ORIGINAL ARTICLE

The study of comparative impact of an integrated model (GSR: Grandstand, Supervising and Report-back) versus SNAPPS of outpatient education on developing students' clinical competencies in Infectious clerkship

Khaironnesa Ramazanzade[1], Azadeh Ebrahimzadeh[2,*], Ali Nazeri[3]
[1]Department of Education and Psychology, Faculty of Education and Psychology, University of Birjand, Birjand, Iran
[2]Hepatitis Research Center, Department of Infectious Diseases, Birjand University of Medical Sciences, Birjand, Iran
[3]Hepatitis Research Center, Department of Internal Medicine, Birjand University of Medical Sciences, Birjand, Iran

*Hepatitis Research Center, Birjand University of Medical Sciences, Ghafari St. Birjand, 9717853577 Iran

Tel: +98 9153613525
Email: mr14436@yahoo.com

Background: This study aimed to compare the effectiveness of SNAPPS and an integrated model of outpatient education in developing clinical competencies of clerkship students concerning infectious diseases.

Method: This study has a quasi-experimental design (pretest, posttest, control group). The experimental and control groups were selected without random placement. The experimental group was trained using the integrated model, whereas the controls were trained with the SNAPPS model. After the data were collected, the test results were analyzed in the three areas of Knowledg, clinical reasoning, and skills using the Wilcoxon test, Mann-Whitney U test, and paired t-test.

Results: The mean within-group score changes were significant in both groups concerning clinical reasoning, skills, and cognition. The cognition mean scores in the integrated and SNAPPS models were 18.94 and 18.06, respectively, with a significant difference between the two models (P=0.029). However, there were no significant differences between the groups concerning the mean scores of clinical reasoning (p=0.425) and skills (p=0.092).

Conclusion: The integrated model outperformed SNAPPS in increasing the knowledge, clinical reasoning,and skills of clerkship students.

Keywords: Teaching Method, SNAPPS, Integrated Model (GSR), Clinical Competence, Clerkship, Outpatient Education

دراسة التأثير المقارن لنموذج متكامل (GSR) مقابل SNAPPS لتعليم العيادات الخارجية على تطوير الكفاءات السريرية للطلاب في التدريب العملي في مجال الأمراض المعدية

الخلفية: هدفت هذه الدراسة إلى مقارنة فعالية SNAPPS ونموذج متكامل لتعليم العيادات الخارجية في تطوير الكفاءات السريرية لطلاب التدريب فيما يتعلق بالأمراض المعدية.

منهج الدراسة: اعتمدت هذه الدراسة على التصميم شبه التجريبي (الاختبار القبلي، الاختبار البعدي، المجموعة الضابطة). تم اختيار المجموعتين التجريبية والضابطة بدون تنسيب عشوائي. تم تدريب المجموعة التجريبية باستخدام النموذج المتكامل، بينما تم تدريب المجموعة الضابطة باستخدام نموذج SNAPPS. بعد جمع البيانات، تم تحليل نتائج الاختبار في المجالات الثلاثة للمعرفة، والتفكير السريري، والمهارات باستخدام اختبار ويلكوكسون، واختبار مان ويتني يو، واختبار تي المقترن.

النتائج: كان متوسط التغيرات في الدرجات داخل المجموعة كبيرا في كلا المجموعتين فيما يتعلق بالتفكير السريري، والمهارات، والإدراك. كان متوسط درجات الإدراك في النماذج المتكاملة ونماذج SNAPPS 18.94 و١٨,٠٦ على التوالي، مع وجود فرق كبير بين النموذجين (P = 0.029). ومع ذلك، لم تكن هناك فروق ذات دلالة إحصائية بين المجموعتين فيما يتعلق بمتوسط درجات التفكير السريري (ع = ٠,٤٢٥) والمهارات (ع = ٠,٠٩٢).

الاستنتاج: تفوق النموذج المتكامل على برنامج SNAPPS في زيادة المعرفة والتفكير السريري ومهارات طلاب التدريب العملي.

