Student Exposure to Actual Patients in the Classroom

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Clinical Applications I (CA I) and Clinical Applications II (CA II) were created and implemented to facilitate the development of first professional year pharmacy students' interaction skills through the use of case presentations and a multidisciplinary faculty team. During the Clinical Applications (CA) classes taught in the 1995-1996 academic year, actual patients presented to the students. When patients were not available, course coordinators presented simulated patient case studies to the class. Following each case presentation, the class divided into groups of 15-20 students to discuss the patient's disease state further. Faculty members from Medicinal Chemistry, Pharmacy Care Administration, Pharmaceutics, and Pharmacology as well as Pharmacy Practice served as moderators to facilitate group discussions. A survey found that each CA course was a valuable learning experience (CA I =4.62±0.70; CA II= 4.40±0.90; scale: 1 = "strongly disagree" to 5 = "strongly agree") and that learning more about the disease states with actual patients was more effective than from simulated case studies (P<0.01). Students also preferred to learn by case presentations or by the combination of traditional lectures and case presentations, rather than traditional lectures alone (P<0.01). Results of the study suggest that the use of actual patients in the classroom is effective in the education of first year pharmacy students.

INTRODUCTION

Educators and practitioners have expressed concern about how best to prepare pharmacy students for practice in a changing health care environment(1,2). Specific areas of focus include the development and implementation of innovative teaching methods/strategies and the need for pharmacy education to have a progressive curriculum continuum that allows graduates to successfully function in a rapidly-evolving health care system(3,4). In addition to pharmacy education stressing traditional skills, (*i.e.*, knowledge, comprehension, application, and analysis), performance-based skills (*e.g.*, interpersonal skills, conceptualization, synthesis, and evaluation) are also essential. Indeed, it is believed that the move from factual transmission of information to reflective action requires a bridge between traditional skills, higher level learning skills (*i.e.*, conceptualization, synthesis, and evaluation), and human interaction skills(5).

In 1993, The American Association of Colleges of Pharmacy's (AACP) Commission to Implement Change in Pharmaceutical Education conceptualized the mission for the need to evaluate and modify pharmacy education. The mission stated that a critical goal of pharmacy education is to prepare students to "enter into the practice of pharmacy and to function as professionals and informed citizens in a changing health care system"(6). In keeping with AACP's vision, curricula also should foster the development of many performance-based abilities including social interaction, critical thinking, and problem solving(7). Furthermore, AACP's mission has prompted pharmacy schools to critically review curricula and effect major changes to facilitate, among other issues, student-patient interactions early in pharmacy education.

A computerized search of the Medlars system from 1985 to 1996 failed to reveal any reports describing the development of pharmacy courses which incorporated the use of actual (live) patients in the classroom to facilitate student-patient interactions. Traditionally, the opportunity to engage student-patient interactions is delayed until the latter stages of the curriculum with the experiential component. By delaying student-patient interactions to the last few months or academic year of the curriculum, most students

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Table I. Revised first year curriculum at the University of Georgia College of Pharmacy

Fall semester hours	Credit hours	Spring semester	Credit
PHM 301 - Introduction to Pharmacy 3 hrs./week x 15 weeks	3	PHM 320 - Quantative Method in Pharmacy 3 hrs./week x 15 weeks	3
PHM 310 - Pharmacy Skills Lab I 4 hrs./week x 15 weeks	2	PHM 311 - Pharmacy Skills Lab II 3 hrs./week x 15 weeks	2
PHM 340 - Anatomy and Physiology I 4 hrs./week x 12 weeks	3	PHM 341 - Anatomy and Physiology II 4 hrs./week x 12 weeks	3
PHM 347 - Pathophysiology I 4 hrs./week x 12 weeks	3	PHM 348 - Pathophysiology II 4 hrs./week x 12 weeks	3
PHM 305 - Biochemical Basis of Disease I 3 hrs./week x 12 weeks	2	PHM 306 - Biochemical Basis of Disease II 3 hrs./week x 12 weeks	2
PHM 362 - Administrative Sciences I 3 hrs./week x 15 weeks	1	PHM 375 - Pharmacy & U.S. Health Care System 3 hrs./ week x 15 weeks	3
PHM 380 - Clinical Applications I 5 hrs./week x 3 weeks	1	PHM 385 - Clinical Applications II 5 hrs./ week x 3 weeks	1
PHM 390 - Pharm. Intercommunications 5 hrs./week x 3 weeks	2	PHM 394 - Survey of Drug Information 5 hrs./week x 3 weeks	1
TOTAL HOURS	17		18

are intimidated by patients; thus interfering with students' full educational potential. Therefore, to expose students to patients early in the pharmacy education process to facilitate the development of pharmaceutical caring, the revised curriculum of the College of Pharmacy introduced student-patient interaction during the first professional year of the new curriculum.

