

# Academic activity aims to early expose medical students to best prescribing practices

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## ABSTRACT

Prescribing medications is a significant clinical responsibility for medical providers. However, fresh medical graduates often report a lack of confidence in prescribing medications and answering drug-related questions in clinical practice. We implemented a course at Sulaiman AlRajhi University medical school to enhance medical training for student physicians to engage in optimal practices in prescribing medications. We designed an elective pharmacology course to optimize student physicians' skills in prescription practices while also introducing them to the pharmacy and the duties of pharmacists as healthcare providers. The course targeted second-year students as we desired early exposure. Furthermore, we identified objectives that were deemed essential to acquire during the course and assessment methods. We analyzed the data of 56 student physicians who participated in the elective pharmacology course during the academic years 2019–2020 and 2020–2021. Collectively, there was a negative shift in the performance of student physicians in the academic year 2020–2021 compared to the previous year 2019–2020, with 5.2% fewer students getting grades of A+ and 17.8% more students getting D grades or lower. The grades significantly differed between both years  $X^2(8, N=56) = 27.61, p = .000$ . Our data reported high satisfaction and confidence in the prescription skills of the student physicians who underwent the course. However, to evaluate its full potential and assess its usefulness, we believe additional research and implementation of more prescribing skills exercises across all academic years is essential.

**Keywords:** Medical education, Pharmacy, Prescribing practices, Prescription

## Introduction

Most prevalent diseases are managed by medication therapy which requires prescription medications. Therefore, skill related to prescribing drugs is an essential requirement of medical practice. Furthermore, writing prescriptions is the provider's primary mode of intervention in many medical specialties [1]. As far as prescription writing is concerned, it is a multi-skilled

process that requires diagnostic attributes, a comprehensive understanding of prescription drugs, practical communication skills, recognition of fundamentals related to clinical pharmacology, appraisal of risk and uncertainty, and clinical judgment. Considering appropriate training in optimal prescribing practices, all the stated practice pillars would be fulfilled [2]. Training for best prescribing practices of medications lies upon medical schools through which they can prepare future providers [1]. However, in most cases, medical schools cover training on best prescription practices late in the curriculum. For example, a survey was distributed among 25 medical schools in the United Kingdom for students in the third to fifth year assessing their satisfaction with their prescribing skills. The given survey hints at the standard timing of when medical schools usually cover prescription writing training [3]. Furthermore, the method of prescribing training varies throughout medical schools, commonly reserved for the last year

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of training. Pre-clinical training in prescription writing is an acceptable way to bridge the gap between fundamental knowledge and clinical practice [4]. One of the studies, which encouraged this concept, was reported by Gibson *et al.* as they conducted numerous tutorials at the University of Edinburgh, where medical students in their final year received interactive small-group tutorials from first and second-year doctors supervised by academic experts. The tutorials were conducted in the form of prescribing simulation sessions, each session lasting one hour. A total of 196 tutorial sessions were delivered during the 2010-2011 academic year, with a questionnaire given to the students at the end of each tutorial. The students responded with an augmentation in their confidence regarding prescribing skills and comprehension [5]. In another clinical study, Kennedy *et al.* distributed a survey among UK medical students regarding the acquisition of practical prescribing skills, recognizing that they feel unprepared and lack adequate abilities. Additionally, medical students believe that incorporating an early introduction to best prescription practices training into the curriculum will be more effective in enhancing their medication prescribing skills. It will provide a more in-depth understanding of prescriptions and polishes the desired skills [3, 6]. This student's perception is adapted and recommended by several studies. For example, Linton *et al.* reported that one of the practical steps toward optimizing prescribing skills is that learning about prescribing skills should be initiated early in medical training, forecasted by continuous opportunities for reflective practice [7]. Furthermore, the pitfalls of poor prescribing skills training are evident as we observed studies suggesting prescription errors are a major hazard in healthcare worldwide, according to the joint commission [8]. Also, medication errors are the eighth most significant source of avoidable mortality in the United States, resulting in around 225,000 deaths per year [9]. Upon narrowing the scope to our community, medication errors are considered a burdening issue, as reported by Almalki *et al.* highlighting that prescription errors are the most common medication misconduct in Saudi Arabia [10]. Therefore, to answer this pressing necessity and avoid the negative repercussions, we in the medical school at Sulaiman Al Rajhi University designed an elective course early in the curriculum for second-year medical students with a dedicated activity aiming to optimize prescription practices.