الكلمات المفتاحية: طريقة التدريس، SNAPPS، النموذج المتكامل (GSR)، الكفاءة السريرية، التدريب العملي، تعليم العيادات الخارجية

ایک مربوط ماڈل کے تقابلی اثرات کا مطالعہ (GSR) بمقابلہ آؤٹ پیشنٹ ایجوکیشن کے SNAPPS infectious clerkship میں طلباء کی طبی قابلیت کو

پس منظر: اس مطالعہ کا مقصد SNAPPS کی تاثیر اور متعدی امراض سے متعلق کلرک شپ طلباء کی طبی قابلیت کو فروغ دینے میں بیرونی مریضوں کی تعلیم کے ایک مربوط ماڈل کا موازنہ کرنا تھا۔

طریقہ: اس مطالعہ کا ایک نیم تجرباتی ڈیزائن ہے (پریٹیسٹ، پوسٹ ٹیسٹ، کنٹرول گروپ)۔ تجرباتی اور کنٹرول گروپوں کا انتخاب بے ترتیب جگہ کے بغیر کیا گیا تھا۔ تجرباتی گروپ کو مربوط ماڈل کا استعمال کرتے ہوئے تربیت دی گئی تھی، جبکہ کنٹرولز کو SNAPPS ماڈل کے ساتھ تربیت دی گئی تھی۔ ڈیٹا اکٹھا کرنے کے بعد، ٹیسٹ کے نتائج کا تجزیہ علم کے تین شعبوں، طبی استدلال، اور ول کوکسن ٹیسٹ، مان-وائٹنی یو ٹیسٹ، اور پیئرڈ ٹی ٹیسٹ کا استعمال کرتے ہوئے مہارتوں میں کیا گیا۔

نتائج: دونوں گروپوں میں طبی استدلال، مہارت اور ادراک کے حوالے سے گروپ کے اندر اندر اوسط اسکور کی تبدیلیاں نمایاں تھیں۔ ادراک کا مطلب مربوط اور SNAPPS ماڈلز میں اسکور بالترتیب ۱۸,۹۴ اور ۱۸,۰۶ تھے، دونوں ماڈلز (P = 0.029) کے درمیان نمایاں فرق کے ساتھ۔ تاہم، طبی استدلال (p = 0.425) اور مہارت (p = 0.092) کے اوسط اسکور سے متعلق گروپوں کے درمیان کوئی خاص فرق نہیں تھا۔

نتیجہ: مربوط ماڈل نے کلرک شپ طلباء کے علم، طبی استدلال، اور مہارتوں کو بڑھانے میں SNAPPS سے بہتر کارکردگی کا مظاہرہ کیا۔

مطلوبہ الفاظ: طریقہ تدریس، SNAPPS، انٹیگریٹڈ ماڈل (GSR)، کلینیکل قابلیت، کلرک شپ، آؤٹ پیشنٹ تعلیم

مطالعه تأثیر مقایسه ای مدل تلفیقی آموزش سرپایی (GSR) با مدل SNAPPS در توسعه صلاحیت های بالینی دانشجویان در کارآموزی عفونی

زمینه و هدف: این مطالعه با هدف مقایسه اثربخشی مدل SNAPPS و مدل تلفیقی آموزش سرپایی در توسعه صلاحیت های بالینی دانشجویان کارآموزی در زمینه بیماری‌های عفونی انجام شد.

روش: این پژوهش از نوع نیمه آزمایشی (پیش آزمون، پس آزمون، گروه کنترل) است. گروه آزمایش با استفاده از مدل تلفیقی و گروه کنترل با مدل SNAPPS آموزش دیدند. پس از جمع‌آوری داده‌ها، نتایج آزمون در سه حوزه شناخت، استدلال بالینی و مهارت با استفاده از آزمون‌های Wilcoxon، Mann-Whitney U و Paired t-test مورد تجزیه و تحلیل قرار گرفت.

یافته ها: میانگین تغییرات نمره درون گروهی در هر دو گروه از نظر استدلال بالینی، مهارت ها و شناخت معنی دار بود. میانگین نمرات شناختی در مدل های تلفیقی و SNAPPS به ترتیب ۱۸,۹۴ و ۱۸,۰۶ بود که بین دو مدل تفاوت معنی داری وجود داشت (P=۰/۰۲۹). اما از نظر میانگین نمرات استدلال بالینی (p=۰/۴۲۵) و مهارت (p=۰/۰۹۲) بین گروه‌ها تفاوت معنی‌داری وجود نداشت.