This article discusses the use of patients and a multi-disciplinary faculty team in the classroom to facilitate student-patient, student-student, student-faculty and faculty-faculty interaction. The goals of this paper are threefold. First, to describe two core courses, CAI and CAII, designed to facilitate the development of patient-interaction skills during students' first professional year. The second is to evaluate students' perception of the courses and other values, and third, to evaluate students' preference of instructional methods utilized to conduct these courses.

DESCRIPTION OF CLINICAL APPLICATIONS COURSES

The professional programs (BS and PharmD programs) offered are sequenced either in a three-or four-year configuration. Students are admitted to the College of Pharmacy following completion of required prepharmacy courses (*i.e.*, usually requiring a minimum of two years). After admission, students have the option of pursuing a baccalaureate of science degree in pharmacy or a Doctor of Pharmacy degree, consisting of a minimum of three or four years of professional coursework, respectively.

The Clinical Applications courses, CA I and CA II (PHM 380 and PHM 385), are two of several core courses in the revised first year professional curriculum and were first conceptualized in response to the perception that the first year of the "old" curriculum resembled more of a continuation of pre-professional courses (*e.g.* "a lot of basic science information that was not related to pharmacy"). Former student attitudes toward this year of study was that while the courses in the first professional year (old curriculum) were somewhat interesting, the relevance of the content with regard to drugs or patients was lacking. Consequently, students felt an inability to utilize and relate this knowledge to the practice of pharmacy.

The College's revised curriculum is an initial attempt to integrate course material in anatomy/physiology, pathophysiology, and biochemistry so that students can apply knowledge gained in these basic science courses with the practice of pharmacy. In order for pharmacy students to gain an appreciation of the transition from normal (*i.e.*, anatomy/physiology and biochemistry) to abnormal (*i.e.*, pathophysiology) and to be able to relate it to pharmacy practice, the Curriculum Committee initially encouraged the integration of case studies in the first professional year. Although all faculty agreed with this suggestion, many basic science faculty felt uncomfortable preparing clinical cases independently, and believed this should be a multi-disciplinary effort. Hence, the Curriculum Committee encouraged a creative approach to the 15-week semester specifying that for the first professional year basic science courses should be taught for 12 weeks and a Clinical Applications course should be taught for the remaining three weeks of each semester. Each CA course was a one credit-hour semester class that met twice weekly for the last three weeks of fall (CA I) and spring (CA II) semesters (Table I). It was also determined that CA I and CA II should: (*i*) utilize clinical cases to reinforce basic science concepts; (*ii*) relate basic science concepts to pharmacy practice; and (*iii*) employ an interdisciplinary teaching team of faculty. Subsequently, the course coordinators decided to use and evaluate actual patient contribution in CA to create a sense of realism and also relate basic science concepts to pharmacy practice

Table II. Standardized questions for group discussions

1.	What signs and symptoms did the patient describe or exhibit and its relationship to his/her disease?
2.	What is the pathophysiology of the patient's disease?
3.	What is the most likely etiology of the patient's disease?
4	What laboratory and/or diagnostic tests did the patient describe that was used to diagnose his/her disease?
5.	What is the role of the nonpharmacological interventions that the patient is using or should be using to manage his/her disease?
6.	What is the role of the pharmacological intervention that the patient is taking to manage his/her disease?

through student-patient, student-student, and student-faculty interaction.

