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Evaluation of Pharmacy Students' Tendency to Self-Medicate

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THESIS SUMMARY

Focusing on one area of study for years, whether it be law, pharmacy, medicine, or any other applicable field, leads to one becoming skilled and having increased confidence in that field of study. With the knowledge and the confidence, one may be comfortable enough to want to apply that information to themselves within their daily lives. This practice can begin as early as the start of education in a specialized field and can be both beneficial and dangerous.

To learn when the self-application of knowledge begins in pharmacy education, a survey was distributed to the students of the South Carolina College of Pharmacy (SCCP), and the University of South Carolina College of Pharmacy (USC-COP). This survey asked students about the frequency of self-medication, what drugs and disease states are typically self-medicated, and reasons to start and stop self-medication. One hundred nine students completed the survey, with an even distribution between the four years of pharmacy school.

First-year students had the lowest self-reported average for self-medication, while the third-year students reported the highest average. The fourth-year students scored lower than the third-year, which may be due to practical experience gleaned through nine to ten different advanced experiential rotations these students are required to complete before graduation.

This project provides more information about a topic previously studied by other schools across the world. While it is already known that students tend to apply knowledge they have learned before graduation, it hasn't been studied how quickly the practice increases as education is completed. This thesis project demonstrates that the level of classroom-based education has a positive correlation with the self-application of knowledge.

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ABSTRACT

Objective: To investigate whether the tendency to self-medicate increases as students progress through the pharmacy curriculum

Design, Setting, and Participants: An online survey was administered through Survey Monkey by a link sent to the email addresses of students who attended the South Carolina College of Pharmacy/ University of South Carolina College of Pharmacy (SCCP/USC-COP) during the 2017-2018 school year.

Main Outcomes and Measures: Self-medication was defined as the use of over-the-counter (OTC) medications, medications prescribed to another person, and recreational (i.e. alcohol, tobacco) or illicit substances for therapeutic purposes. The primary outcome was the likelihood of each class of pharmacy students to self-medicate based on a Likert scale. Secondary outcomes included the most important reasons to start and stop self-medication, the most frequently used medications for self-treatment, the most frequent conditions for self-treatment, and the use of alcohol, tobacco, illicit drugs, or medications prescribed to another person for therapeutic purposes. Data was analyzed using measures of central tendency.

Results: A total of 109 students completed the survey. It was found that the likelihood to self-medicate had an overall increase from first year to fourth year students, with third year students being the most likely to participate in self-medication. The most important reason to start self-medication was “have had a similar problem before” and the most important reason to stop was “symptoms are worsening.” The most common medications used for self-treatment were analgesics and the most frequent condition was headaches/migraines. In addition, the majority of participants denied the use of alcohol, tobacco, illicit drugs, or another person’s prescription medication for therapeutic purposes.

Conclusion and Relevance: This study demonstrated that pharmacy students’ tendencies to self-medicate increased as they progressed through the didactic pharmacy curriculum, as first year students were the least likely to self-medicate with a gradual increase in likelihood as education increased. Fourth year students were not the most likely to self-medicate which could be explained by circumstances surrounding the last year of pharmacy school.

INTRODUCTION

Undergoing four or more years of graduate-level education concerning numerous disease states and the medications used to treat them creates an educated pharmacist trusted by the public to assist in the treatment of their health issues and to promote a healthy well-being. The pharmacists that graduate from these programs must possess confidence within themselves to have the knowledge about the problems presented to them, and to know resources that provide the answers, especially since these problems directly involve people's health and well-being. If there is lack of self-trust, the pharmacist's ability to treat patients could be significantly reduced due to second-guessing and the inability to develop a proper treatment plan. Furthermore, self-trust increases with time and experience, but typically is developed through education. Depending on their level of confidence, pharmacy students may begin to use the knowledge they have gained to help themselves or others, before they receive their Doctor of Pharmacy (PharmD) degree.

The population for this study consisted of students attending all three campuses of the South Carolina College of Pharmacy (SCCP) and the University of South Carolina College of Pharmacy (USC-COP). The SCCP underwent a demerger in 2015 creating the USC-COP located in Columbia, SC, and the Medical University of South Carolina College of Pharmacy located in Charleston, SC. The SCCP and USC-COP curriculum requires students to undergo four years of pharmacy education before receiving a PharmD degree.

In the first professional year (P1), students are introduced to the basics of pharmacy, including its origins, medical terminology, pharmaceutical calculations, and the dosage forms of medications. They also begin to learn the pathophysiology of

different disease states in addition to biological membranes, drug transport, and other pharmacodynamic information. Once admitted into pharmacy school, students are required to attain a pharmacy intern license. This license allows students to acquire a job in a pharmacy to gain experience. Legally, pharmacy interns can complete majority of a licensed pharmacist's tasks, all while under the direct supervision of the pharmacist. In the spring semester of the P1 year, the students participate in a self-care class where certain afflictions, that typically don't require a doctor's office visit, are discussed. These conditions include headaches, acne, minor pain, burns, upset stomach, bug bites, and other self-treatable illnesses. Furthermore, they learn about microbiology, immunology, and participate in community pharmacy simulation labs.

In the second year (P2), students continue to learn the pathophysiology of diseases, but they are also taught the pharmacotherapy used to treat those disease states. Students are educated on the normal functions within the body, the etiology of diseases, and the treatment to either improve functionality or return it to normal. Some of the topics include disorders of the kidneys, lungs, heart, vasculature, and gastrointestinal tract, along with fluids, nutrition, electrolytes, and infectious diseases. Other classes within the P2 curriculum include pharmacokinetics, a health-care systems/hospital pharmacy lab, and an outcomes course where students learn how to interpret clinical trial papers and research articles.

In the third year (P3), students continue to build their knowledge of the treatment of different disease states such as reproduction, seizures, pain, various psychiatric disorders, HIV, and oncology. In addition, the students are challenged to apply their knowledge to real-world patient care scenarios in classes such as clinical applications and

clinical assessment. The P3 year is the last year of classroom-based learning and is the year used to prepare students for their fourth and last year of pharmacy school.

In the fourth professional year (P4), students begin Advanced Pharmacy Practice Experience (APPE) rotations. Students are required to complete 9 different one-month-long rotations within the field of pharmacy, potentially taking the student anywhere in the world, though, typically most students complete the majority of rotations within South Carolina. The five required rotations include ambulatory care, hospital/health systems, community, acute care, and general medicine pharmacy. The four elective rotations could fall within the same categories as mentioned above, but could also include drug information, poison control, management, or academia, for example. These rotations are meant to challenge and prepare the student to use their pharmaceutical knowledge efficiently and appropriately. Also, APPE rotations can provide insight to what areas of pharmacy students would like a career in after graduation.

Given the challenging pharmacy curriculum with each year's knowledge building upon the other, the investigators assumed that the further along within the curriculum a student is, the more self-trust that student possesses. Furthermore, increased self-trust would lead to increased self-treatment of both common and uncommon afflictions. Therefore, it is the investigators hypothesis that as a student progresses through their pharmacy education, increasing their knowledge of different disease states and treatments, their self-medication tendencies will also increase.