نتیجه‌گیری: مدل تلفیقی از SNAPPS در افزایش دانش، استدلال بالینی و مهارت‌های دانشجویان کارآموزی بهتر عمل کرد.

واژه‌های کلیدی: مدل آموزشی، SNAPPS ، مدل تلفیقی(GSR)، شایستگی بالینی، کارآموزی، آموزش سرپایی

INTRODUCTION

Reasonably enough, medical education is of special importanc, as it is a part of the higher education system which provides the healthcare workforce and deals directly with human life, as far as it is considered as a tool for social transformation, and as a resource to achieve social, cultural, and economic equality (1). The contribution of the medical group to healthcare provision highlights the significance of education for this professional group (2). Health care has undergone fundamental changes in recent decades, and the treatment of patients has shifted from hospital wards to outpatient/ambulatory care (3). Consequently, outpatient education has received increasing interest due to its effective role in educating physicians. Alongside this, the ACGME (2009) has emphasized the use of outpatient education models to achieve quality in outpatient education. In the meantime, one of the problems in the outpatient setting is that the experience gained by students is of varying levels, primarily affected by the type of outpatient education model. As such, it stands to reason to adopt the most effective educational models in the outpatient environment (4). Among the models proposed for outpatient education are SNAPPS, Grandstand, Supervising, and Report-back models. The SNAPPS model is student-centered and includes history-taking, differential diagnosis, diagnostic analysis, facilitation of ambiguities and problems by the preceptor, and planning to solve the patient's problem(s) (5). In SNAPPS, moreover, students deal with basic clinical findings. This will help them retain the diagnoses in mind (6), although there are drawbacks such as the time-consuming nature of this model (7). Dent (2005) identified various models for organizing the activities of educators in their interactions with clients and students. These models include the grandstand model, supervising model, and report-back model. In the grandstand model, the educator consults with a single client while students observe. This format is similar to a lecture, with the educator presenting the case and students asking questions or offering assistance. One advantage of this model is that students can observe how the educator interacts with different clients. However, it limits opportunities for students to directly engage with clients. The supervising model involves the educator allowing the student to conduct the consultation without their constant presence. In the sitting-in model, the student observes the educator's consultation with the client. The report-back model involves senior students conducting the consultation and then reporting back to educators, discussing important aspects of the interaction. Students present the significant features of the case to the clinic educators and other students. This model, however, can slow down clinic interventions and increase waiting times for clients. Combining these three models can potentially enhance the clinical skills of students (8).

The integrated model includes a combination components of the grandstand, supervising, and report-back (GSR, henceforth) models. In the GSR model, the students observe the patient's visit by the preceptor and learn how to deal with the patient, take a history, and perform the examination. Subsequently, each student visits her/his patient independently. The preceptor visits the rooms where the students introduce their patient(s) to him/her. The GSR model was initiated in 2015 when different models of outpatient education were studied quasi-experimentally by the current researchers (9). At the same time, related scientific texts were reviewed and the shortcomings and strengths of the models were identified. A consultation session was subsequently held to reach the consensus of experts, consisting of professors of different clinical departments, researchers, and educational specialists. Afterward, the expert group re-defined learning goals and objectives according to the research literature and developed them as per educational strategies. Thus, it was decided that the practical components of varying models be included in a new model of outpatient education, namely, GSR.

