

# Student-led Pharmacotherapy Based Case (PBC) Discussions; A Unique Approach to Teaching

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## Absract

**Objectives.** Pharmacotherapy Based Cases (PBCs) are basic patient vignettes designed to highlight the appropriate use, dosing, and monitoring of a particular drug or drug class. We examined the effect of a student-led discussion of PBCs on students' perceived confidence level regarding their knowledge of the Top 200 drugs in the United States.

**Methods.** Teams of two students received therapeutic drug categories to review from an organized list of the current Top 200 drugs. Faculty members provided sample tables and cases. Students created PBCs from their drug tables to facilitate discussion. PBC quality, summary tables' content, and facilitation style were graded. Students completed baseline and post-PBC Likert scale surveys with questions about knowledge, usefulness of PBC approach and confidence level.

**Results.** The 2006 post-PBC survey results indicate that 100% find the PBC approach useful in the Top 200 drug review. The familiarity of the Top 200 drugs increased by 12%, 27%, 32% and 16% respectively for the following categories: 1) brand and generic names, 2) Food and Drug Administration (FDA) approved indications, 3) contraindications and common side effects, and 4) special patient counseling information.

**Conclusion.** The PBC approach was recommended for future cohorts by 100% of students.

**Keywords:** Top 200 drugs, student-led case discussion, WHO essential drug list

## Introduction

The development of critical thinking skills is an essential component of any student's educational curriculum. Many students progress through their primary and secondary education as well as undergraduate courses listening to lectures without having the opportunity to use or develop these essential skills. The purpose of graduate professional training in pharmacy is to engage students in rigorous active and experiential learning opportunities (Strand & Morley 1987). Active learning through problem- or case-based learning has been successfully implemented in some pharmacy schools (Strand & Morley 1987; Haworth *et al.* 1998). Successful implementation of case-based learning in pharmacy schools has been as a result of committing the time necessary for this type of learning environment, and providing an adequate number of faculty members for guidance or assistance where needed (Haworth *et al.* 1998). Many pharmacy schools, for budgetary reasons, have adapted a hybrid system in which students attend lecture-formatted classes where cases are incorporated through student-led discussions to enhance critical thinking skills (De Volder, De Grave & Gijsselaers 1985; Jones *et al.* 2001; Haworth *et al.*

1998; Strand & Morley 1987; Woodman *et al.* 2004).

Peer or student led discussions have been evaluated since the 1970s and place a different perspective on the learning environment (De Volder, De Grave & Gijsselaers 1985; Kremer & McGuinness 1998). Student-led discussions have been shown to be as effective and in some cases, more effective than instructor-led lectures (De Volder, De Grave & Gijsselaers 1985). This interactive teaching approach allows the development of independent thinkers. Student-led discussions, small-group teaching, and self-directed learning have been reported to promote effective communication, intrapersonal, problem solving, practical application and cooperative spirit (Kremer & McGuinness 1998).

The organization and use of student-led discussions may vary between institutions. Queens University in England has a unique approach to this educational design in which students attend a lecture and then each group of students reconvenes to have their own discussion (Kremer & McGuinness 1998). During these discussions students are encouraged to stimulate debates. There is a faculty member present at all times to monitor the discussion. Grading is based on attendance, peer evaluation, essays, and a final examination (Kremer &

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McGuinness 1998). The University of Southern California's School of Pharmacy conducted a study in which 118 students were divided into didactic lecture or problem-based learning for their third year of pharmacy school (Nii & Chin 1996). The study examined study participants' grade point average (GPA) during their fourth year of school (clinical rotations). The average GPA for students in the problem-based learning group was significantly higher than those in the didactic lecture group. One limitation of the study is that students had different preceptors who may have graded differently. Nevertheless, the study findings support the use of teaching methods such as problem-based learning.

The "Top 200 drugs" is a list of the most common medications compiled by prescriptions or sales each year. In America, the list has been used for;

- 1) evaluating adverse drug reactions in analgesic agents (Hersh, Pinto & Moore 2007),
- 2) evaluating the availability of pharmacogenetic prescribing information (Zineh *et al.* 2006),
- 3) determining the status of generic prescribing in the nation (*Pharmacy Times* 1979),
- 4) evaluating the gluten content of the most common medications in 2003 (King 2009),
- 5) listing the essential nursing resources (Schnall & Levy 2009),
- 6) analyzing patient reported outcomes for research studies (Varghese & Lal 2007),
- 7) evaluating coverage by Medicare-approved drug discount cards of the most commonly prescribed drugs in 2003 (Chisolm, Turner & Dipiro 2005),
- and 8) referencing fatalities due to beta blockers in Federal aviation reports (Angier *et al.* 2005).