METHODS

To test the hypothesis, an online survey was conducted. The fifteen-question survey was developed by the investigators to determine the likelihood of participants to self-medicate by assessing their behaviors within the last year. The survey was

administered through the Survey Monkey website. This website allowed anonymous data collection and provided tools for data analysis. The final version of the survey is included in Appendix 1. To increase the number of survey responses, participants who completed the survey were given the option to follow a link to enter a drawing for one of four \$50 gift cards. The drawing was conducted through Google Forms and winners were chosen by using a random number generator. This study was approved by the University of South Carolina institutional review board. Participants provided consent by following a link to the survey that was embedded in an email.

Students who attended SCCP/USC-COP during the 2017-2018 school year received an invitation to participate in this study through their assigned university email addresses. The version of the cover letter which included a link to the survey is included in Appendix 2. The first invitation was sent out on February 19, 2018 and was followed up by 3 reminder emails. The survey was closed on March 11, 2018.

The inclusion criteria were pharmacy students in their first through fourth years of study, attending either the South Carolina College of Pharmacy (SCCP) or the University of South Carolina College of Pharmacy (USC-COP). This included SCCP students at the Medical University of South Carolina (MUSC) campus in their third or fourth year, and students at Greenville Health System (GHS) campus in their third year. The exclusion criteria were students attending MUSC-COP that were in their first or second year, as these students are not part of the SCCP.

The investigators defined self-medication as the use of over-the-counter (OTC) medications, including vitamins and supplements, using other people's prescription medications, and using recreational (i.e. alcohol, tobacco) or illicit substances for therapeutic purposes. This definition was included in the first question of the survey. The

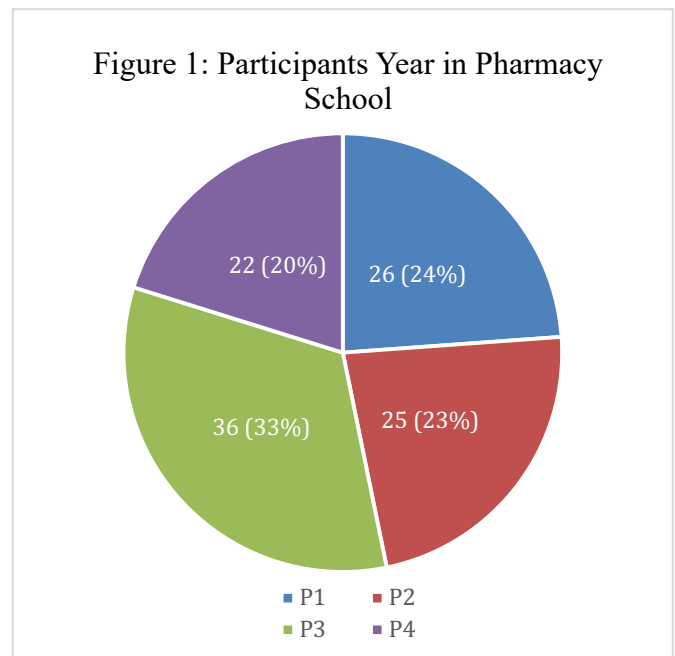
primary outcome was the likelihood of each class of pharmacy students to self-medicate based on a Likert scale (never, seldom, sometimes, often, almost always). Secondary outcomes included the most important reasons to start and stop self-medication, the most frequently used medications for self-treatment, the most frequent conditions for self-treatment, and the use of alcohol, tobacco, illicit drugs, or medications prescribed to another person for therapeutic purposes.

RESULTS

Of the 596 students who received the email invitation, 109 students completed the survey. There were 98 partial responses, 173 no response, 209 unopened emails, and 7 students opted out. Only the 109 completed survey responses are included in our analysis, as the 98 partial responses only included answers for the first survey question and did not distinguish class rank. The mean age of participants was 23.7 years (range 20- 44 years).

79.6% of participants were female. The majority (78.7%) of the study participants were Caucasian. A detailed chart of the demographics is presented in Appendix 3. The classification of participants based upon level of pharmacy school is shown in Figure 1.

By assigning the Likert scale numerical values (Never =1; Seldom =2; Sometimes =3; Often =4; Almost Always =5), the mean, median, standard deviation (SD), and interquartile range (IQR) of each class was determined and compared. Survey



question number one assessed the primary outcome, participants likelihood of self-medication, using the Likert scale (Table 1).

By ranking the means of the individual classes, P3 students subjectively stated that they “often” participate in self-medication more

Table 1: Likelihood of Self-Medication					
	Mean	SD	IQR	Median	Likert Scale
P1	3.08	1.07	2	3	Sometimes
P2	3.24	1.21	2	3	Sometimes
P3	3.56	1.07	1	4	Often
P4	3.23	0.95	1	3	Sometimes

than the other classes (median 4, IQR 1, mean 3.56, SD 1.07). For P1, P2, and P4 students the median was 3 for each group. P2 students subjectively stated that they “sometimes” participate in self-medication (mean 3.24, SD 1.21, IQR 2), closely followed by P4 students (mean 3.23, SD 0.95, IQR 1). P1 students were ranked the lowest to “sometimes” participate in self-medication (mean 3.08, SD 1.07, IQR 2).

Concerning the likelihood to take medications prescribed to another person for therapeutic purposes, including off-label use, majority (greater than 65%) of students within each of the classes

Table 2: Likelihood to Take Medications Prescribed to Another Person					
	Mean	SD	IQR	Median	Likert Scale
P1	1.15	0.36	0	1	Never
P2	1.52	0.9	1	1	Never
P3	1.47	0.93	1	1	Never
P4	1.14	0.34	0	1	Never

chose “never” on the Likert scale (Table 2). The median value for all four groups was 1. P2 and P3 students had an interquartile range of 1, while P1 and P4 students’ interquartile range was 0. P2 students had the highest mean (1.52) with a standard deviation of 0.9, demonstrating that they are slightly more likely to take medications prescribed to other people. P3 students had the second highest mean (1.47) with a standard deviation of 0.93. P1 and P4 students were quite similar for the mean (1.15, 1.14), respectively, and

standard deviation (0.36, 0.34), respectively, demonstrating that they rarely take medications prescribed to another person.

Regarding the use of alcoholic beverages for therapeutic purposes, greater than 50 percent of each class chose “never” on the Likert scale (Table 3). The median