## Materials and Methods

We designed an elective course as part of our medical curriculum in a manner that intended to maximize the experience of the student physicians with medication prescribing practices and introduce the student physicians to the pharmacy and the responsibilities of pharmacists as healthcare professionals. Furthermore, the course activity introduces the student physicians to the common prescription drugs in the community and common mistakes in writing a prescription. The ambition of the course is subdivided into specific objectives which are believed to be the knowledge student physicians must obtain

early on in the medical curriculum. The course objectives are illustrated in **(Table 1)**.

**Table 1. Course objectives as listed in the course handbook**

Describe the mechanisms involved during the movement of drugs through biological membranes and their clinical application.
List and explain routes of administration for drugs and describe their clinical use and limitations.
Explain the mechanism of absorption and factors modifying the absorption of drugs.
Explain the volume of distribution and factors influencing the distribution of drugs in the body compartments.
Describe the bioavailability of the drug and calculate the dose and frequency of the drug administration.
Explain the process of biotransformation and the influence of genetics on the biotransformation of drugs.
Explain drug clearance and demonstrate the application of ion trapping in the treatment of poisoning (Aspirin).
Explain the different phases of drug discovery, and development, details of clinical trials, and design different phases of clinical trials.
List indications for therapeutic monitoring of drugs for improving patient compliance and safety.
Describe the basis of adverse drug reactions and drug-drug interactions.

The course targeted second-year student physicians as we desired early exposure, taking into consideration the baseline knowledge level of the student physicians. Therefore, we focused on diabetes and cardiovascular diseases, the two most prevalent diseases in the community. The student physicians participated in small groups of three to five students and collected 20 prescriptions for these two disease states. The student physicians were then asked to classify and shortlist two common medications, outlining their primary clinical indication, mechanism of action, adverse effects, and potential drug-drug, drug-food, and drug-disease interactions in a slide presentation. Furthermore, the student physicians were expected to shadow the pharmacist while collecting these prescriptions and learn more about their role as part of the healthcare team. The steps of this activity are shown in **(Table 2)**.

**Table 2. Criteria for shortlisting medications in the course activity**

<b>STEP 1</b>	Make a list of all the medications in all the prescriptions collected.
<b>STEP 2</b>	Sort the medications in the list into categories.
<b>STEP 3</b>	Explore the prescription rationale of each medication.
<b>STEP 4</b>	Select two medications and indicate their main indication, mechanism of action, side effects, patient counseling points, and possible interactions.
<b>STEP 5</b>	Critically review the two drugs and present a summary of whether these prescriptions align with national and international recommendations.
<b>STEP 6</b>	Prepare a 7-12 slides PowerPoint presentation covering pertinent information regarding the two medications of choice.

The practical portion of the course also involved hospital visits as it provided the students the opportunity to observe drug dispensing, patient safety checkpoints in the pharmacy, and the handling of medications in the hospital. We aimed to provide the students with as much independence as possible initially, followed by a supervised discussion at the end of the visit. The discussion focused on promoting student physicians interaction and answering questions regarding pharmacy operations and services. Student physicians were expected to explore the rationale of use as well as the relevant procedures involved in dispensing medications to patients. During the discussions with the student physicians, they described the mechanism of action, interactions with other medications, and side effects of two drugs of choice, particularly common antihypertensive and antihyperglycemic drugs. The activity assessment plan is shown in (Table 3).

**Table 3. Methods of assessment for the student physicians' activity**

Assessment item	Grade marks
Written report format	1
Report scientific content	2
Quality of prescriptions collected	1
Classification of drugs	2
Description of two drug agents	1
Group presentation	3
Total: 10 marks	

To evaluate the impact of the course and for future quality improvement, we collected data on the student physicians' performance on the course and their feedback for two academic years 2019-2020, and 2020-2021 for both male and female sections of the college.

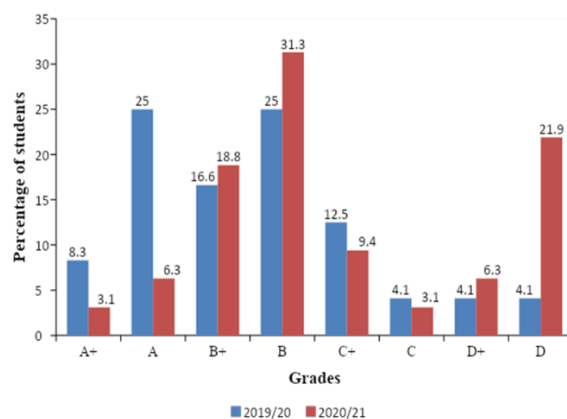
## Results and Discussion

We collected the data of 56 student physicians who participated in the pharmacology elective course during the academic years 2019–2020 and 2020–2021. The comparison of male and female course cohorts is illustrated in (Table 4).

