

Assessment of the curricular content devoted to the application and interpretation of rapid diagnostic tests in colleges of pharmacy in the United States

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Abstract

Background: Current technologies have led to additional point of care and rapid diagnostic tests (RDTs) to assist with medical decision making.

Aims: To quantify the extent and means by which content on use and interpretation of RDTs are included in the curriculum of colleges of pharmacy.

Methods: An electronic survey about inclusion of RDT in curricula was developed and submitted to all colleges of pharmacy in the United States.

Results: Content on RDTs was included in 93% of respondents' curriculum. Types of tests, time allotted to material, and means of assessment varied significantly among institutions. Only 24% of responding institutions included content on infectious diseases RDTs.

Conclusion: Most responding colleges reported inclusion of material on RDTs in their curriculum. Curricular offerings on RDTs are variable, lacking standardization, and inadequate.

Keywords: *Colleges of pharmacy, Curriculum, Pharmacists, Pharmacy students, Rapid diagnostic tests*

Introduction

The role of pharmacists in the healthcare system is constantly evolving. In addition to serving as drug therapy experts, it is widely recognized that pharmacists in community practice settings are at the frontline of patient care and can serve as a gatekeeper to the healthcare system. In this setting, pharmacists routinely identify patients with undiagnosed or uncontrolled medical conditions. Furthermore, pharmacists are coming under increasing patient and legal pressure to assess patients and make decisions regarding patient treatment and disposition. Through their early intervention, pharmacists can help improve patient outcomes and decrease healthcare utilization. (Bryant et al., 2011; Mehuys et al., 2010; Mehuys et al., 2008). Unfortunately, time constraints placed on pharmacists in community practice make the sustainability of many patient care programs impractical.

One means by which pharmacists may improve the efficiency of their decision-making is through the utilization of rapid diagnostic or point of care tests. Tests that can be employed outside of a traditional laboratory setting or "at bedside" are typically referred to as point of care tests. Examples of such tests include, but are not limited to, fecal occult blood tests,

urine dipsticks, blood glucose monitors, pulse oximetry, and pregnancy tests. A subset of point of care tests is referred to as RDTs. As the name implies, this group of tests provides timely, objective information to the clinician to assist them in making or ruling out a clinical diagnosis. Examples of disease states for which RDTs are available include influenza, mononucleosis, group A streptococcus, Human Immunodeficiency Virus (HIV), *Helicobacter pylori*, hepatitis C virus, and others. Some pharmacists have already begun to incorporate point of care tests in their practice. As the reliability and acceptability of these technologies improve, pharmacists will be encouraged to employ more of these tools and provide recommendations to patients and providers based on test results. This changing practice paradigm is putting pressure on colleges of pharmacy to ensure that graduates possess the skills needed to embrace these technologies.

Before widespread utilization of point of care tests can occur in community pharmacy settings, pharmacists must be knowledgeable about conducting tests and understand the limitations associated with tests. To this end, the accreditation standards for colleges of pharmacy state that students should be exposed to home/point of care diagnostics

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(Accreditation Council for Pharmacy Education 2006). The purpose of this study was to determine the extent to which content on the use and interpretation of RDTs was included in the curriculums of colleges of pharmacy in the United States. Additionally, we sought to describe the means of instruction by which pharmacy students are exposed to point of care testing procedures and how knowledge of material and proficiency are assessed.

Methods

A 36 question, electronic survey was created using QuestionPro software (Seattle, Washington) and distributed to all United States' colleges of pharmacy. In addition to basic demographic information, data such as the time of last curricular revision and questions about rapid diagnostic testing content within the curriculum were collected. If content on RDTs was included in their curriculum, respondents were asked to indicate what type of tests were covered, how much course time was allotted to this content, where in the curriculum the material was covered, and how useful they perceived the content to be. Additionally, respondents were asked if they believed the content was a valuable component of their curriculum and if pharmacists in their area routinely utilized RDTs in their practice. The survey consisted of multiple choice, yes or no, and Likert-scale type questions. The survey was pilot tested by a group of faculty and students for clarity and to determine the time needed for completion. It was estimated that the survey could be completed in less than 15 minutes.

