INSTRUCTIONAL DESIGN AND ASSESSMENT

Integrating Medication Therapy Management Education into a Core Pharmacy Curriculum

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Objective. To describe the design of a core course directed at improving confidence and competence of students to perform medication therapy management (MTM) services.

Design. Using the American Pharmacists Association (APhA) certificate training program framework, a core course was developed to teach MTM concepts to third-year student pharmacists. Using deep learning and authentic assignments, course instructors attempted to improve student confidence and readiness to provide MTM services.

Assessment. Student ability to meet course objectives was evaluated by examinations and the APhA MTM program self-assessment. Students had an overall success rate of 93% on all three assessments. Student perceptions of confidence, competence, and importance of performing MTM services were measured using a survey instrument with 56 Likert-type items. Students completing both surveys reported significantly increased confidence and competence.

Conclusion. Integrating MTM-specific education into the core curriculum increased student pharmacists' perceived competence and confidence to perform MTM services.

Keywords: medication therapy management, pharmacy education, deep learning

INTRODUCTION

In June 2013, the IMS Institute for Healthcare Informatics reported that the United States health care system incurs approximately \$200 billion in costs related to the inappropriate use of medications.¹ Numerous studies show the positive impact pharmacists have on clinical, economic, and humanistic outcomes related to medications, and many of these medication-related problems can be mitigated through pharmacist provision of medication therapy management (MTM) services.^{2,3} Since the passage of the Medicare Prescription Drug Improvement and Modernization Act of 2003 and the Patient Protection and Affordable Care Act of 2010, the demand for MTM providers has risen as more patients become eligible to participate in MTM programs.^{4,5} With legislative efforts to enable pharmacists to practice at the top of the profession's license through provider status and collaborative practice, pharmacy education train clinicians who are capable of performing the role of a pharmacist within future models of care upon graduation.⁶

Evidenced by the Accreditation Council for Pharmacy Education (ACPE) Accreditation Standards and American

Association of Colleges of Pharmacy (AACP) - Center for Pharmaceutical Education (CAPE) Educational Outcomes, the two bodies align in their expectations that pharmacy graduates should be equipped with the skills necessary to assess, manage, and monitor medication regimens.^{7,8} Findings from a 2011 joint report by the American Pharmacists Association (APhA) and AACP indicated that the expansion of MTM services would demand student pharmacist involvement to adequately supply the number of qualified persons to perform such services.⁹ This suggests that student pharmacists must not only be exposed to MTM, but be capable of supporting pharmacists in the delivery of advanced services as more MTM-eligible patients enter into the health care system. Another 2011 report by APhA and AACP noted that only 18 schools and colleges of pharmacy submitted the methods by which they included formal MTM-specific training into their curricula, indicating there potentially was a lag in integrating this piece of education into core pharmacy curricula.¹⁰ To date, the literature describing curricular implementation of MTM skills mostly surrounds elective and experiential courses.¹¹⁻¹⁶ In fact, the literature lacks a description of a core course designed to emphasize MTM core elements as skill content across settings in which a pharmacist may perform MTM services. Based on accreditation requirements, it

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may be assumed that the concepts and skills necessary to adequately perform MTM are spread throughout the entirety of pharmacy curricula. While verifying this assumption may be impractical or difficult, designing an intentional core course addresses the needs of MTM education directly.

Through an educational approach known as deep learning, we developed a core course to not only implement MTM education into the core curriculum, but also create student pharmacists capable of assisting with the potential professional gap. Deep learning is defined as the critically examining new facts and ideas, then incorporating them into existing cognitive structures and making numerous links between ideas.¹⁷ The concept of deep learning is associated with a genuine understanding of information that promotes long-term retention of the learned material and the ability to retrieve and apply it.¹⁸⁻²⁰ Instructors facilitate an environment of deep learning by utilizing innovative methods to deliver essential core content to students that allows them to learn and apply new information.

Deep learning is established and measured in this course predominantly by what the literature defines as authentic assessments. Mueller defined an authentic assessment as one for which “students are asked to perform real-world tasks that demonstrate meaningful application of essential knowledge and skills.”²¹ An authentic task requires application of previously learned concepts to new situations that demand judgment to determine what information and skills are relevant and how they should be used.²² These assignments often focus on complex real-world situations and their constraints. Table 1 highlights what Wiggins described as the seven critical elements necessary to define an assignment as authentic.²³

This paper describes: (1) the integration of MTM education into a core pharmacy curriculum; (2) student pharmacist perceptions of their confidence and competence to perform MTM services before and after the MTM

course; and (3) student pharmacists’ perceived importance and expected frequency of providing MTM services, as well as their desire to provide such services.