Table 1. SNAPPS and integrated model (GSR)

	SNAPPS
1.	Summarize briefly the history and findings
2.	Narrow down the differential diagnosis
3.	Analyses the differential diagnosis
4.	Probe the preceptor by asking questions about uncertainties, difficulties, or alternative approaches
5.	Plan management for the patient's medical issues
6.	Select a case-related issue for self-directed learning
Integrated model (GSR)	
1.	Teach general rules with observe the consultation **(** The first 5 steps SNAPPS)
2.	Select a case ,interview and examine the patient in independent rooms with only limited tutor supervision
3.	Introducing patients examined by the student to other students in front of the professor
4.	Discuss the student and other students' comments on positive or negative actions that should be taken
5.	Final conclusion and conclusion by the professor

The implementation of educational models is influenced by the prevailing facilities and culture. In addition, some studies have shown that most learners believe that the current outpatient education is not sufficient to meet the current and future needs of general practitioners (4, 10). On the other hand, the literature shows that studies have not comprehensively examined different models in the development of clinical competence, and studies in this field, in a limited manner, have only examined clinical reasoning. In addition to clinical reasoning, however, knowledge and skills are also critical in medicine. In fact, students in the early stages should be educated and evaluated based on knowledge and information, while for students in advanced stages, it is important to apply this knowledge, skills, and reasoning that create students' competencies (3). It is the use of efficient outpatient models that can develop these competencies in students (11-14). Therefore, selecting the best educational methods requires further study (15). In reality, the prevailing viewpoint is that outpatient education has a negative impact, which is thought to stem from the teachers' effectiveness in teaching (16).

Therefore, given the shortcomings of the current outpatient education models, this study adopts the integrated outpatient education model for the first time. Besides, since the effectiveness of a model must be evaluated in practice, the study compares the SNAPPS model, the efficiency of which has been characterized in various studies (7, 13) , and the integrated model in developing the clinical competencies of medical students at Birjand University of Medical Sciences regarding the infectious diseases clerkship.

METHODS

Study design and participants

The study had a quasi-experimental design: pretest, posttest, and controlled. The participants were recruited via convenience sampling method and allocated to an experimental group and a control group. These groups were called static because they could not be selected and manipulated by the researcher. It is because, at any time, several students entered the clinical departments according to a predetermined schedule by the medical school.

The statistical population involved 67 clerkship students in the infectious diseases department in the first eight months of 2020.

The inclusion criteria comprised student interest and consent, and the student's selection of the course to be presented by the current infectious diseases research colleague. The exclusion criterion was absence from two sessions or the student's withdrawal.

Students entering the infectious diseases ward in the first four months of 2020 were placed in the experimental group and trained by the GSR outpatient education method. Incoming students in the second four months of the year were assigned to the control group and trained by the SNAPPS method (Figure 1, Table1).

The teaching method was explained to the students before the beginning of the semester and the students participated in the orientation class with awareness and consent. For ethical purposes, after the initial intervention and measurements of outcomes, students transitioned to the