**Table 4. Gender comparison between 2019-2020 and 2020-2021**

Variable	2020-2019	2021-2020	Chi-square value	P value
Gender				
Male	14	15	0.721	0.395
Female	10	17		

Chi-square statistics;  $P < 0.05$  is considered statistically significant. Analysis was carried out on the performance and feedback of student physicians in the pharmacology elective course and comparison, to other elective courses offered at the college. Student physician grades for the academic years 2019–2020 and 2020-2021 are shown in (Figure 1).



**Figure 1. Student physician grades comparison between the 2019-2020 and 2020-2021 academic years**

Chi-square value = 27.61; Degrees of freedom = 8;  $p = 0.000$

The collection of student physician feedback for the academic years 2019–2020 and 2020-2021 is shown in (Table 5).

**Table 5. Student physicians' feedback on the course for the academic years 2019-2020 and 2020-2021**

Items included in the evaluation	20/2019	21/2020	Chi-square value	P value
<b>Part I (Likert-scale questionnaire)</b>				
I'm satisfied with the information given to me about the organization of this Block	3.90	4.35		
The content of this Block fitted well with the level of my previous knowledge	3.90	4.23		
The educational activities/learning outcomes and goals of this Block adequately prepared me for this exam	3.45	3.95	0.088	0.999
Overall, I was satisfied with the quality of this Block.	4.19	4.15		
The resources I needed in this Block (textbooks, library, computers, etc.) were available when I needed them.	3.95	3.50		
The usefulness of tutorial group meetings	4.24	4.19		
<b>Part II</b>				
Hours spent on self-study per week (median)	21	25		
Total number of hours spent per week (median)	32	35	0.048	0.852

Chi-square statistics;  $P < 0.05$  is considered statistically significant

Part I: Mean value of Likert scale questionnaire

A comparison of student physician feedback of the course compared to other previous course blocks for the academic years 2019–2020 and 2020-2021 is shown in (Table 6).

**Table 6. Comparison of student physician feedback for pharmacology elective and other course blocks**

Items included in the assessment	Block A	Block B	Pharmacology elective	Chi-square value	P value
The organization of the Block	4.04	3.21	4.35	0.534	0.999
The link of the Block with your prior knowledge	4.30	3.57	4.23		
The educational activities/learning outcomes and goals of this Block adequately prepared me for this exam	2.56	3.54	3.95		
Overall, I was satisfied with the quality of this Block	4.06	3.10	4.15		
The resources I needed in this Block (textbooks, library, computers, etc.) were available when I needed them	4.16	3.05	3.50		
Average usefulness of all tutorial groups	4.05	3.65	4.19		

Chi-square statistics:  $P < 0.05$  is considered statistically significant

In the survey by Kennedy *et al.* among medical students in the United Kingdom, students reported being unprepared and lacking adequate abilities in medication prescribing skills [3]. The students believe they should have had an earlier introduction to best prescription practice, which is also adapted and recommended by Linton *et al.* [6]. Therefore, the course has been designed and aimed to improve the prescription skills of the students. In addition, to ensure the benefit of the course, we traced student physicians' scores for two years.

There was an increase in the number of student physicians enrolled in this course, and the percentage of female student physicians in 2020-2021 increased compared to 2019-2020. A possible cause for this increase in the number and percentage of female student physicians can be attributed to the incremental increase in enrollment of female student physicians in medical school every year. Furthermore, it is possible that more female student physicians became interested in studying medicine as a result of rapid cultural changes in Saudi Arabia.

Tracing of the results shows that the most achievable grade in the academic years 2019-2020 and 2020-2021 was A and B, respectively, with more student physicians scoring D and D+ in 2020-2021. On the other hand, the least achievable grade in 2019-2020 was D, C+, and C, 4% each, while in 2020-2021, it was A+ with only 3.1% of student physicians achieving this grade, along with grade C in the same percentage. Moreover, between 2019-2020 and 2020-2021, there was a severe drop in the percentage of student physicians who achieved A from 25% to 6%. In addition, the percentage of student physicians who achieved a grade of D increased from 4% to 21%. Although the number and percentage of female student physicians have increased, and while the female mean total grade was noticeably higher than the male means in all assessment tools, including exams, quizzes, and homework, the total grade's mean has declined. This might be due to an increase in the difficulty of the

exams over the years. This is evident by the self-study hours per week reported by student physicians, which were 25 hours in 2020-2021, an increase from 21 hours in 2019-2020. In addition, the total study hours for all blocks per week increased to 35 hours in 2020-2021 from 32 hours in 2019-2020.