DESIGN

Belmont University College of Pharmacy is a 4-year professional program located in Nashville, TN. Pharmaceutical Care III is a 3-credit course taught to third-year student pharmacists in the sixth semester of an 8-semester curriculum. The course is taught concurrently with the final semester of Pathophysiology and Therapeutics with Therapeutic Case Studies II. The foundation of the course is designed to create an environment similar to advanced pharmacy practice experiences (APPEs) to familiarize students with the typical workload and time-intensive expectations of most APPEs.

Course objectives and teaching topics were largely constructed using Bloom’s Taxonomy of Educational Objectives and APhA’s nationally-recognized certificate training program, *Delivering Medication Therapy Management Services* (Table 2).^{24,25} The program is described as “an innovative and interactive certificate training program that explores the pharmacist’s role in providing MTM services to patients” and upon completion “enhances pharmacists’ clinical expertise in evaluating complicated medication regimens, identifying medication-related problems, and making recommendations to patients, caregivers, and health care professionals.”¹⁹

To promote deep learning of concepts and skills necessary to successfully carry out MTM services, the structure of the certificate training program was adjusted. Traditionally, the program is taught by having participants complete 10 hours of self-study, eight hours of live seminar training, and pre/postseminar cases. The course differs in that the students complete the program over the course of 13 weeks and do not complete the cases before and after the seminar. Instead, cases with the same concepts are built into the longitudinal weekly calendar. Students complete the self-study modules at their own pace and are required to pass the self-assessment examination by week 6 of the semester. The seminar modules are expanded on and spread over the semester with simultaneous active learning to hone and reinforce key pharmacy practice skills (Table 2).

To facilitate development of clinical reasoning and decision making as well as sound documentation skills, students must use higher order elements of Bloom’s Taxonomy to demonstrate proficiency in skills learned through information presented in the curriculum prior to this course.²⁴ Through completion of in-class active learning activities, students integrate all aspects of pharmaceutical care in a simulated practice environment to

Table 1. Six Critical Components of an Authentic Assignment²²

Is realistic
Requires judgment and innovation
Asks the student to “do” the subject
Replicates or simulates the contexts in which adults are “tested” in the workplace
Assesses the student’s ability to efficiently and effectively use a repertoire of knowledge and skills to perform a complex task
Allows appropriate opportunities to practice, consult resources, and get feedback on performances

Table 2. Course Calendar with Integrated MTM Certificate Program and Authentic Assignments

Week	Lecture Topic	MTM Certificate Program	Patient Encounters/Activity
1	Course Introduction	What is MTM? Identify and Addressing Drug-Related Problems (DRPS)	Identification of DRPs
2	Completing a Patient Visit	Monitoring Outcomes Documentation and Follow-Up	Initial Longitudinal Visit Practice SOAP Note
3	Medication Reconciliation		Follow-Up Longitudinal Visit (SOAP Note #1) Posthospital Discharge Med Reconciliation
4	Anticoagulation	Targeted Intervention Documentation	2 Outpatient Anticoagulation Visits
5	Immunization Update		Follow-up Longitudinal Visit (SOAP Note #2) Immunization Documentation Practice CMR
6	How to Complete a Comprehensive Medication Review (CMR)	Self-Assessment Due	
7	Midterm Examination	CMR #1	Intervention Documentation Personal Medication Record Medication Action Plan
8	Adherence	Communication	Follow-Up Longitudinal Visit (SOAP Note #3)
9	Consulting Pharmacy	Elderly Patients	Follow-Up Longitudinal Visit (SOAP Note #4)
10	Access and Health Disparities		Follow-Up Longitudinal Visit (SOAP Note #5) Patient Assistance Application
11	Pharmacokinetic Consults	Targeted Intervention Documentation	3 Inpatient Pharmacokinetic Consults
12	Creating and Marketing a Clinical Service	Implementation: Financial and Operational Issues	
13	Final Examination	CMR #2 Evaluation of Program and Instructor	Intervention Documentation Personal Medication Record Medication Action Plan

MTM=Medication Therapy Management

SOAP=subjective, objective, assessment, and plan

apply their pharmacotherapeutic knowledge and communication skills to clinical problem-solving, interprofessional and patient communication, and clinical intervention documentation. Clinical time management skills are also challenged as real-time clinical applications are simulated through written case assignments.