In addition to facilitating interaction, another main emphasis of each course was to teach these students about disease states by using a patient case presentation format. The diseases covered in the CA I course was selected from these disease states taught in the Pathophysiology I course, and the diseases covered in the CA II course were selected from disease states taught in the Pathophysiology II course. Objectives of the CA courses were that students should be able to identify: (*i*) the signs and symptoms that the patient describes or exhibits and their relationship to his/her disease; (*ii*) the pathophysiology of the disease; (*iii*) the general prevalence and incidence of the disease in the public; (*iv*) the etiology of the disease; (*v*) laboratory and other diagnostic tests used to diagnosis and monitor the disease; (*vi*) the role of nonpharmacological intervention in the disease; and (*vii*) the role of pharmacological intervention in the disease process.

At the beginning of each CA class period, 20-30 minutes are devoted to a traditional lecture format reviewing the disease state to be presented that day. Immediately following the disease state review, the next 45 minutes were devoted to either a presentation by the patient (who was advised earlier concerning the class format, expectations of the students, and length and depth of the presentation) or by the course coordinators narrating a case study. Within this 45 minute period, many aspects of the actual or simulated patient's disease state were discussed-including onset, diagnoses, medications (including medication compliance and adverse medication experiences), and current patient status. Immediately after the case or patient presentations, using a press conference style format, students and faculty were encouraged to ask the patient questions. Then, to facilitate student discussions (student-patient discussions, student-student discussions, and student-faculty discussions) and to develop problem solving skills, the class was divided into groups of 15-20 students to discuss the case further. When an actual patient was involved, the patient visited each group to answer additional questions. In cases where the patient was immobile, a student representative from each group visited the patient (who was in a classroom) with the group's questions and reported the responses back to the group. After 45 minutes of small group discussions, the class was reconvened and the remainder of the class session was spent asking the patient follow-up questions.

Each small group is facilitated by a designated faculty member familiar with the disease state being presented. Faculty were drawn from either the Departments of Pharmacy Practice, Medicinal Chemistry, Pharmacy Care Administration, Pharmaceutics, or Pharmacology. The primary role of the faculty was to encourage group discussion. (See Table II for example questions discussed during group discussions).

Preparation of the Faculty Moderators

To prepare faculty for their moderating duties, selected readings from various sources (*e.g.*, textbooks, primary literature, World Wide Web sites) were assigned to each participating faculty member by the CA coordinator. Course objectives, classroom format, patient information, and selected questions about the disease state with answers (see Table II and Appendix A) are also distributed to the participating faculty. In addition, each moderator was offered the opportunity to individually meet with the CA coordinators to review the disease state and patient information prior to the class session. Faculty members were encouraged to ask the coordinators questions regarding the disease state, classroom format, and the presenting patient at any time.

METHODOLOGY

Phase One-Clinical Applications I

The cases presented in the Fall CA I course were selected from those diseases taught in Pathophysiology I and included: breast cancer, peptic ulcer disease, Parkinson's disease, Crohn's disease, and Alzheimer's disease. Three of the case presentations (*i.e.*, breast cancer, Parkinson's disease, Crohn's disease) involved actual patients. Two disease state topics (*i.e.*, peptic ulcer disease and Alzheimer's disease) were simulated case studies and were narrated by the course coordinators (Table III). Appendix A describes the simulated peptic ulcer disease case used in the course. For each class, students had required reading assignments from their pathophysiology textbook. In addition, several assignments involved reviewing preselected information on the World Wide Web (WWW).

Each student's academic performance (course grade) was based on a test administered on the final day of class. The examination consisted of approximately 60 percent multiple choice questions, 10 percent true/false questions, 10 percent fill in the blank questions, and 20 percent discussion questions. The questions were developed from content contained in the selected assigned readings and homework questions that were distributed to the students with each case. The short answer discussion questions were included to give students the opportunity to express and support their answers in written form. To limit bias that may be introduced by using multiple graders, all final exams were graded by one faculty member (*i.e.*, the course coordinator).