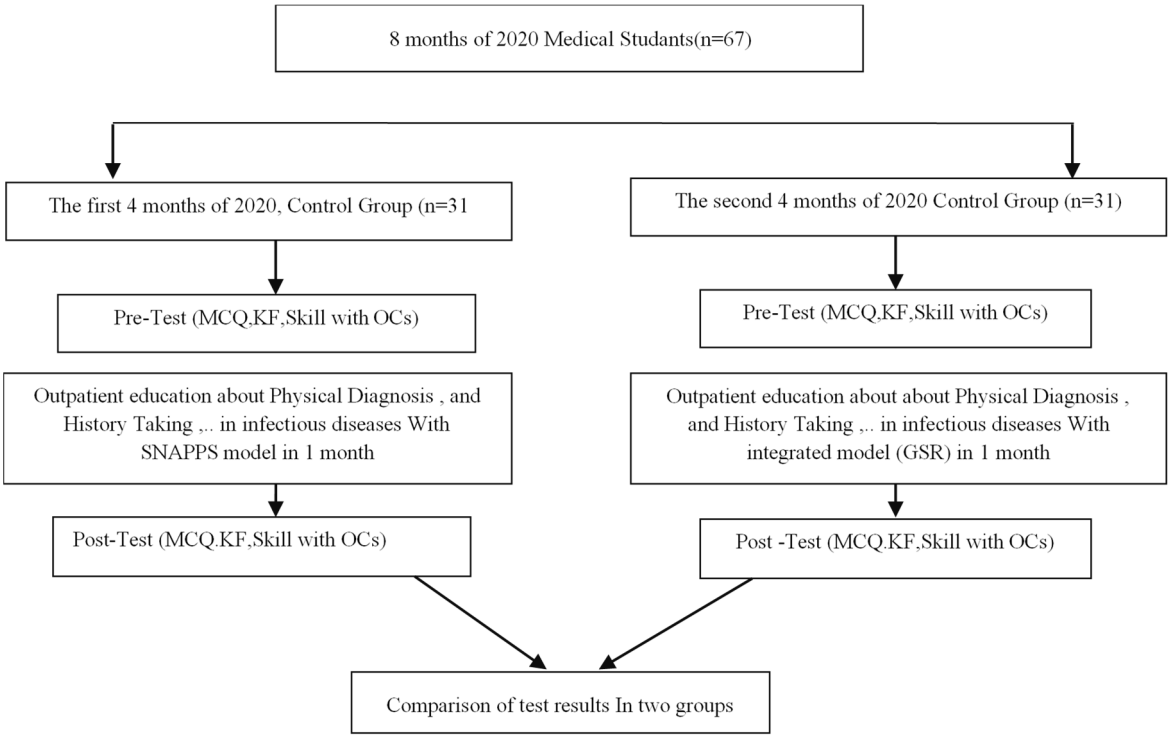

Figure 1. Diagram of the study design

other group to ultimately receive the educational content in both formats.

At the beginning of students' entrance to the ward (baseline), a pre-test was given. The pretest measured clinical reasoning using KF questions, skills via direct observation and a checklist, and cognition using a multiple-choice test, whose content validity was confirmed by three infectious diseases specialists. Subsequently, the students were trained for one month using two methods: GSR (experimental group) and SNAPPS (control group). At the end of the course, a posttest was performed on the clinical reasoning, skills, and cognition of both groups. Students were allocated into the study groups in a perfectly random manner, and the final clinical training in both groups was performed by the same professor.

Evaluation methods

In this study, to measure the clinical skills of students, their knowledge of multiple-choice questions and their reasoning with KF, and to measure their clinical skills, an observation checklist was used.

Knowledge test

Pre-test and post-test including multiple-choice questions were selected from the faculty's bank of questions. They were evaluated in terms of difficulty level and discriminating power, which proved to be standard. The questions in the control and experimental groups were tried to be similar in terms of difficulty, discriminating power, and themes.

Each question measured a specific teaching point. In both groups, the pretest was administered before the teaching sessions were initiated, while the posttest was administered immediately after the last teaching session was completed. Each question worthed 1 point, and the total score for each of the pretest and posttest was 20. Both the pretest and posttest were completed on paper in a proctored and closed-book setting. The scores were measured using an answer key that was developed before the administration of the tests. The scorers of the pretests and posttests were blinded to the intervention.

Clinical reasoning Test

The data collection tool in this project was the key Feature (KF) Clinical Reasoning Test and the questions were designed by an infectious disease specialist based on the topics that students should learn in the Infectious Diseases Clinic. There were 5 cases in each test (pre-test and post-test).

Scoring method: In this test, the score assigned to each weight option was initially determined based on the degree of difficulty. The score of each question was the sum of the scores of the selected options and the final test score was the sum of the scores of the questions. It should be noted that if a student has chosen more than five options in each question, one of the first 5 choices was removed for each additional choice.

A sample test item:

1. A 70-year-old man presented with vomiting, fever, and impaired consciousness. On examination, the symptoms of meningeal stimulation are positive (PR = 100/min, RR = 16/min, T = 39). Which items do you need for the most probable diagnosis? (Choose 5 items)

Convulsions □ History of diabetes □ Presence of cough and sputum □ Presence of diarrhea □ Sudden or gradual onset of symptoms □ Headache □ History of otitis □ Breathing in a particular manner □ .....

Skills test (Observation Check- list)

This test evaluated patient care skills, including history and physical examination, in both groups before and after training. The *Observation Check- list* assessed the extent to which the skill was perfect (perfect, somewhat perfect, and imperfect). To ensure the reliability of the *Observation Check- list*, two infectious disease specialists evaluated the performance of five students based on the checklist, reporting a reliability coefficient of 0.8. Each student was observed twice, and the average of two observations was recorded as the final score out of 20.