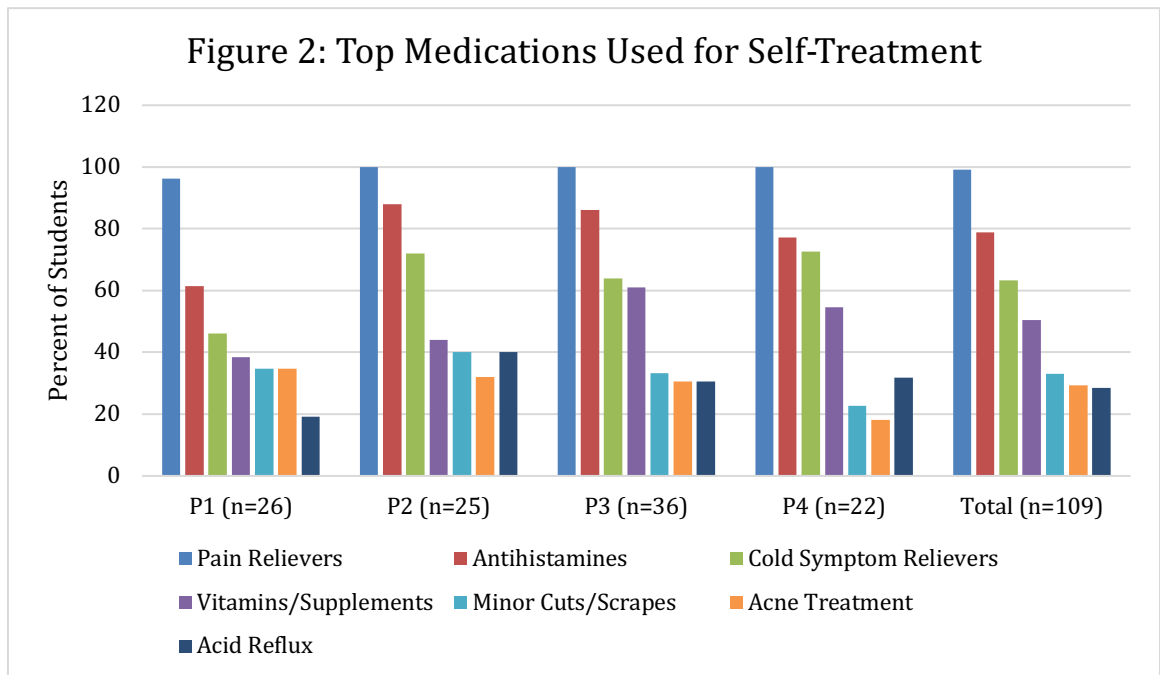
	Mean	SD	IQR	Median	Likert Scale
P1	1.50	0.80	1	1	Never
P2	1.72	1.04	1.5	1	Never
P3	1.50	0.93	1	1	Never
P4	1.64	0.88	1	1	Never

value for all four groups was 1. The P1, P2, and P4 classes had an interquartile range of 1. P2 students ranked the highest with a mean of 1.72, standard deviation of 1.04, and interquartile range of 1.5 demonstrating that they are slightly more likely to consume alcoholic beverages for therapeutic purposes than other classes. P4 students ranked second with a mean of 1.64 (SD 0.88). P1 and P3 students both had a mean of 1.5 and standard deviation (0.8, 0.93), respectively.

As for the likelihood to use illegal drugs for therapeutic purposes, 95.5% of all participants chose never (median 1, mean 1.06, SD 0.28, IQR 0). Also, 96.33% of all participants indicated that they never use tobacco for therapeutic purposes (median 1; mean 1.06; SD 0.37, IQR 0).

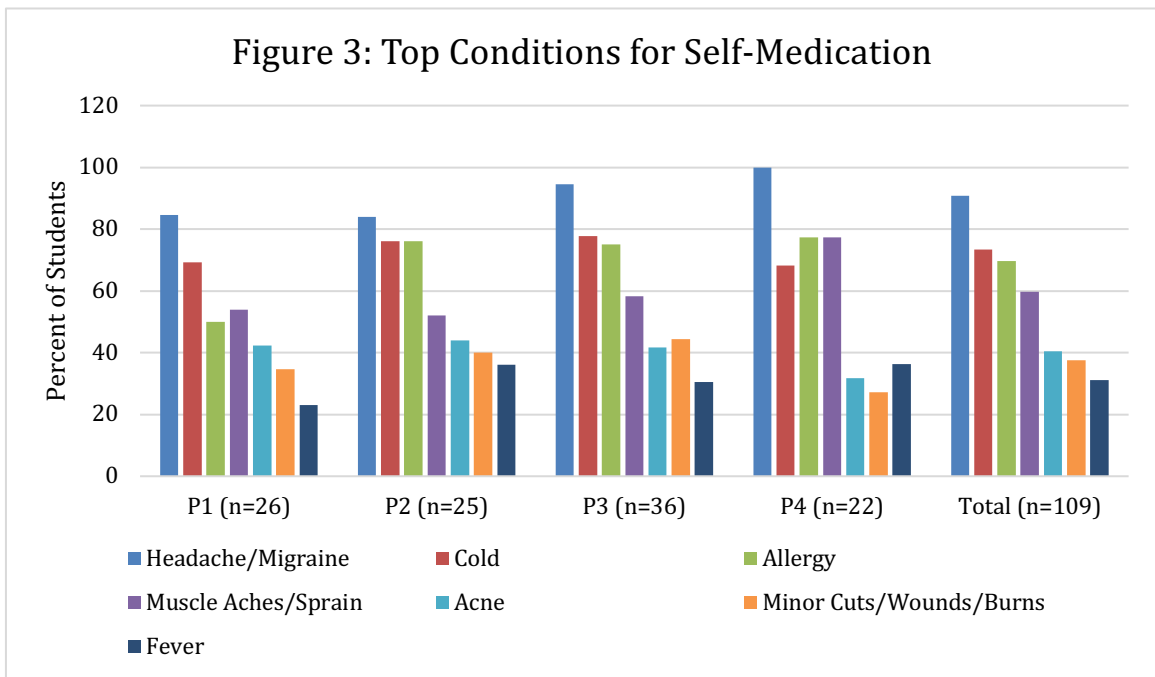
To determine the types of medications used for self-treatment, the investigators allowed the students to choose from a list of medications and check all the OTC medications they remember using within the past 12 months. To interpret the data, the top five drugs from each pharmacy class were compared (Figure 2). Overall, the top two types of medication used by all four classes were pain relievers (acetaminophen, ibuprofen, naproxen, aspirin) and antihistamines (cetirizine, loratadine, diphenhydramine, etc.), respectively. Also, the number four spot for all four classes was vitamins or

supplements. The differences arise in the number three spot where P1s chose treatments for minor cuts/scrapes and other skin ailments including calamine, aloe vera, neomycin sulfate/polymyxin B sulfate/bacitracin zinc, etc. The number three spot for the other classes (P2-P4) was cold symptom relievers such as guaifenesin, dextromethorphan, pseudoephedrine, etc. The fifth spot also differed between the classes. P1 students chose acne treatments (benzoyl peroxide, salicylic acid, adapalene). P2 and P4 students chose acid reflux medications such as famotidine, ranitidine, antacids, omeprazole, etc. and P3 students chose treatments for minor cuts/scrapes. The ranking for all 109 participants from highest to lowest was pain relievers (99.08%), antihistamines (78.9%), cold medications (63.3%), vitamins and supplements (50.46%) and treatments for minor cuts/scrapes (33.03%).