At the end of the semester, all students enrolled in CA I were asked to complete a voluntary, anonymous, pretested survey to evaluate the students' perception of the effectiveness of the course. A focus group consisting of the study investigators developed the survey and by using a five-point Likert-type scale (ranging from 1= "strongly disagree" to 5= "strongly agree"), students were asked to indicate their response to fifteen statements. The survey also encouraged students to provide any written comments they felt would improve the quality of the course. The objectives of the survey were to: (*i*) evaluate each student's perception of the value of CA; (*ii*) determine the value of patients in the classroom; and (*iii*) determine whether pharmacy students preferred to learn by traditional lectures, case presentations, or by a combination of traditional lectures and case

Table III. Diseases in clinical applications

Clinical Applications I			Clinical Applications II		
Class session	Disease state	Presentation	Class session	Disease state	Presentation
Week 1, Session 1	Breast Cancer	Real Patient	Week 1, Session 1	Diabetes Mellitus	Real Patient
Week 1, Session 2	Parkinson's Disease	Real Patient	Week 1, Session 2	AIDS	Real Patient
Week 2, Session 3	Peptic Ulcer Disease	Simulated Case	Week 2, Session 3	Angina	Real Patient
Week 2, Session 4	Alzheimer's Disease	Simulated Case	Week 2, Session 4	Emphysema	Real Patient
Week 3, Session 5	Crohn's Disease	Real Patient	Week 2, Session 5	Grave's Disease	Real Patient
				Hashimoto's Thyroiditis	Real Patient

presentations. Investigators were blinded as to the identity of the questionnaire respondents.

Phase Two-Clinical Applications II

The diseases covered in the Spring CA II course were selected from those diseases in Pathophysiology II and were: diabetes mellitus, acquired immunodeficiency syndrome (AIDS), angina pectoris, emphysema, Grave's disease, and Hashimoto's Thyroiditis (Table III). Based on results obtained in the Phase One/Clinical Applications I of the study, comments/suggestions obtained from students enrolled in CA I, and an overall assessment of the CA I course made by the coordinators and instructors, two modifications were made and implemented in CA II. The first modification was to use actual patients for every class. The second alteration involved the grading system. In CA II, students' final grades were based on three components: (*i*) participation/assignments (15 percent of final course grade); (*ii*) unannounced quizzes (40 percent of final course grade); and (*iii*) a final examination (45 percent of final course grade).

Participation was assessed by class attendance and by completion of in class assignments (assignments were consistent with the course's learning objectives). As in CA I, students had required reading assignments from their pathophysiology textbook and the WWW. To assess students' knowledge base concerning disease states and preparation for class, unannounced quizzes were given. These quizzes were developed by the course coordinator and consisted of a pre-quiz (given at the beginning of class before the case presentation) and a post-quiz (given at the end of the class after the small group sessions) to measure students' learning during the class session. All questions on the quiz were multiple choice with five responses to choose from (this type of question made-up 80 percent of each quiz) and true/false (20 percent of each quiz) in nature. Although the pre and post quizzes were not identical, they did emphasize similar objectives (content of the quizzes was consistent with the course's objectives). The final examination in CA II was written by the course coordinator and consisted of 50 percent multiple choice questions, 20 percent true/false questions, and 30 percent short answer discussion questions. All final exams were graded by the course coordinator.

On the last day of class, students were again asked to complete a pretested anonymous survey which was developed by a focus group to evaluate each student's perception of the value of CA II, value of having patients in the classroom, and preferred method of learning. Using a five-point Likert-type scale (ranging from 1="strongly disagree" to 5= "strongly agree"), students were asked to indicate their response to twenty-one statements.

Statistics

Data were entered in a computer database and analyzed using SPSS, version 6.1, for Windows. The Cronbach's alpha test was used to assess the reliability of each survey instrument. Frequencies and descriptive statistics such as means and standard deviations for each question on the surveys were performed. The Mann-Whitney U Test was used to determine which teaching method (traditional lectures, case presentations, and the combination of traditional lectures and case presentations) was preferred by students and to determine whether students perceived that they learned more about disease states with actual patients or simulated patients (case studies). To reduce the probability of Type I error, the Bonferroni procedure was used and the significance level was decreased to 1.25 percent rather than five percent. Paired-Samples t-test was used to compare scores of pre- and post-lecture quizzes in CA II. A significance level of 0.05 was established for this analysis.