Statistical analysis

After the data were collected, the test results were analyzed in SPSS-19 software in the three areas of cognition, clinical reasoning, and skills. Since the data of the study variables were not distributed normally in the GSR training model, non-parametric tests (e.g., Wilcoxon test) were used for comparison. On the other hand, parametric tests (e.g., paired t-test) were employed to compare the variables in the SNAPPS training model, given the normal distribution of the data in this method. Mann-Whitney U test was used to compare the post-intervention scores of the two groups.

RESULTS

The study was performed with 67 clerkship students. In the SNAPPS model, 18 members were female (58.06%) , and 13 were male (41.94%); in the GSR model, 23 were female (63.88%) , and 13 were male (36.12%).

The mean scores of the cognitive test in the GSR and SNAPPS models were 18.94 and 18.6, respectively, with a significant difference between the two models (P = 0.029). There was no significant difference between the mean scores of clinical reasoning in the GSR model (18.94) and the SNAPPS model (18.74) (p = 0.425). Lastly, the mean scores of the skills test in the GSR model (18.19) and the SNAPPS model (17.81) were not significantly different (p = 0.092). Comparison of the mean scores of clinical reasoning, skills, and cognition tests in the GSR and SNAPPS models did not show a significant difference in terms of gender (Tables 2, 3, and 4).

DISCUSSION

This study was conducted to investigate the impact of the GSR outpatient education model versus the SNAPPS model on developing students' clinical competencies in the infectious diseases clerkship course. The study is the first attempt to implement and evaluate the GSR model. As such, there lacks a similar study. The study results showed significant within-group score changes concerning clinical reasoning test, a skills test, and cognitive test in both GSR and SNAPPS models after the intervention, which shows the positive impact of the GSR outpatient education model on developing medical competence of clerkship students. This effect was significant in knowledge. The studies by Kapoor et al.(7) and Wolpaw et al.(17) have similarly shown that the SNAPPS model improves student performance.

Table 2. Comparison of baseline and post-intervention mean scores of clinical reasoning, skills, and cognition in the SNAPPS model and the GSR model

Group		Clinical reasoning		Skills		Cognition	
		Pre-	Post-	Pre-	Post-	Pre-	Post-
SNAPPS n = 31	Mean ± SD	16.26 ± 2.08	18.74 ± 1.09	16.45 ± 1.63	17.81 ± 1.11	15.65 ± 3.20	18.06 ± 1.67
	t-test results	p-value < 0.001 w = 7.36		p-value <0.001 w = 5.67		p-value = 0.001 w = 4.23	
GSR model n = 36	Mean ± SD	17.03 ± 1.86	18.94 ± 1.19	16.89 ± 1.65	18.19 ± 0.95	16.91 ± 2.59	18.94 ± 1.12
	Wilcoxon-test results	p-value <0.001 w = -4.075		p-value <0.001 w = -3.667		p-value <0.001 w = -4.152	

Table 3. Comparison of control and experimental groups in clinical reasoning, skills, and cognitive tests at baseline and after intervention

Group		Clinical reasoning		Skills		Cognition	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
SNAPPS n = 31	Mean ± SD	16.26 ± 2.08	18.74 ± 1.09	16.45 ± 1.63	17.81 ± 1.11	15.65 ± 3.20	18.06 ± 1.67
GSR model n = 36	Mean ± SD	17.03 ± 1.86	18.94 ± 1.19	16.89 ± 1.65	18.19 ± 0.95	16.91 ± 2.59	18.94 ± 1.12
	Mann-Whitney test results	P-value = 0.078 Z=-1.762	P-value = 0.425 Z=-1.797	P-value = 0.198 Z=-1.286	P-value = 0.092 Z=-1.683	P-value = 0.086 Z=-1.719	P-value = 0.029 Z=-2.186

Table 4. Comparison of mean scores of clinical reasoning, skills, and cognitive tests at baseline and after intervention as per gender