To assess proficiency of a student's ability to provide MTM services, instructors use both formative and summative assessment. Formative assessment includes the completion of 11 weekly case scenarios referred to as "patient encounters," which simulate targeted medication reviews (TMRs). For six weeks of the semester, students follow a patient longitudinally through a series of outpatient visits to emphasize the importance of follow up and continuity of care. This exercise challenges students to incorporate elements of MTM services such as a posthospital discharge medication reconciliation,

patient assistance program applications, health promotion (eg, smoking cessation, nutrition counseling, immunizations), and targeted adherence interventions.

The other five patient encounters include more specialized MTM services in the form of two anticoagulation and three pharmacokinetic consult case scenarios. These activities are assessed via a pass/fail grading system. Instructors developed a rubric to highlight the important drug-related problem considerations and documentation concepts necessary for success in providing MTM services (Table 3). The first case scenario is evaluated but has no grade assigned so students have a starting point regarding their strengths and weaknesses regarding their ability to complete the skills outlined in the rubric. Feedback is provided prior to the beginning of the graded assessments, which take place with the second patient encounter. Each week, rubrics are returned to students

Table 3. “Patient Encounter” Evaluation Rubric Components^a

Identification of Drug-Related Problems (DRPs)
Appropriately identified all DRPs
Appropriately prioritized all DRPs
Appropriately categorized all DRPs
Subjective/Objective
Appropriately identified the chief complaint
Included pertinent information important to the HPI (eg, s/sx, duration, exacerbating/alleviating factors)
Included pertinent vitals, labs, and risk assessments necessary for appropriate patient assessment
Appropriately updated subjective information as necessary (eg, PMH, SxH, SH, med list, allergies, immunization hx)
Assessment/Plan
Identified contributing and risk factors pertinent to the assessment of the patient
Appropriately assessed patient based on available information
Appropriately recommended a specific, optimal pharmacologic regimen for each DRP
Included appropriate goals of therapy for each DRP:
Appropriately recommended the best nonpharmacologic regimen for each DRP
Included appropriate monitoring recommended to assess the efficacy and safety of the regimen:
Safety:
Efficacy:
Included appropriate time to follow up for each DRP:
Included pertinent patient education related to the pharmacologic regimen (administration, ADRs, etc)
Adequately assessed and planned for all other chronic conditions and complaints
Addressed all patient-related factors that would impact the success of meeting the plan set forth for the patient
Documentation (must meet expectations on 7/10 measures):
Information presented is clear, concise, complete, thorough, and unambiguous
Information is clinically relevant
There is minimal use of extraneous or non-pertinent information
Writing is legible and free of errors
Information is properly categorized within the SOAP Note
No new information is added to the A or P
Followed directions given in class
Incorrect information was included
Documentation standards are appropriately applied
Used appropriate professional language, medical terminology, and abbreviations
Errors that result in an automatic zero (0)
Did not sign and/or date note
Did not appropriately scratch through errors
Used ink other than blue or black
Made a recommendation that, if initiated, would likely cause a sentinel event

^aevaluated with categories of deficient, needs improvement, and meets expectations

SOAP=subjective, objective, assessment, and plan

prior to completing the next case scenario to provide students with continuous feedback.

Summative assessment occurs in the form of comprehensive medication reviews (CMRs) at the midterm and the final point of the semester via a simulated patient case. Midterm and final examinations are administered as a CMR, in which students have 2.5 hours to complete the five core elements of MTM. The artifacts include a document outlining all identified drug-related problems with appropriate priority, assessment, and plan, a medication action plan (MAP) that provides patient-centric recommendations enabling patients to take responsibility for

their health, and a comprehensive personal medication record (PMR) to serve as a permanent record of medications for all providers involved in the patients care.²⁶ A separate rubric was designed by instructors to evaluate proficiency of students to adequately complete a CMR (Table 4). This study was approved by the Institutional Review Board of Belmont University.