RESULTS

Phase One- Clinical Applications I

CA **I** was taught to one-hundred and six, first year pharmacy students in the fall semester of 1995 (57 females and 49 males). Ninety-seven of the students (91.5 percent of the class) completed the survey. The reliability coefficient of the survey instrument is 0.82 (15 items). Overall, students indicated that CA I helped to reinforce information acquired in the pathophysiology course taught earlier in the semester (4.64, SD = 0.58) and they indicated that CA I was a valuable learning experience (4.62, SD = 0.70). Students felt that CA I taught them how to both recognize relevant patient data for evaluating a specific disease state (4.32, SD = 0.74) and how to mentally organize data (relate data) into a format that facilitates decision making in evaluating a patient's health care needs (4.01, SD = 0.90). Students indicated that they learned more about the disease states in the case presentations with actual patients than in the simulated case presentations ($P<0.01$), and preferred to learn by case presentations or by the combination of traditional lectures and case presentations, rather than traditional lectures alone ($P<0.01$). See Appendix B for a complete listing of survey items and scores.

Phase Two- Clinical Applications II

CA II was taught to one hundred and five, first year pharmacy students during Spring Semester 1996 (one student withdrew from the College of Pharmacy after Fall Semester 1995). The class consisted of 57 females and 48 males. One hundred students completed the survey (95 percent of the class). The reliability coefficient of the survey instrument is 0.96 (21 items). See Appendix C for survey statements and scores. Similar to the results in phase one,

students indicated that they preferred to learn by case presentations or by the combination of traditional lectures and case presentations rather than just traditional lectures ($P<0.01$).

Students were given pre- and post- lecture quizzes in two of the five class sessions. The average score on the diabetes mellitus quizzes were 84.6 percent (SD = 0.10) and 97.1 percent (SD = 0.23) for the pre and post-lecture quizzes respectively. The difference in the pre- and post-lecture quiz scores on diabetes was statistically significant (t=-11.85, $P<0.05$). The average scores for the angina pectoris quizzes were 84.9 percent (SD = 0.71) pre-lecture, and 96.5 percent (SD = 0.60) post-lecture. The difference in the pre- and post-lecture quiz scores on angina was also statistically significant (t=-11.48, $P<0.05$).

DISCUSSION

Patients were a key component to the success of CA. In addition to lecturing and grading, CA coordinators' responsibilities included identifying patients to participate in the courses. A major challenge of the course coordinators was to identify patients who felt comfortable and willing to speak to a large class about their disease state. Most patients involved in the courses are friends/family members of the faculty or referrals by a professional associate of the course coordinators. To maintain the course structure and discuss the basic layout of the course with the patient, course coordinators had to coach the patients on the length and depth of his/her presentation to the class. Therefore, it was necessary to interview all patients prior to their class presentation. After presenting, all patients indicated that they enjoyed speaking to the class and were willing to participate again.

The second key component to the success of the CA courses was the faculty that served as group moderators. Although specific objectives (questions) were given and discussed, students and faculty moderators were allowed to discuss any aspect of the disease state. Because faculty members tended to focus on many different aspects of the patients, the use of interdisciplinary moderators led to dynamic group interactions and discussions which enriched the course. For example, when questioning the patients, pharmacy practice faculty tended to focus on medications that the patients were taking and the impact of medications on their quality of life. Alternatively, pharmacy administration faculty tended to be more inquisitive about insurance and reimbursement issues. Some students expressed the opinion that involving faculty from the various disciplines provided them with a multifaceted view of each patient's disease.

Overall, students' written comments about the CA courses were positive and encouraging. Most felt that the use of patients discussing their diseases to the class was a highly effective method of teaching. Additionally, many students predicted that they would retain the material for a longer period of time as opposed to learning through traditional lectures and/or simulated case presentations.

In both phases of the study, students indicated that they preferred to learn by case presentations or the combination of traditional lectures and case presentations as opposed to just traditional lectures. Traditionally, case instruction has been used only in selected courses such as therapeutics and pharmacokinetics (these courses are generally taught during students' third or fourth professional year in pharmacy school). This study supports the use of case presentations as an effective teaching method for first year professional pharmacy students as well.

Although most students completed the surveys (approximately 93 percent of the class), a limitation to the study is that every student enrolled in the course did not complete each survey- thereby possibly influencing the results. A second limitation of the study is the lack of a control group. This is particularly important in examining scores of the pre and post quizzes. Due to the lack of a control group and the existence of confounding variables such as the possible discussion of quiz answers among students during the interim (approximately 1.5 hours) of the pre and post quiz, it is impossible to account the difference in pre and post quiz scores solely to the use of real patients in the course.