Feedback from student physicians shows student physicians were satisfied with the organization of the course, and with the course content. The satisfaction rate increased to 4.35 in 2020-2021 compared to 3.90 in 2019-2020, which indicates the positive experience of the course organizers. In addition, the student physicians were satisfied with the content and the fitting of the block to their level of previous knowledge, as demonstrated by the increase in the satisfaction rate from 3.90 in 2019-2020 to 4.23 in 2020-2021.

Even though their scores have decreased, the student physicians have shown increased satisfaction with the educational activities, results, and goals of the block, which has adequately prepared them for the exam. This is evidenced by an increased contentment of 0.5 in 2020-2021 compared to 2019-2020, which may suggest that the decline in the student physicians' scores was caused by the increase in the quantity and quality of the course content, which is also shown by the satisfaction rate in their feedback. Moreover, the addition of a consultant clinical pharmacist as a course coordinator for the year 2020-2021 may have premeditated these results.

Unexpectedly, the overall satisfaction with the quality of the block decreased by 0.05. However, it is statistically insignificant, and the result is not in line with the previously mentioned answers. Furthermore, the feedback shows that the accessibility of educational resources decreased in 2020-2021 by 0.45 compared to 2019-2020. Moreover, the usefulness of tutorial group meetings has slightly declined by 0.05, which is statistically insignificant. However, to improve the course, we need to prepare more learning materials and tools, along with increasing the student physician's engagement in the tutorial group meetings.

Overall, the student physicians showed improvements in their abilities to prescribe the most common medications in the community in the proper way, fulfilling all the stated practice pillars and avoiding common mistakes in writing prescriptions. The feedback from the student physicians was positive, they were satisfied and more confident. This goes along with the report of Gibson *et al.*, at the University of Edinburgh, where they conducted numerous tutorials to improve the student's confidence in prescription skills [4]. Based on the results, we suggest introducing the best prescription practice to the medical students in the early curriculum years, adjusted adequately to their knowledge level.

## Conclusion

In conclusion, we anticipate that early exposure to prescription education will reduce the prevalence of prescription errors as it provides the early awareness and training needed by medical students to correct knowledge errors early. The method is a

novelty in medical education, which can be an important aspect of medical curriculums. Further research and applications are needed in this area.

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## References

1. Maxwell S, Walley T. BPS Clinical Section Committee. Teaching safe and effective prescribing in UK medical schools: a core curriculum for tomorrow's doctors. *Br J Clin Pharmacol.* 2003;55(6):496-503. doi:10.1046/j.1365-2125.2003.01878.x
2. Maxwell SR. How should teaching undergraduates in clinical pharmacology and therapeutics be delivered and assessed? *Br J Clin Pharmacol.* 2012;73(6):893-9. doi:10.1111/j.1365-2125.2012.04232.x
3. Kennedy MB, Haq I, Ferns G, Williams SE, Okorie M. The role of undergraduate teaching, learning and a national prescribing safety assessment in preparation for practical prescribing: UK medical students' perspective. *Br J Clin Pharmacol.* 2019;85(10):2390-8. doi:10.1111/bcp.14058
4. Ross S, Maxwell S. Prescribing and the core curriculum for tomorrow's doctors: BPS curriculum in clinical pharmacology and prescribing for medical students. *Br J Clin Pharmacol.* 2012;74(4):644-61. doi:10.1111/j.1365-2125.2012.04186.x
5. Gibson KR, Qureshi ZU, Ross MT, Maxwell SR. Junior doctor-led 'near-peer' prescribing education for medical students. *Br J Clin Pharmacol.* 2014;77(1):122-9. doi:10.1111/bcp.12147
6. Sergeevna SM, Efimovna LE. Improving the training of pharmaceutical specialists for consultation in pharmacy organizations using interactive forms of education. *Pharmacophore.* 2020;11(2):7-14.
7. Linton KD, Murdoch-Eaton D. Twelve tips for facilitating medical students prescribing learning on clinical placement. *Med Teach.* 2020;42(10):1134-9. doi:10.1080/0142159X.2020.1726309
8. The Joint Commission. Sentinel Event Alert: Preventing Pediatric Medication Errors. Issue 39, April 11, 2008. Available from: [http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea\\_39.htm](http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_39.htm).
9. Miller G. The best health care system in the World? *Soc Work.* 2013;58(2):181-3. doi:10.1093/sw/swt002
10. Almalki ZS, Alqahtani N, Salway NT, Alharbi MM, Alqahtani A, Alotaibi N, et al. Evaluation of medication error rates in Saudi Arabia: A protocol for systematic review and meta-analysis. *Medicine.* 2021;100(9):e24956. doi:10.1097/MD.00000000000024956