduate work before becoming a hospital pharmacy specialist. Services that many nations consider advanced pharmacy services are still offered, with phar-
macist cognitive services found in every WHO region.

**Medicine procurement.** Access to essential medicines was a concern for many nations. Nations in lower HDI categories were less likely to be able to easily obtain essential medicines (RR = 8.1), and only 80% of countries indicated that most hospitals do not use expired or outdated medicines (Figure 2). Compounding the potential for administering potentially unsafe medicines, only 63% of countries stored and tracked medicines in a manner that facilitates efficient and effective recalls in a majority of their hospitals.

**Medicine prescribing and influence on prescribing.** Pharmacists play a significant role in influencing the prescribing of medicines. Sixty-five nations (77%) reported having a pharmacist either as a part of a committee or the individual responsible for developing a formulary in a clear majority of hospitals. Twenty nations (24%) reported that pharmacist prescribing of medicines in hospitals under certain circumstances (such as under an agreement with a doctor) were within the scope of practice; however, only 13 nations (16%) stated that this activity was performed in >60% of hospitals. Only one WHO region did not have a single respondent state that this activity occurred in at least 3% of hospitals.

**Medicine preparation and delivery.** Medicines preparation and delivery are tasks that are closely related to the profession of pharmacy. Only 1 nation reported that medicine distribution was not in the scope of practice; however, only 2 nations reported that ensuring the identity of medicines before distribution was not within the scope of practice. Seventy-one respondents (84%) stated that the pharmacy department performed medicine distribution in >60% of their hospitals. Fifty-five percent of respondents stated that at least 3% of hospital pharmacies compounded sterile products from nonsterile components.

**Medicine administration.** Medicine administration is a key phase of the medication-use process in which pharmacists may not be directly involved; however, many nations reported pharmacist’s influence on the process of administering medicines. Only five nations (6%) reported that pharmacists were required to be involved in the administration of medicines in hospitals; however, 50 nations (60%) reported that the identity of the patient is verified before administration of a medicine in nearly all hospitals.

**Outcomes monitoring.** Pharmacists across the globe monitor outcomes of medication therapy. To monitor outcomes in the most effective manner, pharmacists must have access to several items. While access to the patient’s medical file was relatively evenly distributed among nations of all HDI categories,
pharmacists in hospitals in low HDI category nations were more likely to have access to the file in <3% of hospitals than hospital pharmacists in medium or high HDI category nations (4 of 8 responses, RR = 2.1). Access to medical libraries was much less common in low HDI category nations as well, with 3 (33%) of 9 respondents in low HDI category nations able to access libraries in >40% of hospitals, compared with 74% (n = 53) of medium and high HDI category nations.

Discussion

This survey had several limitations. First, it is difficult for any individual or even a small group of individuals to accurately reflect the practice of hospital pharmacy in a diverse nation. To address this concern, respondents were asked to describe the sources used (and provide the sources, if possible) when responding to the survey and were provided with the free response to give additional detail that was deemed necessary. Second, language was a concern. English, French, and Spanish versions of the instrument were distributed to increase the pool of individuals able to respond. Also, definitions of terms were provided to ensure that terms that have varying definitions from country to country were interpreted in the same way.

Conclusion

While the practice of hospital pharmacy differs from country to country, many nations face similar challenges, regardless of their population, location, or wealth. These survey results provide a basis for identifying opportunities for growth and development, as well as for international collaboration, to advance the procession of pharmacy and ensure that patients worldwide receive the care that they deserve.

References