In several other countries, the World Health Organization's (WHO) Model List of Essential Medicines serves a similar function and is used as the basis to develop unique lists for their respective nations. The number of drugs on the WHO list has increased to 302 in 2002 from 186 in the late seventies (Aziz *et al.* (n.d.); WHO 2010). Student pharmacists' knowledge of the medications on this list is foundational to successful practice in their respective nations. The only

literature reference we found on teaching the top 200 drugs in a pharmacy curriculum was related to improving the student's attitude towards a biochemistry course (Carroll & Oliveira 2006). The teaching approach linked the main biochemistry concepts to the most commonly prescribed drugs (Carroll & Oliveira 2006).

The use of student-led discussions when teaching the top 200 drugs in pharmacy school is an innovative method in which the students and their peers are learning simultaneously. The rationale behind this is that while students are preparing to teach their classes of drugs, they will learn the pertinent facts about the medication (Woodman *et al.* 2004). Also, students would be better suited to determine which teaching methods work best for their peers, and according to role theory, are more likely to learn best from people around their age (Strand & Morley 1987). We present here an evaluation of students' perceptions of the use of student led discussions to teach the top 200 drugs among final year pharmacy students.

### Description of Course

Seminar is a required course offered in the fourth year at the University of North Carolina Eshelman School of Pharmacy. The course has four major components to it that are assessed at the end of each semester. Students are evaluated on journal club or its equivalent (20%); participation (30%); attitude, attendance, and attire (10%); and a formal Case Presentation (40%). Seminar is administered across all nine Area Health Education Centers (AHEC) in North Carolina. In North Carolina, the state is divided into nine different regions, referred to as AHEC. The purpose of the AHEC is to allow students to be divided amongst the different regions while completing their last year of hands on pharmacy education experience. One faculty member coordinates the course in each region. Students meet twice a month for seminar during their clinical rotations. All faculty members at our AHEC actively participate in administering the different components of the seminar course.

Based on feedback from students (indicating that they would like to increase their knowledge of the Top 200 drugs) and preceptors, we piloted a focused study of the Top 200 drugs in the seminar course using student-led pharmacotherapy based cases (PBCs) for the pharmacy students at our AHEC. This activity would replace the twice a month journal club portion

**Table I.** Sample Case Provided to Students

JR is a 35 year old WM who approaches your pharmacy complaining of heartburn. He says that this pain usually occurs after dinner, while he is laying on the couch watching TV. At times, he also notes reflux of gastric acid. JR drinks 2 bottles of beer every evening and occasionally indulges in a delightful snack of chocolate ice cream before going to bed. What factors contribute to \*GERD/heartburn? How would you treat JR's GERD, and what important counseling points would you emphasize? You also notice in his profile that he is HIV+ and is taking atazanavir 400mg qd and Truvada® 1 tab qd. How would this information affect your drug of choice for JR? A †CrCl of \_\_\_\_\_ may necessitate a change in dosing of famotidine 20mg bid and rantiidine 150mg bid to \_\_\_\_\_ and \_\_\_\_\_, respectively. True/False: Omeprazole holds a pregnancy category B.

\* Gastroesophageal reflux disease

† Creatinine clearance

of the spring semester seminar course. The goal of the student-led pharmacotherapy based cases is to increase knowledge of the Top 200 drugs, facilitate critical thinking skills, and encourage students to take responsibility for their own learning.

The first step was to perform an internet search of the Top 200 drugs, compile and organize them by therapeutic categories. During the fall 2005 semester, the resultant table, detailed instructions, a sample table, sample PBC case (see Table I), and pre-PBC survey tool were sent to the Wake AHEC class of 2006. Teams of two students were each given color-coded therapeutic drug categories to review. Teams were color-coded to coordinate with the Top 200 drug table organized by therapeutic class. Indications for use, contraindications, drug-drug interactions, brand, generic, dosing, dosage forms, side effects and cost were summarized in tabular form. The proper use of assigned drugs, monitoring, and unique differences were emphasized. Student teams were asked to use the sample table as a guide. Students then used the information on the table to compose cases for each therapeutic class.