A list of 119 accredited (full accreditation and candidate status) colleges of pharmacy in the United States was amassed from the American Association of Colleges of Pharmacy (AACP) website and cross checked against the Accreditation Council for Pharmacy Education (ACPE) online database. In December 2009, an email invitation to participate in the survey was sent to department heads at each of the identified colleges. Department heads were encouraged to either complete the survey or forward the survey link to the most appropriate person at their institution. Reminder postcards were sent and follow-up telephone calls were placed in January and February 2010. The survey was active from December 2009 until March 2010.

Results were exported to Microsoft Excel (Redmond, Washington), compiled, and summarized using descriptive statistics appropriate for the data (i.e. counts and percentages or means and standard deviations). Data were examined for duplicate responses from institutions.

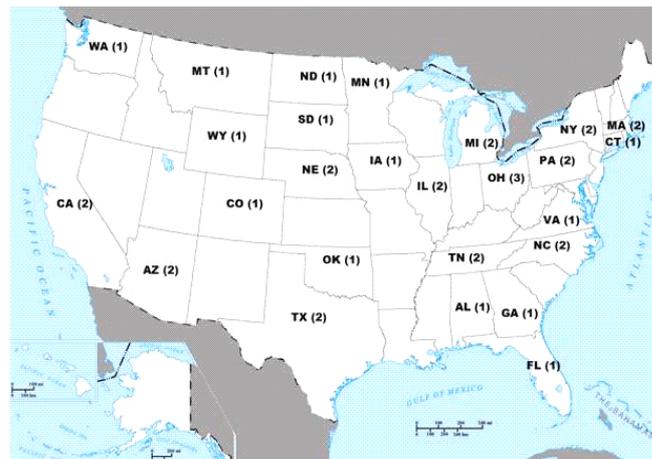
All procedures were reviewed and approved by the Institutional Review Board at Ferris State University.

Results

Of the 119 institutions invited to participate, 40 completed the online survey (response rate: 33.6%). Respondent institutions were well distributed across the United States (Figure 1). Table I provides a summary of demographics for respondent institutions. Ninety-two percent of the responding institutions were fully accredited. Three responding institutions identified themselves as having candidate status. The majority, 70%, of colleges that completed the survey had been in existence for > 20 years and approximately 65% had been fully accredited for >10 years. There was a fairly even representation of college size among responding colleges with roughly one-third claiming

50-100, 100-150, and >150 students in each class. Sixty-five percent of colleges reported that their last curricular revision occurred less than 4 years prior to the survey.

Figure 1: Geographical distribution of responding institutions



*One institution did not provide information regarding their location.

Table I: Respondent institution demographics

Demographic Parameter	Descriptor
Number of respondents	40
Accreditation status	
Full	37 (92.5%)
Candidate	3 (7.5%)
Years since program was established	
≤5	5 (12.5%)
5-10	5 (12.5%)
10-20	2 (5.0%)
>20	28 (70.0%)
If fully accredited how many years since first accreditation (n=37)	
<5	5 (13.5%)
5-10	8 (21.6%)
>10	24 (64.9%)
Average class size	
Not reported	1 (2.5%)
50-100	15 (37.5%)
100-150	12 (30.0%)
>150	12 (30.0%)
Years since last curricular revision	
<1 year	11 (27.5%)
1-2 years	3 (7.5%)
2-4 years	12 (30.0%)
>4 years	14 (35.0%)

Three responding institutions stated that content on RDTs that could be conducted by a pharmacist in an ambulatory setting was not included in their curriculum. All three of these colleges were established programs and had been in existence for >20 years. Additionally, two had undergone curricular revision in the year preceding the survey. Of these three institutions, two believed that content should be added to their curriculum and one was neutral. All three stated that cost was a primary reason that this content had not been added to their curriculum. One respondent noted that lack of adequately trained faculty was also a consideration. The remaining 37 (93%) colleges reported inclusion of at least some content on point of care/RDTs that could be conducted by a pharmacist in an ambulatory setting in their curriculum (Table II).