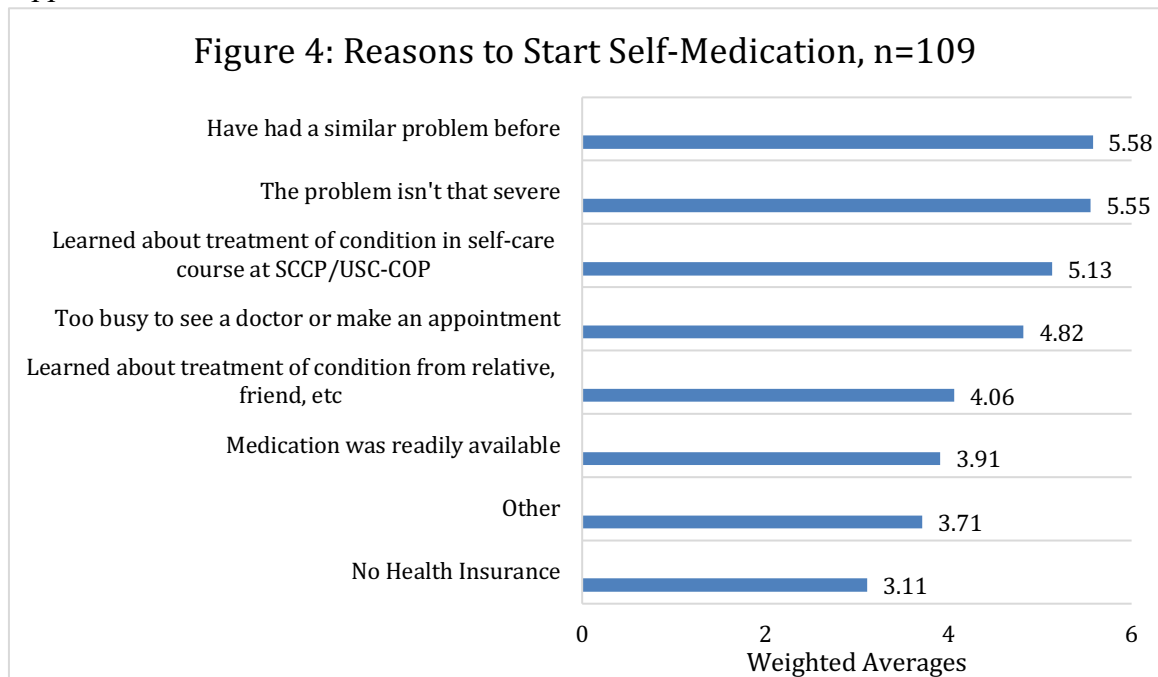
Following the same format as the question discussed above, participants were asked to identify the conditions they self-treated for within the past 12 months. The number one ailment for all four groups was headache/migraine with about 90% of total participants. The number two ailment was a cold for P1, P2, and P3 students. For P4s,

muscle aches/sprains held the number two position. Furthermore, P2, P3, and P4 students ranked allergies as their third condition, while P1s chose muscle aches/sprains. For the fourth most self-treated condition, P2 and P3 students chose muscle aches and sprains, P1s chose allergies, and P4s chose colds. Lastly, P1 and P2 students chose acne as the fifth condition, while P3 students chose cuts/wounds/burns, and P4s chose fever. The ranking for all 109 participants from highest to lowest was headache/migraine (90.83%), colds (73.98%), allergies (69.72%), muscle aches and sprains (59.63%), and acne (40.37%) (Figure 3).



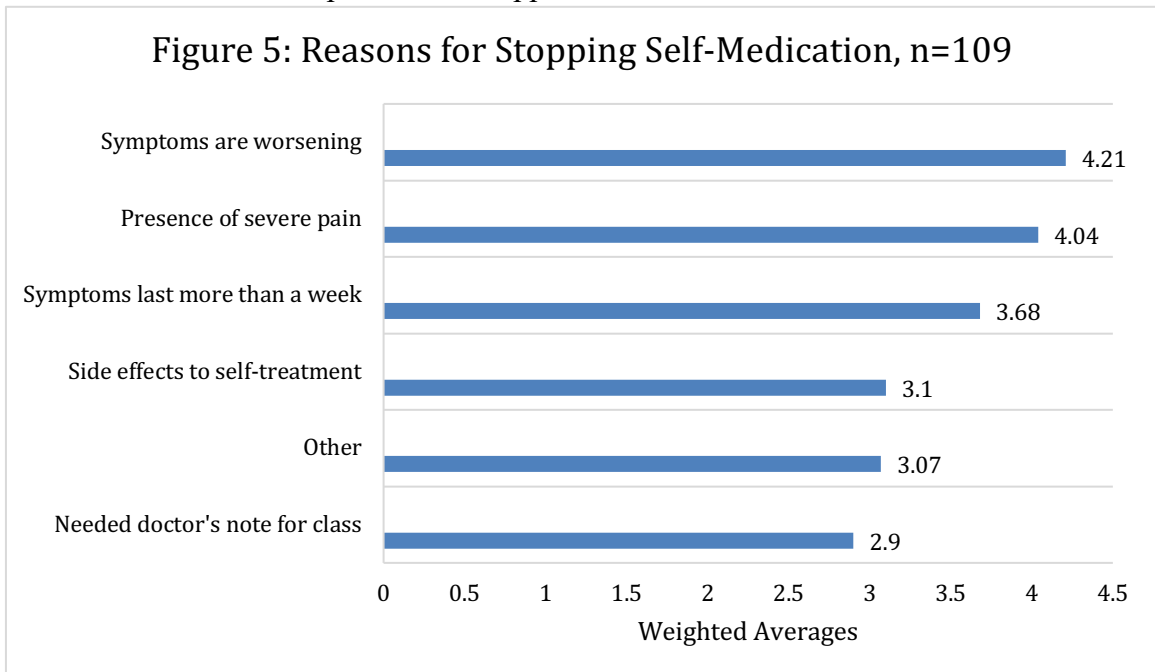
To assess the reasons for self-medication, participants were given the option to rank eight reasons from less important (1) to more important (8), including an “other” reason that allowed participants to write in their own response. The weighted averages for each reason were ranked from lowest (less important) to highest (most important). Figure 4 displays the results for all four classes combined. For all the participants combined, “have had a similar problem before” (5.58) was the most important reason to self-medicate, followed by “the problem isn’t that severe” (5.55), “learned about treatment of

condition in self-care course at SCCP/USC-COP” (5.13), “too busy to see a doctor or make an appointment” (4.82), “learned about treatment of condition from a relative, friend, etc.” (4.06), “medication readily available” (3.91), “other/short answer” (3.71), and last was “no health insurance” (3.11). As for the P1s, P3s, and P4s, the top four most important reasons coincided with the top four reasons overall. For the P2 class, their choices for the two most important reasons were “have had a similar problem before”, and “learned from self-care class”, respectively. “No health insurance” was the least important reason for starting self-medication for all classes. Furthermore, the “other/short answer” reasons for self-medication included students wanting temporary relief, convenience, felt comfortable doing so, and physician telling them how to treat their condition with OTC medications. The results for each individual class are presented in Appendix 4.



Following the same format as the previous question, students were asked to rank six reasons to stop self-medication and seek medical/professional attention from less important (1) to most important (6), including a “other” reason that allowed participants

to write in their own responses. With all the participants combined, the most important reason to stop self-medication was “symptoms are worsening” (4.21), “presence of severe pain” (4.04), “symptoms last more than a week” (3.68), “side effects to self-treatment” (3.1), “other” (3.07), and “needed a doctor’s note for class” (2.9). Moreover, the “other/short answer” reasons for stopping self-medication included OTC medication not working, and never seeking medical attention because the problem resolved. The results for all four classes combined are represented in Figure 5 below. The results for each individual class are presented in Appendix 5.



DISCUSSION

Overall, this study demonstrated that the likelihood to self-medicate increased as students progressed through the didactic pharmacy curriculum. Once in the last year of the program, students were less likely to self-medicate and this could be explained by their hands-on experience in different areas of pharmacy through their APPE rotations. This study is similar to previous studies in that it examines self-medication behaviors in students, but different in how it delves deeper into the self-treatment process.