Although the results generated from this investigation are limited to the study population and institution, it serves as a starting point for future analysis of teaching methods that enhance student-patient, student-student, and student-faculty interactions. The early exposure of students to patients is extremely important to pharmacy education and pharmacy practice. The sooner students interact with patients, the sooner they can begin to develop patient-problem solving skills and a sensitivity to patients' needs. Although the investigators did not attempt to objectively quantify students' respect or empathy for patients, many comments were made by the course coordinators and faculty moderators about the students displaying attitudes of respect, empathy, commitment, and caring for the patients presenting in CA. The instructors of the CA courses will conduct future studies evaluating the influence of actual patients in the classroom to students' commitment to patients and to students' image of the pharmacy profession.

CONCLUSION

Pharmacy education, like the pharmacy profession itself, is entering a dynamic period. This paper describes two, new required courses in a college of pharmacy's revised curriculum that utilized actual patients and an interdisciplinary team to facilitate the development of student interaction skills. This study demonstrated that the use of actual patients in first professional year courses not only facilitated learning, but that students enjoyed having patients involved in their education. This study revealed that students preferred to learn by case presentations or by the combination of case presentations and traditional lectures rather than traditional lectures alone. This report suggests that the use of patients in the classroom is beneficial in the education of first year professional pharmacy students.

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APPENDIX A.

Example of Peptic Ulcer Disease Simulated Case-"THE POST-MASTER"

CC (Chief Compliant): "My stomach has been hurting for weeks"

HPI (History of Present Illness): WC is a retired, 68 year old Postmaster who has had a three day history of black bowel movements and a three week history of epigastric pain. WC stated that his pain increased at night and between meals and ingesting food or taking antacids seems to decrease the pain.

PMH (Past Medical History): HTN (Hypertension)

FH (Family History): WC is an only child and his mother and father are deceased. Both parents had PUD (peptic ulcer disease) and his father had CHF (Congestive heart failure). WC is the proud grandfather of seven grandchildren (Alvin, Mike, Allison, Tommy, David, Joe, and Leon).

SH (Social History): Presently WC is retired. He smokes approximately two packs of cigarettes per day. He denies any use of alcohol.

Meds (Medications): Lopressor (a beta-antagonist) 50 mg BID (twice daily); Maalox (an antacid) prn (as needed) abdominal pain; Aspirin prn (as needed) for knee pain, he has been using aspirin for more than 7 years

All (Allergies): NKA (no known allergies)

ROS (Review of systems): Unremarkable except for complaints noted above

VS (Vital signs): BP (Blood pressure) = 140/80; HR (Heart rate) = 80 bpm (beats per minute); R (Respirations) = 12 per minute; Ht=5 feet, 6 inches; Wt:= 98 kg (85 kg 6 months ago)

LABS (Laboratory): Na (sodium) = 140 mEq/L (normal: 135-147), K (Potassium) = 4.2 mEq/L (normal: 3.5-5); Cl (Chloride) = 102 mEq/L (normal: 95-105); SCr (serum creatinine)= 1.1 mg/dl (normal:0.8- 1.2), BUN (Blood urea nitrogen) = 10 mg/dl (normal:8-18); FBG (fasting blood glucose) = 100 mg/dl (normal=70-110), Hgb (Hemoglobin) = 15 gm/dl (normal: 14-18), Hct (Hematocrit): 45% (normal 40%-48%), RBC (Red blood cells) = 4.5 x 106/mm3 (normal:4.3-5.8), WBC (White blood cells) = 8500/mm3 (normal: 3200-9800), platelets=340 x 103/mm3 (normal: 130-400)

Rectal: Black melanic stool found in rectal vault

EGD (Esophagogastroduodenoscopy): 5-mm ulcer in the duodenum, biopsy performed.