Each student team took turns presenting the information and facilitating a discussion with the rest of the Wake AHEC class. The total duration of the team's presentation was 20-30 minutes. A faculty member was present to support, clarify information, and emphasize key points. Students and teams were graded according to the effectiveness of their presentation, the quality of the content submitted to the faculty, the ability to submit concise information on the tables by the assigned deadline, and individual student participation toward the team assignment (see Table II). A total of 15 points was achievable.

The class was required to complete a pre- and post-PBC survey anonymously. The pre-PBC survey was completed before administering the PBCs while the post-survey was administered at the end of the fourth year after all the PBCs had been completed. The students were encouraged to use an identifier on the pre-survey tool so as to submit follow up remarks on the post-survey tool. Pre- and post-PBC survey data collected from the class of 2006 were then used to determine potential areas of improvement and changes in

students' knowledge of the Top 200 drugs as a result of PBC? Questions were posed using Likert scales as shown in Table IV. Students were also encouraged to provide written comments on specific sections on the survey tool to augment quantitative data. Survey results were summarized using descriptive statistics. After some changes had been incorporated to the PBCs, additional feedback was obtained from faculty at the university and at American Association of Colleges of Pharmacy (AACP). The class of 2007 provided written feedback on the modified PBCs after they completed the process.

### Evaluation

All students in the regional AHEC cohort of 2006 completed the pre- and post-PBC surveys. A summary of the 2006 survey data is provided in Table III. After the PBC exercise, there was an increase from 42% to 62% in the number of students who did not feel the need to look up basic drug information more than they should have at that point in their education. The number of students that felt the need to look up basic information more than they should have at that point in their education was also reduced to 33% from 58%. All students recommended the student-led review of the Top 200 drugs for future Wake AHEC and final year pharmacy student cohorts. Evaluations of this teaching strategy including student's perceptions are detailed in Table IV. Though the absolute percentages were smallest for the recommended dosages category, there was a 94% improvement in familiarity of >70% of the Top 200 drugs with regard to recommended dosages. The familiarity of the Top 200 drugs increased by 12%, 27%, 32% and 16% respectively for 1) brand and generic names, 2) FDA approved indications, 3) contraindications and common side effects, and 4) special patient counseling information.

Student feedback was generally positive when asked, "What would you change to improve next year's PBCs of the Top 200 Drugs?" The main focus was on increasing the required drug summary table limit for the learners since the original requirements made the tables hard to read due to the use of very small font sizes to fit the information in the tables. They

**Table II.** Grading Tool for the Spring Semester PBCs at the Wake AHEC\*

PBC Points	Evaluator	Evaluates	Component Eligible For Full Points
5	Faculty	Team	The table produced by your group was in the correct format and contained all of the information included in the headers of the example given.
5	Faculty	Team	The case worksheets, tables, and answer keys were turned in by the deadline.
5	Faculty	Individual student	Overall quality and creativity of the teaching method, completed the presentation within the allotted time, engaged/invited audience participation
<b>15</b>			<b>Total possible points†</b>

\* This tool was upgraded in Spring 2009 to provide a total of 20 points.

† The PBC is one component of the seminar course offered in the Wake AHEC PY4 year at UNC Eshelman School of Pharmacy. Other aspects include participation (30%), attitude, attendance, and attire (10%); and Case Presentation (40%) to make a total of 100 points available for the seminar course grade.

**Table III.** Summary of the 2006 Survey Responses

	<b>Pre-PBC Survey*</b> (% Students)	<b>Post-PBC Survey†</b> (% Students)
Worked in a retail environment <6 months	42	42
Worked in a retail environment 6-12 months	0	0
Worked in a retail environment >1yr	58	58
Think a thorough review of the Top 200 drugs is beneficial in the final semester of the PY4 year	100	100
Unsure that a thorough review of the Top 200 drugs is beneficial in the final semester of the PY4 year	0	0
Felt the need to look up basic drug information more than they should have at this point in their education	58	33
Did not feel the need to look up basic drug information more than they should have at this point in their education	42	67
Students that felt at least moderately prepared to take the board exams if administered the next day	75	75
Would recommend this review of the Top 200 drugs to future PY4 Wake AHEC cohorts‡	§	100
Would recommend this review of the Top 200 drugs to future PY4 UNC cohorts	§	100

\* The pre survey was administered at the early months of the PY4 year before piloting the PBCs

† The post survey was administered in April at the completion of the PBCs and the last month of the PY4 year

‡ Wake Area Health Education Center cohort of 12-15 students per year

§ Not Asked

also suggested focusing on what is needed for the board examinations. After incorporating some changes based on feedback from the class of 2006, the class of 2007 was asked the same question. One suggestion was to have the final year student pharmacists answer the cases on the presentation day to truly test what is learned instead of providing the cases in advance. They would also like to have more time to spend on each topic allowing for more in class discussion. Faculty members are encouraged not to be too liberal in the table limit so that the student can really prioritize the information they choose to include in the tables.