The first question asked in the survey involved the tendency to self-medicate within the past year. On average, the highest scoring class was the P3s, followed by the P2s, then P4s, and ending with the P1s. This is interesting, particularly because the top two classes are the two in the middle of the curriculum. It is understandable for the P1 class to be the least likely on average to participate in self-medication as they had only just started the self-care course when the survey was released, in addition to them not having any pharmacotherapy courses yet. Thus, P1 students had not been taught the treatments for certain minor afflictions, but also had not learned in-depth information regarding the medications available. Likewise, it is understandable for the P3 class to score high on this measure, particularly because they have finished the self-care course, are about to complete the entire pharmacotherapy curriculum, and are almost done with their classroom-based learning, gearing up to start the APPE rotations. Confidence could be running high in this class, particularly since they have gone through the knowledge base provided by the college. What separates P3s from P4s is the application of this knowledge. P4s scored third for self-care tendencies, which may be due to experiences through their rotations. These students have the most access out of any of the other classes to a wide variety of pharmacists and other healthcare professionals, usually changing every month unless the student performs multiple rotations within one healthcare system. The P4s can ask the advice of these numerous professionals and may see the real-world consequences of self-treatment in their patients, steering them to be less likely to self-treat.

The second question asked the students to indicate any over-the-counter medications they used during the last year by checking the corresponding box. The list included medications from a range of categories such as pain relievers, antihistamines,

cough and cold, antacids, antifungals, and laxatives to name a few. The number one class of medications used was pain relievers such as acetaminophen, ibuprofen, naproxen, and aspirin. By adding up the number of boxes checked per class and dividing by the number of participants per class provided the average number of boxes checked per class. In this case, the P3s came out on top with 5.64 boxes checked on average. They were followed by the P2s (5.28), then P4s (5.09), and finally the P1s (4.19). This indicates that the P3 class was more likely to use the medications included in the provided list, while the P1s were less likely.

The third question asked the students to indicate conditions they had self-treated in the past year, including muscle aches, headaches, allergies, and diarrhea. The number one condition treated was headaches/migraines. Calculating the averages, the P2s came out on top with an average of 7.16 boxes checked, followed by the P3s (7.08), P4s (6.95), and finally the P1s (6.31). This indicates that the P2 class, closely followed by the P3 class, was more likely to self-treat for the conditions included in the question, while the P1 class was less likely.

The fourth question asked about likelihood within the last year to take medications prescribed to another person. The highest response in all four of the classes was “Never.” One person in the P3 class indicated “Almost Always,” which is concerning.

The fifth question asked about the likelihood within the last year of using illegal drugs for therapeutic purposes. As with the question before it, the highest response in all four classes was “Never.”

The sixth question asked about likelihood within the last year of drinking alcoholic beverages for therapeutic purposes. “Never” had the highest response rate in all

four classes. However, the second highest response on average for the P1s and P2s were “Sometimes” while the P3s and P4s indicated “Seldom”. The legality of alcohol may play a part in this increase of alcohol use for the P1s and P2s, as those students may be reaching the legal drinking age, 21 years old. Majority of both P1 and P2 students are in their third and fourth years of college, respectively, and assuming they began college at 18 years old, their 21st birthday would fall within those years of pharmacy school. This explains why the P2 class had the highest average for alcohol use.

The seventh question asked about likelihood within the last year of using tobacco products for therapeutic purposes. “Never” once again had the highest response rate in all four classes. One hundred percent of the P3 classes indicated “Never”.

The intention of these questions was to gauge how students used alcohol, tobacco, or illegal substances, such as marijuana, to treat ailments including stress, migraine, pain, etc. Using the substances for pleasure or fun was not the intent of the question. If this survey were to be conducted again, it is recommended that the phrase “for therapeutic reasons” be expanded upon to say, “for therapeutic reasons, not for pleasure or fun, but to treat an ailment such as stress, migraine, pain, etc.” The lack of this understanding could explain why there were few students who admitted to using these substances.

In comparison, a study conducted in Serbia from 2014 surveyed medical students for consumption of alcohol, consumption of psychoactive substances, or smoking. This study first categorized participants based on participation in self-medication, using a yes or no question. Out of the students who admitted to self-medication, 58% consumed alcohol, 5% consumed psychoactive substances, and 21% smoked (Lukovic, 2014). These results are not similar to the results from this study, which may be due, in part, to how the question was phrased. The survey used in the study from Serbia did not specify a

time frame for consumption and asked about overall use. This survey specified a year for the time frame and focused on using these substances for “therapeutic reasons,” a phrase which may have confused the participants, leading them to deny the use of these substances.

The eighth question asked the students to assign a number of importance to eight different reasons why a student may choose to self-medicate, with eight being the most important and one being the least important. All four classes chose “The problem isn’t that severe” and “Have had a similar problem before” as the top two reasons, and “No health insurance” as the least important. “Learned about treatment of the condition in self-care course at SCCP/USC-COP” placed third for every class except the P2 class, in which it ranked second. This correlates with the fact that the P2s just recently completed the self-care course and it is most fresh within their minds. As for the P1 class, they were just beginning the self-care course at the time the survey was distributed. It was hoped by the investigators that the survey would be distributed before the P1s started this class, so that a potential correlation could be made between this class and the tendencies of self-care before and after. However, these students had only gone through a small section of the class by the time the survey was completed, so these effects can still be evaluated.

The tenth question asked the students to rank six reasons to stop self-medication and seek medical or professional attention, with six being the most important and one least important. “Symptoms are worsening” ranked as number one for the P2s, P3s, and P4s, and ranked second for the P1s. During data analysis, it was discovered that a total of 7 participants ranked the reasons in the same order they were presented, which indicates they may not have fully read the choices. However, the results should not have been affected, since only a small percent did this.

A problem discovered after the survey had closed was that the fill-in-the-blank questions located after the two ranked questions may have been confusing. While the questions before them were required to be answered to submit the survey, these fill-in-the-blank questions were not. However, numerous responses of “n/a”, as well as versions of the responses provided, were received even though the question could have been left blank. Nevertheless, some responses to the “Other” options were appropriate. For example, in response to question 10, reasons to stop self-medication, students within all four classes submitted “problem resolved” or “never had to seek medical attention” for their response. Both problems could have stemmed from the fact the survey was not pilot tested before distribution due to time constraints.

Originally, it was the investigators intention to utilize the statistical analysis features of the advanced plan in Survey Monkey to analyze the four pharmacy classes tendencies to self-medicate, and to find statistically significant data. Unfortunately, Survey Monkey is only able to run this test if at least two answer choices have 30 or more responses in each group. The P3s were the only class to have over 30 responses total, and no single answer choice per class had more than 30 responses. Thus, we were unable to use the built-in analysis for statistical significance, and instead had to analyze the data using measures of central tendency. While it would have been more interesting to have statistically significant data, the conducted analysis using mostly mean and median is sufficient to answer our hypothesis.

Regarding the low number of responses per class, a reason for this may be due to the time the survey and the reminders were released. Using Survey Monkey, the survey was released to all four classes early on a Monday morning. At that time, the P1s and P2s were in class, the P3s were not in class but had an exam later that afternoon, and the P4s

were either on rotation or had that month off. We received 97 responses that day, either complete or partial. A week and a half later, a reminder email was sent out, garnering 47 more responses. The next week, a reminder email was again sent out, but one was sent specifically to people with partial responses and one specifically to people with no response recorded. These emails gained 32 more responses, either partial or complete. One last reminder email was sent out three days before the survey closed, adding 10 partial or complete responses. Majority of the reminder emails also occurred in the morning. The P3 class had the highest response rate of the classes, which may have been due to how they were, for the most part, not in class at the times these emails went out. Some P3s may have had electives at that time, but no core classes were scheduled during those times. The high P3 response rate may also be due to name recognition, as both investigators were P3 students. While we only received an 18% response rate, this rate is acceptable because we had such similar response rates from each class. We received responses between 20-23% from the P1s, P2s, and P4s, and 33% of the P3s responded. Also, the demographics of the study population are similar to the overall population of the schools, which are predominantly white and female.