Biopsy: Positive for Helicobacter pylori

Pharmacological Treatment Plan: D/C (discontinue) aspirin use; Maalox prn (as needed) for ulcer pain for 1 week; Clarithromycin 500 mg tid (three times daily) for 2 weeks; Omeprazole 40 mg qd (once daily) for 2 weeks

1. What is Peptic ulcer disease (PUD)?
   Answer: Ulcers are defects in the gastrointestinal mucosa which penetrate the muscularis mucosa. Peptic ulcer disease is a group of ulcerative disorders of the upper gastrointestinal tract (esophagus, stomach, and duodenum). This includes duodenal ulcers, gastric ulcers, gastroesophageal reflux disease, stress ulcers, Zollinger-Ellison Syndrome, and dyspepsia.
2. What is the incidence of PUD?
   Answer: Approximately 10% of all Americans will develop PUD during their lifetime. Duodenal ulcers occur in 4-10% of the U.S. population, and gastric ulcers occur in approximately 0.03-0.05% of the U.S. population.
3. What signs, symptoms, and laboratory values of PUD are described in this patient?
   Answer: (1) three day history of melanic stools; (2) three week history of epigastric pain that increases at night and between meals and ingesting food (may attribute to weight gain) or taking antacids seems to decrease the pain; (3) tarry bowel movements; (4) blood detected in rectal vault; (5) EGD revealing duodenal ulcer; and (6) presence of *H. pylori*.
4. What is the pathophysiology of PUD?
   Answer: There are important noxious factors present in the gastric lumen that can cause injury including pepsin, hydrochloric acid, pancreatic enzymes, and bile acids (aggressive factors). Cell restitution, the mucus layer, and bicarbonate secretion are protective elements of the gastrointestinal tract that contribute to the capacity of the stomach and duodenum to withstand injury. By disrupting the delicate balance between aggressive and protective mucosal factors, the conditions are well suited for mucosal injury and ulcer development. *H. Pylori* and NSAIDs (non-steroidal anti-inflammatory drugs) are the most common disrupting influences leading to peptic ulcer disease.
5. What is the most likely etiology of this patient's PUD?
   Answer: Use of aspirin, a NSAID, and the presence of *H. Pylori* in the gastric lumen.
6. What type of ulcer does WC have?
   Answer: WC has a duodenal ulcer.
7. What is the duodenum?
   Answer: The first part of the small intestine.
8. Where is the duodenum?
   Answer: It is a relatively fixed, C-shape tube measuring approximately 25 cm from the pyloric sphincter of the stomach to the duodenojejunal flexure.
9. What laboratory and/or diagnostic test(s) was used to diagnose WC's DU (duodenal ulcer)?
   Answer: EGD (esophagogastroduodenoscopy) revealed the ulcer. Biopsy detecting the presence of H. Pylori served as a guide for designing treatment. The CBC (complete blood count) with Hgb and Hct was used to rule-out the presence of anemia.
10. What are the goals of PUD treatment?
    Answer: (1) Relieve pain and discomfort (epigastric pain); (2) promote ulcer healing; (3) prevent or treat complications of PUD (this patient maybe experiencing GI bleeding indicated by blood in rectal vault and blood in stools).
11. What nonpharmacological intervention(s) should you suggest to the patient to treat his disease?
    Answer: The biggest nonpharmacological intervention that should be advised to WC is to discontinue smoking. Smoking decreases ulcer healing and people who smoke have a higher ulcer recurrence rate.
12. What is the role of the pharmacological plan prescribed to WC?
    Answer: (1) Discontinue aspirin — caustic agent to GI (gastrointestinal) mucosa; (2) Maalox is an antacid, it aids to neutralize acid, reduces epigastric pain; (3) Clarithromycin is an antibiotic, used to eradicate *H. pylori*; (4) Omeprazole is a proton pump inhibitor, decreases acid production by the parietal cells. Omeprazole may help relieve WC's pain and works synergistically with Clarithromycin to eradicate *H. pylori.*

APPENDIX B.