Test Group		Post-clinical reasoning		Post-skills		Post-cognition	
		Female	Male	Female	Male	Female	Male
SNAPPS	Mean ± SD	18.88 ±1.02	18.53 ± 1.19	17.77 ± 1.26	17.84 ± 0.89	18.11 ± 1.90	18.00 ± 1.35
	Test results	P-value = 0.388 T = 0.876		P-value = 0.869 T = -0.167		P-value = 0.859 T = 0.180	
GSR	Mean ± SD	18.86 ± 1.21	19.07 ± 1.18	18.00 ± 0.79	18.53 ± 1.12	18.86 ± 1.17	19.07 ± 1.03
	Test results	P-value = 0.667 Z = -0.430		P-value = 0.162 Z = -1.399		P-value = 0.658 Z = -0.443	

Sawanyawisuth et al. (2015) found that this model is effective in reinforcing clinical reasoning because it relies on self-centered student learning and that it enhances the power of hypothesizing and expressing a variety of differential diagnoses. They maintain, moreover, that the model is highly structured and helpful in strengthening clinical reasoning in the ambulatory education of pediatric diseases assistants (12) . This is similarly confirmed by Jain et al. (2019) (18).

The results of this study also showed that the GSR model is more effective than the SNAPPS model in increasing the knowledge of medical clerks**.** In the study of Seki et al. (2016), which compared the two SNAPPS and OMP, students' self-reports revealed their satisfaction with the OPM method in fast learning compared to the SNAPPS method (19). Examination of test scores of clinical reasoning and skills showed that the mean scores of the two tests in the GSR model were slightly and non-significantly higher than those in the SNAPPS model. In explaining these results, it can be argued that the GSR outpatient education model covers the limitations of the foundational models based on which it is developed. Therefore, it seems to have more significant impact on developing students' clinical competence. Moreover, since on-the-clinic training can enable learners to respond to changes (8), the GSR model can further enhance graduates' preparedness to cope with these changes and treatment needs.

On the other hand, the GSR model is a hybrid and student-centered model in the clinic setting , and according to Chinai et all (2018) (20), learner-centered education is more effective in educating medical students than the routine medical program, leading to improved individual skills and clinical reasoning of students (21).

According to studies, teaching and learning affect significanty 92% and 97% on outpatient education, respectively. Moreover a written program can contribute positively to clinical skills and reasoning, creating conditions for students

to use their knowledge (17) and improve performance (22, 23). Overall, given the nature of the medical field, which requires strengthened clinical reasoning and physicians' broad view of patients, and given the profitability of using more efficient methods that can enhance the performance and ability of graduates, the present researchers recommend using the GSR outpatient education model for the clerkship course.

LIMITATIONS

One of the limitations is that the study was limited to the clinical education of infectious diseases clerkship. The GSR model should be implemented in other clinical courses to determine its effectiveness better. Therefore, similar studies with larger sample sizes and varying levels, i.e., clerkship, internship, and assistantship can be performed.

CONCLUSION

Based on the results of this study, it can be concluded that the GSR outpatient education model yields better results than the SNAPPS model in increasing the knowledge of medical students. In the clinical skills and reasoning tests, while the mean scores in the GSR outpatient education model were higher, the differences were not significant.

Ethical considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors. Code of ethics was granted by the National Committee of Ethics of Biomedical Research of Iran (IR.BUMS.REC.2019.292).