The study's limitations included a lack of pilot testing to ensure feasibility and comprehension of the questions and to uncover any issues within the survey itself. If pilot testing would have occurred, some problems may have been discovered, potentially leading to an improvement in study design. Another limitation was the study design. As this was a cross-sectional study, the results are based on a specific point in time and may not encompass the true relationship between level of pharmacy education and self-medication. However, this study could be transformed into a cohort study by administering the survey every year to the same class of pharmacy students as they

progress through the curriculum. Furthermore, the survey was released at a date later than intended, leading to the P1 students already having been introduced to some aspects of self-care. The original intention of the study was to release the survey during the fall semester of 2017 to truly see the effect that the SCCP/USC-COP self-care and pharmacotherapy classes had upon students' tendencies to self-medicate. However, the study was released early spring semester of 2018 while the P1 students were taking the self-care course. Regardless, the P1s had not yet been exposed to any pharmacotherapy courses, so this comparison can still be validly made.

The study's strengths included a similar number of responses per class, allowing a comparison of these responses to be calculated, irrespective to the low response rate. In addition, numerous thoughtful responses were submitted to the fill-in-the-blank questions, providing reasons to start or stop self-medication that the researchers didn't originally consider. Another strength is that this survey is standardized and can be replicated in other pharmacy schools.

Studies similar to this one have been conducted, though the majority didn't test for an increase in self-care tendencies as more information was learned. One of these studies from 2015 compared medical students to pharmacy students studying in Bangladesh and found that while the two groups had similar self-medication tendencies, first-year students tended to be more cautious and serious about self-medicating than the older students were. They also found that the medical students viewed self-medication as much more dangerous compared to the pharmacy students (Alam, 2015). Other studies focused more on reasons why students chose to self-medicate. One found that medical students reported having a hard time acting as both a student and a patient, or even believed that their academic standing could be decreased by certain health problems

(Montgomery, 2011). Another study from the University of Belgrade reported that their students self-medicated due to non-serious symptoms or long waits at the doctor's office (Lukovic, 2014). Some of the data was conflicting, especially concerning the hypothesis that medical education increases the odds of self-treating. For example, one study found that there was no significant difference between medical and non-medical student's self-medication tendencies (Zafar, 2008), while another found that nonmedical students had higher odds of self-medicating (Sawalha, 2008).

All the studies mentioned above utilized a self-administered questionnaire to obtain cross-sectional data, which is similar to how this study was performed. While self-reported information can be biased, it provides important insight into what the test subject thinks, feels, and does. The current study focused on how increasing pharmacy education affects one's confidence in self-treating. Also, this study adds to the narrative of the methods and medications students used for self-treatment, why students chose the potentially dangerous path of not getting a registered physician or other trained professional involved in their care, and what caused them to stop self-medication.

CONCLUSION

In conclusion, pharmacy students' tendencies to self-medicate increased as they progressed through the didactic pharmacy curriculum. Students in their fourth-year gain knowledge through the practical experience of pharmacy, which may have a negative effect upon their confidence to treat themselves. Nevertheless, first year pharmacy students were the least likely to self-medicate, and there was a positive correlation between level of pharmacy school and the likelihood to self-medicate.

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Appendix 1: Survey Questions

1. Over the past year, how likely were you to self-medicate? (Self-medication includes using Over-The-Counter (OTC) medications, including vitamins and supplements, using medications prescribed to another person, and using recreational (i.e. alcohol, tobacco) or illicit substances for therapeutic purposes)

1. Never
2. Seldom
3. Sometimes
4. Often
5. Almost always

2. Have you used any of the following OTC medications during the past 12 months?

Check all that apply.

- | | |
|---|--|
| 1. Acetaminophen, Ibuprofen, Naproxen, Aspirin | 10. Famotidine, Ranitidine, Omeprazole, Esomeprazole, Lansoprazole, Cimetidine, Antacids |
| 2. Benzocaine/Menthol (Cepacol, Chloraseptic), Guaifenesin, Dextromethorphan, Oxymetazoline, Phenylephrine, Pseudoephedrine | 11. Aspirin/Acetaminophen/Caffeine (Excedrin) |
| 3. Cetirizine, Diphenhydramine, Loratadine, Levocetirizine, Fexofenadine, Chlorpheniramine, Brompheniramine | 12. Terbinafine, Clotrimazole |
| 4. Benzoyl Peroxide, Salicylic Acid, Adapalene | 13. Menthol/Zinc oxide (Gold Bond), Hydrocortisone |
| 5. Acetaminophen/Caffeine/Pyrilamine (Midol), Acetaminophen/Pamabrom/Pyrilamine (Pamprin) | 14. Neomycin Sulfate/Polymyxin B sulfate/Bacitracin Zinc (Neosporin), Calamine, Lidocaine, Aloe Vera |
| 6. Loperamide, Bismuth Subsalicylate | 15. Piperonyl butoxide/Pyrethrum extract (RID), Permethrin (Nix) |
| 7. Wheat dextrin (Benefiber), Psyllium husk (Metamucil) | 16. Phenazopyridine, Fluconazole, Miconazole |
| 8. Docusate Sodium, Bisacodyl | 17. Docosanol (Abreva) |
| 9. Sodium Citrate Dihydrate (Nauzene), Dimenhydrinate (Dramamine), Meclizine (Bonine), Emetrol | 18. Artificial Tears, Lubricating Eye gels/ointments |
| | 19. Xylitol, Sorbitol |
| | 20. Benzocaine, Prilocaine |
| | 21. Minoxidil (Rogaine) |
| | 22. Orlistat (Alli) |
| | 23. Supplements/Vitamins |
| | 24. Other (short answer) |

3. Have you self-treated for any of the following conditions during the past 12 months?

Check all that apply.

- | | |
|------------------------------|------------------------------|
| 1. Muscle Aches/Sprain | 21. Insect bites |
| 2. Gout/Arthritis | 22. Sunburn |
| 3. Headache/Migraine | 23. Ticks |
| 4. Cold | 24. Poison Ivy, Poison Oak |
| 5. Allergy | 25. Warts |
| 6. Fever | 26. Hair Loss |
| 7. Diarrhea | 27. Lice |
| 8. Constipation | 28. Jock Itch |
| 9. Nausea | 29. Hemorrhoids |
| 10. Vomiting | 30. PMS/Cramping/Bloating |
| 11. Acid Reflux/Heartburn | 31. Vaginal yeast infections |
| 12. Ingrown toenails | 32. Urinary Tract Infections |
| 13. Bunions | 33. Dry Eyes |
| 14. Athlete's Foot | 34. Cold Sores |
| 15. Acne | 35. Dry Mouth |
| 16. Eczema | 36. Toothache/Mouth Pain |
| 17. Psoriasis | 37. Weight Loss |
| 18. Rosacea | 38. Stress/Anxiety |
| 19. Cuts/Wounds/Burns | 39. Other (short answer) |
| 20. Ingrown hair/ Razor burn | |

4. Over the past year, how likely were you to take medications for therapeutic purposes (off-label use included) that were prescribed to another person?