Table II: Summary of curricular content on rapid diagnostic testing included in responding colleges

Topic	Number of colleges responding affirmatively (%)
Endocrine system	36 (90.0%)
Blood glucose testing	36 (90.0%)
Hgb A _{1c} testing	27 (67.5%)
TSH testing	1 (2.5%)
Cardiovascular system	32 (80.0%)
Lipid/cholesterol testing	32 (80.0%)
INR testing	23 (57.5%)
Infectious Diseases	9 (22.5%)
Influenza testing	7 (17.5%)
Group A streptococcus testing	7 (17.5%)
Urinary tract infection testing	2 (5.0%)
Women's health	31 (77.5%)
Pregnancy tests	25 (62.5%)
Bone mineral density testing	23 (57.5%)
Ovulation tests	5 (12.5%)
Fertility testing	2 (5.0%)

Of the topics for testing that were queried, 90%, 80%, 77.5%, and 22.5% of respondents stated that their program included testing content for the endocrine system, the cardiovascular system, women's health, and infectious diseases, respectively. Blood glucose (90%) and lipid/cholesterol (80%) were the most common point of care/rapid diagnostic testing devices covered by respondents. Only 17.5% of colleges reported covering Clinical Laboratory Improvement Amendment-waived (CLIA-waived) RDTs for influenza and Group A streptococcus.

Forty-five percent of colleges responding to the survey stated that they devote four hours or less to covering content related to point of care/RDTs (Table III).

Most respondents (57.5%) agreed or strongly agreed that the amount of time devoted to these tests was appropriate. The majority (81.1%) of colleges indicated that they exposed students to rapid diagnostic test content on multiple occasions throughout the professional degree program. All of the respondents stated that there was a practice-based component included in their content delivery strategy; however, roughly 25% of institutions did not require a practical demonstration to assess skill proficiency. Furthermore, of the 28 colleges that stated that their assessment included a demonstration component, only 75% of respondents stated that the students were actually required to perform the test. From a practice perspective, only 67.5% of the institutions stated that CLIA legislation and CLIA waivers were discussed. Only 32.5% of programs reported that reimbursement for conducting tests was discussed in their curriculum.

Discussion

As medical costs continue to soar, persistent pressure is placed on healthcare providers to seek means to deliver cost-effective care to patients. It is widely recognized that hospitalization is one of the most costly, yet often avoidable, aspects of healthcare. As a result, a tremendous amount of effort has been placed into managing patients as outpatients. Although several studies have demonstrated the value of community pharmacists' contribution to improving the cost-effectiveness of healthcare, several limitations to the sustainability of such programs have been identified. (Bereznicki et al., 2011; Bereznicki et al., 2010; Bryant et al., 2011; Negru et al., 2010; Winfrey et al., 2003). Access to patient health information is among the frequently cited

Table III: Summary of content delivery characteristics of point of care/rapid diagnostic tests

Survey item	Response frequency
The amount of time devoted to RDT (n=40)	
0 hours	3 (7.5%)
<1 hour	1 (2.5%)
1-2 hours	3 (7.5%)
2-3 hours	3 (7.5%)
3-4 hours	8 (20.0%)
>4 hours	22 (55.0%)
The amount of time dedicated to RDT in your curriculum is adequate (n=40)	
Strongly disagree	3 (7.5%)
Disagree	5 (12.5%)
Neutral	7 (17.5%)
Agree	20 (50.0%)
Strongly agree	3 (7.5%)
No response	2 (5.0%)
Professional year in which RDT are covered (n=37)	
P1	21 (56.8%)
P2	28 (75.7%)
P3	24 (64.9%)
P4	13 (35.1%)
Multiple years	30 (81.1%)
Method of teaching used (n=37)	
Didactic and practical	35 (94.6%)
Practical	2 (5.4%)
Description of practical component (n=37)	
Students practice on students	22 (59.5%)
Students perform tests on patients	9 (24.3%)
Students observe only	5 (13.5%)
No response provided	1 (2.7%)
Means of proficiency of skills assessment (n=37)	
Demonstration	28 (75.7%)
Written assessment	19 (51.4%)
Verbal assessment	8 (21.6%)
Multiple means of assessment	12 (32.4%)
If students' proficiency skills are assessed by demonstration, are students expected to actually perform the test (n=28)	
Yes	21 (75.0%)
No	7 (25.0%)
CLIA regulation and CLIA waivers are discussed in the curriculum (n=40)	
Yes	27 (67.5%)
No	8 (20.0%)
Unsure	5 (12.5%)
Reimbursement for conducting RDTs is discussed (n=40)	
Yes	13 (32.5%)
No	13 (32.5%)
Unsure	14 (35.0%)

limitations to the provision of care in community pharmacies. As technologies have improved, more and more point of care and RDTs have become available to assist with medical decision making in the community setting. Such tests range from point of care diagnostic tests to monitoring disease markers such as blood glucose and cholesterol to RDTs to screen for influenza and Group A streptococcus. Although available tests have the potential to be used for a myriad of medical conditions, they do share the characteristic that the user must possess knowledge on how to conduct tests and interpret the data generated.