EVALUATION AND ASSESSMENT

Student pharmacist ability to meet course objectives was evaluated by overall cohort performance on the comprehensive medication review (CMR) midterm and final

Table 4. CMR Evaluation Rubric Components

Personal Medication List (PMR)
All pertinent information was included and PMR is complete
Information included for each medication was accurate
Medication Action Plan (MAP)
Actions are appropriate and patient-centric
Actions are specific, realistic, and measurable
Assessment and Plan
Correctly identified drug-related problems (DRPs)
Correctly classified DRPs
Appropriately prioritized DRPs
Appropriately rationalized assessment of DRPs
Appropriately recommended specific solutions to DRPs
Appropriately included monitoring and follow-up for DRPs
Documentation
Uses appropriate patient language in the PMR and MAP
Adheres to CMS regulations
Followed directions (eg, late, not PDF, MAP is max 2 pages, no name)
Information included was clinically relevant
Information was thoroughly, succinctly, and clearly documented
Appropriate medical terminology was used
Potentially fatal error occurred

^aEvaluated with categories of deficient, needs improvement, and meets expectations

CMS=Centers for Medicare and Medicaid Services

examinations and the APhA MTM certificate program self-assessment, all of which require a 70% pass rate in order to complete the certificate program and the course. Figure 1 illustrates the success rate of each cohort on each assessment used to establish student pharmacist competency of performing MTM.

Attributes were tested using a pre/posttest design, and a 56-item survey instrument was administered using a 5-point Likert scale (1=strongly disagree to 5=strongly agree) prior to the first day of class and again at the conclusion of the semester after all assessments were completed.

The survey instrument was constructed from course objectives and activities used to fulfill course outcomes to evaluate student perception of confidence and competence of providing MTM services. Precourse and post-course surveys were matched using university-issued unique identifiers. The precourse survey was completed by 137 (99%) students, and the postcourse survey was completed by 106 (76%) students. Of the 106 responses, 10 were excluded during the paired samples *t* test because of incomplete survey instruments (either precourse or postcourse) or because survey results could not be matched. Of the 96 responses analyzed in the *t* test, students reported significantly increased confidence on all items related to MTM. Mean scores increased on both confidence in ability to explain the five core elements of MTM and in knowledge of the meaning of MTM. Confidence in ability to perform key tasks also increased, including performance of CMR, completion of PMR, development of a MAP, and classification of DRP. Mean responses regarding confidence in ability to document MTM services also increased significantly (Table 5).

Student-reported competence also increased on the postcourse survey. Students responded that their ability to identify and prioritize a patient's DRP had increased. Students reported increased ability to use appropriate medical terms and abbreviations and were also more likely to agree that they could create and market a clinical service on the post-course survey.

Students displayed high levels of agreement with desire to provide MTM and importance of and expected

Figure 1. Success rate of student pharmacist by assessment.

frequency of providing MTM and CMR on the precourse survey. Student desire to provide CMR showed a significant increase between the precourse and postcourse surveys (Table 5).

DISCUSSION

Student perceptions of readiness, competence, and importance of the ability to provide MTM services is imperative to the success of the paradigm shift of the pharmacy practice model from the traditional product-centered approach to a patient-centered approach. Students' perceptions of and confidence in learning also contribute to future success in subsequent learning activities.²⁷

The survey results suggest that student pharmacists desired to perform MTM services and perceived that it is important to have a knowledge base as a result of increased frequency of being asked to complete MTM

services. However, while students perceived the need to know how to perform MTM services, their level of confidence and competence was low prior to completing the coursework, indicating a need to ensure proficiency upon graduation. Students who are unsure of their ability to perform MTM services may be unlikely to provide them and a lack of training might also predict low quality.

Previously, garnering MTM expertise was self-motivated and completed in a postgraduate setting either through job-based training, certificate programs, or residencies and fellowships. Based on data from ASHP, ACCP, and ACPE, there are not enough residency positions to serve as additional training for pharmacists. Thus, the profession cannot rely on postgraduate training to address graduates' perceived deficiencies in this area.²⁸ It is vital to the evolving pharmacy practice model that MTM-specific training be integrated into the curriculum

Table 5. Comparison of Student Responses to MTM-related Questions on Pre/PostCourse Surveys