1. Never
2. Seldom
3. Sometimes
4. Often
5. Almost Always

5. Over the past year, how likely were you to use illegal drugs for therapeutic purposes?

1. Never
2. Seldom
3. Sometimes
4. Often
5. Almost always

6. Over the past year, how often did you drink alcoholic beverages for therapeutic purposes?

1. Never
2. Seldom
3. Sometimes
4. Often
5. Almost always

7. Over the past year, how often did you use tobacco products for therapeutic purposes?
 1. Never
 2. Seldom
 3. Sometimes
 4. Often
 5. Almost always
8. Over the past year, what were the most important reasons for you to self-medicate?
Rank each response 1-8, 1=less important, 8=more important.
 1. The problem isn't that severe
 2. Have had a similar problem before
 3. Too busy to see a doctor or make an appointment
 4. No health insurance
 5. Learned about treatment of the condition in self-care course at SCCP/USC-COP
 6. Learned about treatment of the condition from a relative, friend, etc.
 7. Medication was readily available from a relative, friend, etc.
 8. Other (short answer available in next question)
9. If you answered "Other" in question 8, what was a reason for you to self-medicate?
10. Over the past year, what were the most important reasons for you to stop self-medication and seek medical/professional attention? Rank each response 1-6, 1=less important, 6=more important.
 1. Symptoms last more than a week
 2. Symptoms are worsening
 3. Presence of severe pain
 4. Side effects to self-treatment
 5. Needed doctor's note for class
 6. Other (short answer available in next question)
11. If you answered "Other" in question 10, what was your reason to stop self-medication and seek medical/professional attention?
12. Year in pharmacy school
 1. P1
 2. P2
 3. P3
 4. P4
13. Age (OPTIONAL)
 1. (Short Answer)
14. Gender (OPTIONAL)
 1. Male
 2. Female
 3. Prefer Not to Answer/Other

15. Race/Ethnicity (OPTIONAL)

1. White/Caucasian
2. Black/African American
3. Hispanic or Latino
4. American Indian or Alaska Native
5. Asian
6. Native Hawaiian or Other Pacific Islander
7. Other

16. (OPTIONAL) As a token of appreciation for completing the survey, you may enter to win a gift card. Please follow this link (link provided at time of survey distribution):

Appendix 2: Cover Letter

Dear SCCP/USC-COP Student,

We are conducting a study to measure the impact pharmacy education has on pharmacy students' inclination to self-medicate. We are asking you, as a pharmacy student enrolled in the South Carolina College of Pharmacy and the University of South Carolina College of Pharmacy, to complete a survey. Your response to the survey is extremely important to this research. We ask you to complete the survey to the best of your knowledge.

Your participation is optional and your responses are anonymous. Study information will be kept in a secure location at the University of South Carolina. The results of the study may be published or presented at professional meetings, but the results are unidentified. Taking part in the study is your decision.

We will be happy to answer any questions you have about the study. You may contact us if you have study related questions or problems (contact information is below). If you have any questions about your rights as a research participant, you may contact the Office of Research Compliance at the University of South Carolina at 803-777-7095.

Thank you for your consideration. If you would like to participate, please follow the link below to complete the survey.

Sincerely,

Rebekah Crandall (RLC@email.sc.edu)

Danielle O'Neal (doneal@email.sc.edu)

Appendix 3: Table 1: Demographics

Demographics of 109 survey participants	
Characteristic	# of students (%)
Sex	
Male	21 (19.44%)
Female	86 (79.63%)
Prefer not to answer/Other	1 (0.93%)
Race	
White/Caucasian	85 (78.70%)
Black/African American	10 (9.26%)
Hispanic or Latino	4 (3.70%)
Asian	6 (5.56%)
Other	3 (2.78%)
Age	
20-24 years	83 (76.85%)
25-29 years	17 (15.74%)
30+ years	8 (7.41%)
Year in Pharmacy Curriculum	
P1	26 (23.85%)
P2	25 (22.94%)
P3	36 (33.03%)
P4	22 (20.18%)

Appendix 4: Question #8 Reasons for Starting Self Medication Data

P1 students

P1 Students	1	2	3	4	5	6	7	8	Total	Score
No health insurance	38.46% 10	34.62% 9	11.54% 3	0.00% 0	7.69% 2	3.85% 1	3.85% 1	0.00% 0	26	2.31
Other (short answer available in the next question)	38.46% 10	19.23% 5	11.54% 3	7.69% 2	0.00% 0	11.54% 3	0.00% 0	11.54% 3	26	3.04
Medication was readily available from a relative, friend, etc.	3.85% 1	23.08% 6	30.77% 8	15.38% 4	15.38% 4	3.85% 1	7.69% 2	0.00% 0	26	3.58
Learned about treatment of the condition from a relative, friend, etc.	11.54% 3	15.38% 4	15.38% 4	26.92% 7	15.38% 4	7.69% 2	7.69% 2	0.00% 0	26	3.73
Too busy to see a doctor or make an appointment	0.00% 0	3.85% 1	3.85% 1	30.77% 8	19.23% 5	26.92% 7	11.54% 3	3.85% 1	26	5.11
Learned about treatment of the condition in self-care course at SCCP/USC-COP	0.00% 0	0.00% 0	15.38% 4	7.69% 2	30.77% 8	30.77% 8	3.85% 1	11.54% 3	26	5.35
The problem isn't that severe	7.69% 2	3.85% 1	3.85% 1	7.69% 2	11.54% 3	7.69% 2	19.23% 5	38.46% 10	26	6.04
Have had a similar problem before	0.00% 0	0.00% 0	7.69% 2	3.85% 1	0.00% 0	7.69% 2	46.15% 12	34.62% 9	26	6.85

P2 students

P2 Students	1	2	3	4	5	6	7	8	Total	Score
No health insurance	32.00% 8	28.00% 7	4.00% 1	4.00% 1	8.00% 2	0.00% 0	8.00% 2	16.00% 4	25	3.40
Medication was readily available from a relative, friend, etc.	4.00% 1	20.00% 5	16.00% 4	24.00% 6	24.00% 6	12.00% 3	0.00% 0	0.00% 0	25	3.80
Other (short answer available in the next question)	36.00% 9	8.00% 2	8.00% 2	8.00% 2	0.00% 0	4.00% 1	12.00% 3	24.00% 6	25	4.08
Learned about treatment of the condition from a relative, friend, etc.	0.00% 0	8.00% 2	32.00% 8	16.00% 4	12.00% 3	20.00% 5	12.00% 3	0.00% 0	25	4.40

The problem isn't that severe	20.00% 5	12.00% 3	4.00% 1	12.00% 3	8.00% 2	0.00% 0	20.00% 5	24.00% 6	25	4.76
Too busy to see a doctor or make an appointment	4.00% 1	4.00% 1	16.00% 4	16.00% 4	24.00% 6	20.00% 5	8.00% 2	8.00% 2	25	3.64
Learned about treatment of the condition in self-care course at SCCP/USC-COP	0.00% 0	0.00% 0	16.00% 4	20.00% 5	20.00% 5	28.00% 7	12.00% 3	4.00% 1	25	5.12
Have had a similar problem before	4.00% 1	20.00% 5	4.00% 1	0.00% 0	4.00% 1	16.00% 4	28.00% 7	24.00% 6	25	5.60