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REFERENCES

1. Brauer S, Kettunen J, Levy A, Merenmies J, Kulmala P. The educational paradigm shift–a phenomenographic study of medical teachers' experiences of practices. BMC Med Educ. 2023;23(1):29.
2. Zhu N, Zhang Z, Xie J, Ou Y, Tan J, Gao H. The relationship between the sources of confidence in overcoming COVID-19 and the improvement of medical students' professional identity: mediation by medical students' attention to COVID-19. BMC Med Educ. 2023;23(1):27.
3. Kumar P, Parthasarathy R. Walking out of the hospital: the continued rise of ambulatory care and how to take advantage of it. McKinsey Co Healthc Syst Serv. 2020.
4. Coyle A, Helenius I, Cruz CM, Lyons EA, May N, Andrilli J, et al. A decade of teaching and learning in internal medicine ambulatory education: a scoping review. Journal of graduate medical education. 2019;11(2):132-42.
5. Wolpaw TM, Wolpaw DR, Papp KK. SNAPPS: a learner-centered model for outpatient education. Acad Med. 2003;78(9):893-8.
6. Wolpaw T, Côté L, Papp KK, Bordage G. Student uncertainties drive teaching during case presentations: more so with SNAPPS. Acad Med. 2012;87(9):1210-7.
7. Kapoor A, Kapoor A, Kalraiya A, Longia S. Use of SNAPPS model for pediatric outpatient education. Indian pediatrics. 2017;54:288-90.
8. Dent JA. AMEE Guide No 26: clinical teaching in ambulatory care settings: making the most of learning opportunities with outpatients. Med teach. 2005;27(4):302-15.
9. Ramazanzade K, Ebrahimzade A. Comparison of the Effect of Two Clinical Education Methods SNAPPS and conventional method on the medical students' clinical reasoning skills. Journal of Birjand University of Medical Sciences. 2018;25:46-52. Persian.
10. Sabzghabaei F, Salajeghe M, Arabshahi SKS. Evaluating ambulatory care training in Firoozgar hospital based on Iranian national standards of undergraduate medical education. Medical Journal of the Islamic Republic of Iran. 2017;31:99. Persian.
11. Pascoe JM, Nixon J, Lang VJ. Maximizing teaching on the wards: review and application of the One-Minute Preceptor and SNAPPS models. Journal of hospital medicine. 2015;10(2):125-30.
12. Sawanyawisuth K, Schwartz A, Wolpaw T, Bordage G. Expressing clinical reasoning and uncertainties during a Thai internal medicine ambulatory care rotation: does the SNAPPS technique generalize? Med teach. 2015;37(4):379-84.
13. Schimbeno V, Bosle C, Stegmeier-Petroianu A, Etminan N, Hoffmann K. Competence-based teaching and learning in the outpatient clinic: development of a clinical elective in ambulatory medicine. GMS Journal for Medical Education. 2019;36(4).
14. Beigzadeh A, Yamani N, Bahaadinbeigy K, Adibi P. Challenges and problems of clinical medical education in Iran: a systematic review of the literature. Strides in Development of Medical Education. 2019;16(1). Persian.
15. Goad M, Huntley-Dale S, Whichello R. The use of audiovisual aids for patient education in the interventional radiology ambulatory setting: a literature review. Journal of Radiology Nursing. 2018;37(3):198-201.
16. Franco RLO, Machado JLM, Grinbaum RS, Porfírio GJM. Barriers to outpatient education for medical students: a narrative review. International journal of medical education. 2019;10:180.
17. Wolpow T, Papp K, Bordage G. Using SNAPPS to facilitate the expression of clinical reasoning and uncertainties: a randomized clinical trial. Acad Med. 2009;84:517-24.
18. Jain V, Rao S, Jinadani M. Effectiveness of SNAPPS for improving clinical reasoning in postgraduates: randomized controlled trial. BMC med educ. 2019;19:1-8.
19. Seki M, Otaki J, Breugelmans R, Komoda T, Nagata-Kobayashi S, Akaishi Y, et al. How do case presentation teaching methods affect learning outcomes?-SNAPPS and the One-Minute preceptor. BMC med educ. 2016;16(1):1-7.
20. C Chinai SA, Guth T, Lovell E, Epter M. Taking advantage of the teachable moment: a review of learner-centered clinical teaching models. Western Journal of Emergency Medicine. 2018;19(1):28.
21. Warm EJ, Schauer DP, Diers T, Mathis BR, Neirouz Y, Boex JR, et al. The ambulatory long-block: an accreditation council for graduate medical education (ACGME) educational innovations project (EIP). Journal of general internal medicine. 2008;23:921-6.
22. Khazaei Z, Ramezanzadeh K, Moodi M, Moradi M. Quality of clinical education in Birjand Medical School from the students perspective. Future med educ j. 2012;2(1):22-6.
23. Ebrahimzadeh A. Student-centered ambulatory education based on SNAPPS model. Research in Medical Education. 2016;8(3):17-23. Persian.