	Paired Differences (n=96)				
	PreCourse Survey	PostCourse Survey	95% Confidence Interval of the Difference		p value ^a
			Lower	Upper	
Confidence					
Explain the five core elements of MTM ^b	2.26	4.04	1.57	2.00	<0.001
Complete a CMR ^c	2.79	4.40	1.37	1.84	<0.001
Complete a PMR ^d	2.56	4.59	1.82	2.25	<0.001
Develop a MAP ^e	3.55	4.45	0.70	1.09	<0.001
Classify DRPs ^f	3.92	4.49	0.39	0.76	<0.001
Document MTM	2.67	4.33	1.45	1.89	<0.001
Competence					
Identify DRPs	3.55	4.52	0.81	1.13	<0.001
Create and market a clinical service	2.67	3.96	1.07	1.51	<0.001
Classify DRPs	3.41	4.52	0.94	1.29	<0.001
Prioritize DRPs	3.36	4.54	1.00	1.35	<0.001
Use of medical terms and abbreviations	3.72	4.52	0.63	0.98	<0.001
Desire					
Provide MTM	5.69	5.76	-0.21	0.36	.62
Perform CMR	5.78	6.09	0.02	.61	0.04
Importance					
Provide MTM	6.45	6.45	-0.17	0.17	1.00
Perform CMR	6.52	6.60	-0.07	0.24	0.29
Expected Frequency					
Provide MTM	5.48	5.53	-0.25	0.35	0.73
Perform CMR	5.51	5.49	-0.34	0.30	0.90

^aPaired samples *t* test, $\alpha=0.05$

^bMedication therapy management

^cComprehensive medication review

^dPersonal medication record

^eMedication-related action plan

^fDrug-related problems

as graduating student pharmacists will be looked upon to provide these services for an ever growing MTM-eligible population.²⁹

Regarding MTM-specific curricula, we need to determine which specific elements led to students' perceived increase confidence and competence levels. Continued data gathering on future cohorts may validate methodology and evaluate impact on deep learning and the use of authentic assignments in this population.

Regarding student pharmacist competence, using the APhA certificate program self-assessment could be considered a limitation. Since it is an open book and out-of-class activity, it may not adequately reflect competency with MTM skills. Course instructors felt it was important to assess student competence through additional, more authentic assessments. The course also created workload limitations as the additional assessments required substantial faculty time to provide enough feedback to implement learning strategies. Evaluating patient encounters and CMR midterm and final examinations required a significant amount of time, averaging roughly 7 and 15 minutes, respectively, per student. Two instructors are dedicated instructors of the course, and a third provides assistance with the inpatient aspects of the course. Increasing the amount of faculty members responsible for feedback would likely decrease the workload associated with the evaluation. The APhA certificate program requires faculty time to become trained as a trainer, and additional costs are associated with training students and faculty members as trainers. Allowing students to voluntarily complete surveys is also a limitation and a larger cohort of students is needed as well to strengthen data regarding student perceptions of confidence and readiness to complete MTM reviews.

SUMMARY

Implementing MTM education within the core curriculum improved student proficiency in performing MTM services. Students perceived that their readiness, confidence, and competence to perform MTM services on APPEs significantly improved after completing the MTM-specific course that provided intentional and substantive longitudinal training.

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Appendix 1. Course Objectives Mapped to 2013 Center for the Advancement of Pharmacy Education (CAPE) Outcomes⁸

Course Objective	Mapped CAPE Domain(s)
Explain the 5 core elements of medication therapy management (MTM)	1.1 Learner
Complete a comprehensive medication review	2.1 Patient Centered-Care 2.3 Health and Wellness 2.4 Population-Based Care 3.1 Problem Solving 3.6 Communicator
Complete a personal medication record (PMR)	2.1 Patient-Centered Care 3.6 Communicator
Develop a medication-related action plan (MAP)	2.1 Patient-Centered Care 2.3 Health and Wellness 3.1 Problem Solver 3.2 Educator 3.6 Communicator
Classify drug-related problems	1.1 Learner
Identify potential nonadherence to medication regimens	2.1 Patient-Centered Care 3.1 Problem Solving 3.2 Educator
Implement strategies to improve adherence	3.3 Patient Advocacy 3.5 Cultural Sensitivity 3.6 Communicator
Accurately and thoroughly document various MTM interventions	1.1 Learner 2.1 Patient-Centered Care 3.1 Problem Solving 3.4 Interprofessional Collaboration 3.5 Cultural Sensitivity 3.6 Communication
Accurately complete a patient assistance program application	4.4 Professionalism 2.2 Medication Use Systems Management 3.3 Patient Advocacy