There was one reference to having a drug information specialist check the accuracy of the content. While this can be valuable, it may be more practical to utilize a combination of internal medicine and community or ambulatory care specialists to help determine the key points to remember for each drug and therapeutic category. This way, students can focus on the more clinically relevant details. The feedback from students and faculty were subsequently incorporated into a newly upgraded evaluation tool used for the learners.

The main limitation to executing this process is the amount of time it takes to compile and organize the Top 200 drug list according to drug class (5 hours). This is an activity that can be delegated to a resident or a highly motivated student. The time it takes to design a survey tool using Zoomerang® was another limitation. One of our experienced users helped design, disseminate, and administer the tool to the students

before the survey was closed. There were no costs incurred to execute the innovation other than the institution's subscription cost to Zoomerang® for administering the surveys, and the printing costs to the student of their respective teaching materials.

### Future Plans and Implementation

The goal of the student-led pharmacotherapy based cases was to increase knowledge of the Top 200 drugs, facilitate critical thinking skills, and encourage students to take responsibility for their own learning in a learner-centered approach. The perceived gap in knowledge of the Top 200 drugs came mainly from the students' report and inspired the evaluation. The PBC cases allowed students to take ownership of their learning and increase their peers' knowledge and familiarity with the medications in the Top 200 drug list.

The revised grading rubric and instruction sheets are used annually for the Top 200 student-led discussions at the local AHEC with continued positive feedback. Our observation from year to year is that the students tend to add their own creativity to the case presentations. They make the material easier to learn while making it fun. Some have used Jeopardy® themes and other interactive games to motivate and provide rewards to their peers while adding levels of difficulty to each case question asked. These games can be reused and revised as needed to fit each unique situation.

**Table IV.** Percent of 2006 students familiar with aspects of the Top 200 drugs\* on the pre† and post‡

	PBC survey							
	<25% of drugs		26-50% of drugs		51-70% of drugs		>70% ‡ of drugs	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
Brand and generic names	0	0	17	8	17	17	67	75
Recommended dosages	17	8	42	33	25	25	17	33
FDA approved indications	0	0	33	0	33	58	33	42
Contraindications and common side effects	8	0	17	17	25	17	50	66
Special patient counseling information	8	0	17	17	17	17	58	67

\* When asked "Regarding the following aspects of pharmacotherapy, how many of the Top 200 drugs are you familiar with?" students responded using the following scale: <25%, 26-50%, 51-70%, 71-90% and >90%

† The pre survey was administered at the early months of the PY4 year before piloting the PBCs

‡ Percentage was calculated using those who responded 71-90% and >90%

§ The post survey was administered in April at the completion of the PBCs and the last month of the PY4 year

The main barrier we had with this project was trying to determine if the study of the Top 200 drugs had any correlation to passing the NC board exams. We initially instructed the students to communicate with us after their board examinations to comment if the exercise facilitated their study process. Unfortunately, no one responded from the class after the examinations. We decided therefore not to investigate the impact on the boards but rather to keep the PBCs as part of the seminar curriculum for purposes of increasing the students' perception of their knowledge on the Top 200 drugs. Feedback at the annual end of semester reviews with each local AHEC student for the past 4 years continues to be positive so far on this matter.

### Conclusion

Student-led discussions hold promise for teaching the Top 200 drugs which many students may traditionally learn through passive learning. A more active teaching/learning mechanism using the student-led pharmacotherapy based cases allows students to have a better foundation in medications they will see frequently throughout their career. Based on feedback from students and faculty, this approach to teaching the Top 200 drugs can be considered for expansion into the other regions and incorporated into the school's curriculum. This affordable method may also be considered as an approach to teach the most commonly used drugs in other countries (Essential drugs list). Potential areas of future studies include the use of active learning techniques in faculty-led teaching of the Top 200 drugs.

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