Survey Results of Clinical Applications I (n=97)

		Mean[a] + SD
1.	This course (PHM 380) allowed me to apply the information acquired in the pathophysiology course (PHM 347).	4.67 ± 0.53
2.	The course (PHM 380) was well organized.	4.40 ± 0.77
3.	I learned a lot from this course (PHM 380).	4.50 ± 0.78
4.	I enjoyed applying the knowledge learned in the pathophysiology course (PHM 347) to specific patient case presentations during this course (PHM 380).	4.60 ± 0.65
5.	I enjoyed applying the pathophysiology knowledge of disease states by participating in patient interviews during this course (PHM 380).	4.52 ± 0.80
6.	This course (PHM 380) taught me to organize patient data into a format that facilitates making decisions to evaluate patients' health care needs.	4.01 ± 0.90
7.	This course (PHM 380) taught me to recognize relevant patient data for evaluating a specific disease state.	4.32 ± 0.74
8.	This class (PHM 380) reinforced lecture materials learned in the pathophysiology course (PHM 347).	4.64 ± 0.58
9.	This course (PHM 380) enhanced my comprehension of the pathophysiology of disease states.	4.61 ± 0.69
10.	I learned more about the disease states from the case presentations with actual patients (breast cancer, Parkinson's Disease, and Crohn's Disease) than the case presentations with simulated patients (Peptic Ulcer Disease and Alzheimer's Disease) during this course (PHM 380).	4.75 ± 0.70
11.	I learned more about the disease state from the case presentations from simulated case patients (Peptic Ulcer Disease and Alzheimer's Disease) than the cases with actual patients (Breast Cancer, Parkinson's Disease, and Crohn's Disease) during this course (PHM 380).	1.91 ± 1.33
12.	I prefer to learn by case presentations rather than traditional lectures.	4.20 ± 0.90
13.	I prefer to learn by traditional lectures only.	1.96 ± 0.93
14.	I prefer to learn by the combination of case presentations and traditional lectures.	4.0 ± 1.07
15.	Overall, this course (PHM 380) was a valuable learning experience.	4.62 ± 0.70

[a]Scale: 5=Strongly agree; 4=Agree; 3=Neutral; 2=Disagree; 1=Strongly disagree.

APPENDIX C.

Survey Results of Clinical Applications II (n=100)

		Mean[a] + SD
1.	This course (PHM 385) allowed me to apply the information acquired in the pathophysiology course (PHM 348).	4.53 ± 0.89
2.	The course (PHM 385) was well organized.	4.51 ± 0.98
3.	I learned a lot from this course (PHM 385).	4.40 ± 0.92
4.	I enjoyed applying the knowledge learned in the pathophysiology course (PHM 347) to specific patient case presentations during this course (PHM 385).	4.55 ± 0.93
5.	I enjoyed applying the pathophysiology knowledge of disease states by participating in patient interviews during this course (PHM 385).	4.47 ± 0.91
6.	This course (PHM 385) taught me to organize patient data into a format that facilitates making decisions to evaluate patients' health care needs.	3.92 ± 0.99
7.	This course (PHM 385) taught me to recognize relevant patient data for evaluating a specific disease state.	4.26 ± 0.96
8.	This class (PHM 385) reinforced lecture materials learned in the pathophysiology course (PHM 348).	4.56 ± 0.87
9.	This course (PHM 385) enhanced my comprehension of the pathophysiology of disease states.	4.46 ± 0.98
10.	I enjoyed interacting with patients in this course (PHM 385).	4.33 ± 1.03
11.	In this course (PHM 385), I believe it is valuable to break into small groups to discuss the patient.	3.81 ± 1.26
12.	I prefer to learn by case presentations rather than traditional lectures.	4.16 ± 1.13
13.	I prefer to learn by traditional lectures only.	2.00 ± 1.22
14.	I prefer to learn by the combination of case presentations and traditional lectures.	4.14 ± 1.05
15.	I believe this course (PHM 385) enhanced my understanding of the value of practicing pharmaceutical care.	4.32 ± 0.89
16.	I believe this course enhanced my understanding of the value of pharmacists as members of the health care team.	4.38 ± 0.85
17.	I believe I would like to perform pharmaceutical care as a pharmacist.	4.73 ± 1.00
18.	I believe that practicing pharmaceutical care would benefit my professional career as a pharmacy practitioner.	4.52 ± 0.92
19.	This course (PHM 385) allowed me to learn about patient specific data concerning diseases.	4.54 ± 0.80
20.	This course (PHM 385) allowed me to learn about patient specific data concerning disease management.	4.42 ± 0.97
21.	Overall, this course (PHM 385) was a valuable learning experience.	4.40 ± 0.90

[a]Scale: 5=Strongly agree; 4=Agree; 3=Neutral; 2=Disagree; 1=Strongly disagree.