P3 students

P3 Students	1	2	3	4	5	6	7	8	Total	Score
No health insurance	27.78% 10	27.78% 10	5.56% 2	8.33% 3	0.00% 0	8.33% 3	13.89% 5	8.33% 3	36	3.47
Medication was readily available from a relative, friend, etc.	16.67% 6	8.33% 3	22.22% 8	11.11% 4	19.44% 7	13.89% 5	5.56% 2	2.78% 1	36	3.86
Learned about treatment of the condition from a relative, friend, etc.	0.00% 0	11.11% 4	27.78% 10	30.56% 11	19.44% 7	5.56% 2	5.56% 2	0.00% 0	36	3.97
Other (short answer available in the next question)	22.22% 8	19.44% 7	11.11% 4	5.56% 2	5.56% 2	11.11% 4	2.78% 1	22.22% 8	36	4.08
Too busy to see a doctor or make an appointment	13.89% 5	5.56% 2	11.11% 4	13.89% 5	16.67% 6	19.44% 7	2.78% 1	16.67% 6	36	4.67
Learned about treatment of the condition in self-care course at SCCP/USC-COP	2.78% 1	2.78% 1	11.11% 4	19.44% 7	19.44% 7	30.56% 11	11.11% 4	2.78% 1	36	5.00
Have had a similar problem before	8.33% 3	13.89% 5	2.78% 1	5.56% 2	13.89% 5	2.78% 1	38.89% 14	13.89% 5	36	5.36
The problem isn't that severe	8.33% 3	11.11% 4	8.33% 3	5.56% 2	5.56% 2	8.33% 3	19.44% 7	33.33% 12	36	5.58

P4 students

P4 Students	1	2	3	4	5	6	7	8	Total	Score
No health insurance	31.82% 7	31.82% 7	4.55% 1	4.55% 1	4.55% 1	0.00% 0	18.18% 4	4.55% 1	22	3.14
Other (short answer available in the next question)	36.36% 8	18.18% 4	4.55% 1	9.09% 2	4.55% 1	9.09% 2	0.00% 0	18.18% 4	22	3.45
Learned about treatment of the condition from a relative, friend, etc.	0.00% 0	13.64% 3	9.09% 2	36.36% 8	27.27% 6	13.64% 3	0.00% 0	0.00% 0	22	4.18
Medication was readily available from a relative, friend, etc.	4.55% 1	4.55% 1	22.73% 5	9.09% 2	27.27% 6	27.27% 6	4.55% 1	0.00% 0	22	4.50
Too busy to see a doctor or make an appointment	4.55% 1	9.09% 2	27.27% 6	13.64% 3	9.09% 2	9.09% 2	9.09% 2	18.18% 4	22	4.59
Learned about treatment of the condition in self-care course at SCCP/USC-COP	0.00% 0	13.64% 3	4.55% 1	18.18% 4	18.18% 4	22.73% 5	13.64% 3	9.09% 2	22	4.91
Have had a similar problem before	18.18% 4	9.09% 2	0.00% 0	4.55% 1	9.09% 2	9.09% 2	40.91% 9	9.09% 2	22	5.14
The problem isn't that severe	4.55% 1	0.00% 0	27.27% 6	4.55% 1	0.00% 0	9.09% 2	13.64% 3	40.91% 9	22	5.82

Appendix 5: Question #10 Reasons for Stopping Self Medication Data

P1 Students	1	2	3	4	5	6	Total	Score
Other (short answer available in the next question)	73.08% 19	7.69% 2	11.54% 3	0.00% 0	3.85% 1	3.85% 1	26	1.65
Side effects to self-treatment	11.54% 3	23.08% 6	42.31% 11	15.38% 4	7.69% 2	0.00% 0	26	2.85
Needed doctor's note for class	11.54% 3	50.00% 13	7.69% 2	7.69% 2	7.69% 2	15.38% 4	26	2.96
Symptoms last more than a week	3.85% 1	7.69% 2	15.38% 4	38.46% 10	23.08% 7	11.54% 3	26	4.04
Symptoms are worsening	0.00% 0	11.54% 3	3.85% 1	19.23% 5	38.46% 10	26.92% 7	26	4.65
Presence of severe pain	0.00% 0	0.00% 0	19.23% 5	19.23% 5	19.23% 5	42.31% 11	26	4.85

P2 Students	1	2	3	4	5	6	Total	Score
Needed doctor's note for class	16.00% 4	28.00% 7	20.00% 5	24.00% 6	8.00% 2	4.00% 1	25	2.92
Symptoms last more than a week	24.00% 6	12.00% 3	12.00% 3	36.00% 9	12.00% 3	4.00% 1	25	3.12
Side effects to self-treatment	8.00% 2	20.00% 5	32.00% 8	16.00% 4	24.00% 6	0.00% 0	25	3.28
Other (short answer available in the next question)	36.00% 9	8.00% 2	4.00% 1	0.00% 0	12.00% 3	40.00% 10	25	3.64
Presence of severe pain	4.00% 1	16.00% 4	28.00% 7	12.00% 3	16.00% 4	24.00% 6	25	3.92
Symptoms are worsening	12.00% 3	16.00% 4	4.00% 1	12.00% 3	28.00% 7	28.00% 7	25	4.12

P3 Students	1	2	3	4	5	6	Total	Score
Needed doctor's note for class	22.22% 8	38.89% 14	11.11% 4	8.33% 3	16.67% 6	2.78% 1	36	2.67
Side effects to self-treatment	5.56% 2	19.44% 7	33.33% 12	27.78% 10	11.11% 4	2.78% 1	36	3.28
Other (short answer available in the next question)	41.67% 15	5.56% 2	8.33% 3	2.78% 1	5.56% 2	36.11% 13	36	3.33
Presence of severe pain	16.67% 6	5.56% 2	11.11% 4	30.56% 11	22.22% 8	13.89% 5	36	3.78
Symptoms last more than a week	8.33% 3	13.89% 5	19.44% 7	19.44% 7	19.44% 7	19.44% 7	36	3.86
Symptoms are worsening	5.56% 2	16.67% 6	16.67% 6	11.11% 4	25.00% 9	25.00% 9	36	4.08

P4 Students	1	2	3	4	5	6	Total	Score
Side effects to self-treatment	4.55% 1	45.45% 10	13.64% 3	27.27% 6	9.09% 2	0.00% 0	22	2.91
Needed doctor's note for class	18.18% 4	18.18% 4	18.18% 4	18.18% 4	27.27% 6	0.00% 0	22	3.18
Symptoms last more than a week	9.09% 2	18.18% 4	18.18% 4	22.73% 5	22.73% 5	9.09% 2	22	3.59
Presence of severe pain	18.18% 4	4.55% 1	31.64% 7	9.09% 2	13.64% 3	22.73% 5	22	3.64
Other (short answer available in the next question)	36.36% 8	0.00% 0	13.64% 3	4.55% 1	0.00% 0	45.45% 10	22	3.68
Symptoms are worsening	13.64% 3	13.64% 3	4.55% 1	18.18% 4	27.27% 6	22.73% 5	22	4.00