Eighty-five percent of respondents in our survey indicated that they were aware of pharmacists in their communities that currently employed point of care/RDTs in their practice. Additionally, 78% of respondents stated their belief that the use of such tests would become increasingly important to the practice of pharmacy in the future. Being mindful of these responses, it was surprising that 45% of colleges of pharmacy devoted <4 class hours of their curriculum to conducting and interpreting point of care/RDTs. Also, only 20% of

respondents thought that the amount of time devoted to RDTs in their curriculum was inadequate. The fact that <25% of colleges stated that students actually conducted tests in a clinical setting was also somewhat surprising.

Use of point of care/RDTs can be roughly dissected into two broad categories: 1) management of patients with identified disease states such as diabetes, osteoporosis, and hyperlipidemia and 2) screening for diseases among individuals without a current diagnosis such as infectious diseases like influenza and HIV. Currently, the point of care/rapid diagnostic testing curricular content delivered by the majority of colleges focuses on tests used to monitor/manage patients with previously diagnosed conditions. Instruction on blood glucose (90%) and lipid/cholesterol (80%) testing were the point of care tests most commonly included in curricula. In contrast, only 22.5% of colleges stated that they included content on RDTs designed to aid with the diagnosis of infectious diseases. Recently, programs have been proposed that place pharmacists on the frontline of identification and treatment or directing patients to treatment for various infectious diseases such as HIV, influenza, hepatitis C, and Group A Streptococcus pharyngitis. Members of the Society of Infectious Diseases Pharmacists have implemented a study that dovetails with the Center of Disease Control and Prevention (CDC) initiative that encourages patients to know their HIV status (Darin, 2010). This program centers on community pharmacists conducting HIV RDTs on their patients. If an individual tests positive for HIV, the pharmacist contacts them and facilitates their integration into a medical care program. The CDC also recently released a request for proposals to fund a nationwide community pharmacy HIV screening program. A recent influenza based study, performed by Klepser et al., examined the ability of pharmacists to identify patients with influenza in a community setting on the basis of clinical signs and symptoms and rapid diagnostic test results. This program resulted in a significant reduction in the time to first dose of antiviral therapy for those with a high likelihood of influenza, compared to those referred to their physician.

Another disturbing finding of our study was the fact that many programs did not discuss the logistics of offering testing services at their practice sites. Only 67.5% of colleges discussed CLIA legislation and CLIA waiver requirements with their students. This is critical knowledge if a pharmacist seeks to employ RDTs in their practice. Furthermore, only 32.5% of respondents stated that they discussed reimbursement for testing services in their curriculum. This omission is surprising in this age of cost consciousness. In order for any pharmacy-based program to be sustainable, pharmacists must get reimbursed for their activities. It is imperative that pharmacists understand reimbursement qualifications and procedures for any activities they are engaged in.

The response rate in our study was 33.6%. Although lower than we would have liked, this rate is comparable to other studies of this design. It is important to note that responding institutions were fairly well distributed across the United States. Therefore, data were less likely to be influenced by regional practice bias. Similarly, the respondent mix included both large and small programs; those in rural and urban locations; and newer and more established colleges. Therefore, we believe that our data provides a good cross-sectional snapshot of the curricular content in colleges of pharmacy across the United States.

Pharmacists have the potential to grow into important frontline providers. As a general rule, pharmacists have more contact time with patients on a regular basis than any other healthcare provider. Additionally, they have access to patients across the entire continuum of health. This positions pharmacists well to assist patients and their prescribers to monitor chronic medical conditions and identify new problems early in the course of disease. A key to accomplishing this is the incorporation of point of care/RDTs into their routine practice. However, pharmacists can only fulfill this role if they have the proper knowledge regarding the use and limitations of these tools. Pharmacy schools need to take a critical look at their curriculum to insure that students are properly equipped to engage in a contemporary practice upon graduation. Currently, there is virtual lack of instruction across colleges of pharmacy regarding the use and interpretation of RDTs for infectious diseases. We encourage colleges to give this deficiency prompt attention before another golden opportunity passes our profession by.

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