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ORIGINAL RESEARCH

Hands-on Clinical Clerkship at the Department of General Medicine in a University Hospital Improves Medical Students' Self-Evaluation of Skills of Performing Physical Examinations and Informed Consent: A Questionnaire-Based Prospective Study

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Introduction: The educational effects of a hands-on clinical clerkship on medical students at the Department of General medicine of Japanese university hospitals remain to be clarified. This study aimed to determine how such education affects medical students' self-evaluation of their clinical skills.

Methods: We enrolled 5th-year-grade students at the Department of General Medicine, Saga University Hospital, Japan in 2017. The students were divided into those who were going to have Japanese traditional-style observation-based training mainly in the outpatient clinic (Group O) and those in the 2018, new-style, hands-on clinical clerkship as one of the group practice members in outpatient and inpatient clinics (Group H). A questionnaire survey using the 4-point Likert scale for self-evaluation of the students' clinical skills at the beginning and the end of their training was conducted in both groups. The pre- and post-training scores of each item in both groups were compared and analyzed using the Mann–Whitney test.

Results: All 99 students in Group O and 121 of 123 students in Group H answered the questionnaires. The response rate was 99%. Two items regarding the abilities of "can perform a systemic physical examination quickly and efficiently" and "can clearly explain the current medical condition, therapeutic options, or risks associated with treatment, and discuss the process for obtaining informed consent" showed higher scores in the post-training survey in Group H than in Group O. There were no differences in these scores in the pre-training survey between the two groups.

Conclusion: A hands-on clinical clerkship at the Department of General medicine in a university hospital in Japan provided medical students with higher self-confidence in their skills of performing a physical examination and better understanding of patients' treatment options and the process of informed consent than observation-based training.

Keywords: general medicine, hands-on clinical clerkship, medical education, observation-based training

Introduction

The standard 6-year medical educational program in Japanese universities consists of 4 years of pre-clinical training and 2 years of clinical training.[1] Clinical training in Japan is categorized into traditional observation-based training and a hands-on clinical clerkship, which has recently become more popular.[2] Until the 1990s, observation-based training had been the mainstay of training in Japan,[1] in which medical students acquired knowledge of clinical practice only through observing the practice of supervising clinicians. This style of training makes active learning an arduous goal and impairs students' motivation.[2] In contrast, a hands-on clinical clerkship enables students to acquire a physician's professional

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knowledge, mindset, skills, and attitude by sharing the clinical work as one of the group practice members.[3] Unlike observation-based training, this type of medical training provides medical students with better opportunities to engage in active clinical practice, increasing their motivation to train themselves.[2] In 2010, the Educational Commission for Foreign Medical Graduates in the United States established the 2024 Medical School Accreditation Requirement. Starting in 2024, individuals applying for Educational Commission for Foreign Medical Graduates Certification must be a student or graduate of a medical school that is appropriately accredited.[4,5] Consequently, most Japanese Universities decided to acquire the international certification, which required them to change their clinical training system from observational-based training to a hands-on clinical clerkship. Therefore, in 2018, the Department of General Medicine (GM) of Saga University Hospital, Japan, also changed the clinical training system to a hands-on clinical clerkship from observation-based training, which had been its main training system until 2017.

In Japan, the Model Core Curriculum for medical education was established in 2001 with three revisions by 2021, using the standard of clinical competencies (knowledge, skills, and attitudes). The basic clinical competencies are (1) a problem-oriented system and clinical reasoning, (2) medical interviews, (3) medical records (chart), (4) clinical judgment, (5) physical examinations, and (6) the basic clinical procedure, which medical students must acquire.[6] Evidence-based medicine (EBM) was added as one of the learning topics for medical students in the revision in 2016.[6]

To the best of our knowledge, there have been no reports on the educational effect of the hands-on clinical clerkship conducted at the Department of GM of a university hospital. The reason for this lack of reports could partly be because the roles of generalists are variable and highly dependent on the background where they work.[7] One of the main working settings of generalists is community medicine. They are expected to play a major role in the comprehensive community healthcare system, focusing on not only the diseases that patients are suffering from, but also the lives of patients and their families in connection with the community around them.[8] In such a situation, careful consideration and in-depth discussion on the influence of the background of their lives on pathophysiological conditions are mandatory. However, the Department of GM at some university hospitals in Japan, including Saga University Hospital, treat inpatients with severe medical conditions who require intensive general treatments in addition to newly visiting outpatients without a referral letter and patients returning to the clinic.[9] In these Departments of GM, generalists provide patients with medical care through a comprehensive and holistic approach without limiting to specific organ disorders or refusing to treat patients owing to a lack of organ-specific expertise. Therefore, these departments could be ideal to educate students with a hands-on clinical clerkship.

In this study, we investigated how a hands-on clinical clerkship in the Department of GM at a university hospital improved medical students' self-confidence of their clinical competencies. We compared the results of a questionnaire survey between students who underwent a hands-on clinical clerkship and those who had observation-based training.

Materials and Methods

Design and Participants

This was a questionnaire-based, prospective study. In 2017, we enrolled 99 5th-year-grade medical students who were going to have observation-based training mainly in the outpatient clinic (Group O). In 2018, we also enrolled 123 students who were going to participate in the new-style hands-on clinical clerkship as one of the group practice members (Group H). At the Faculty of Medicine, Saga University, all medical students were divided into groups with members of five to nine. They had clinical training in the Department of GM for 2 weeks between April of the 5th year and September of the 6th year. Self-evaluation questionnaires were administered at the beginning and the end of the clinical training to evaluate the students' self-assessment regarding the achievement of clinical competencies.

Setting

Saga University Hospital is the only national university hospital in Saga Prefecture, which is a regional city in the southern part of Japan. This hospital has 602 beds and 29 departments. During the period of this study from 2017 to 2019, 13 physicians consisting of 7 faculty members (Assistant Professors and higher qualification) and 6 full-time

physicians at the Department of GM were involved in the training of medical students through their medical practices in outpatient and inpatient clinics. In the outpatient clinic, these physicians mainly treated newly visiting patients without a referral letter or those who were referred directly to the department because of the difficulty in making a correct diagnosis at other hospitals. The GM department also has its own hospital beds, and it treats inpatients with infection, septic shock, fever of unknown origin, undiagnosed autoimmune disease, cancer of unknown primary origin, and other diagnostically challenging cases.

Changes in Clinical Training Between 2017 and 2018

In 2017, medical students in Group O received observational-based training in a similar manner as that in the preceding years (Supplementary Table 1). Every day, students recorded the medical history of newly visiting patients at the outpatient clinic of the Department of GM in the morning and gave a presentation on their patients at a conference in the afternoon. The students then spent time taking classroom lectures mainly on their practice at the outpatient clinic from faculty members of the departments or reviewing their practice in training by themselves. Therefore, they did not have the opportunity to see inpatients or join the conferences on them.

In 2018, we changed the training method in the Department of GM to a hands-on clinical clerkship (Supplementary Table 2). The students in Group H underwent the same outpatient clinic training with recording the medical history in the morning in the same manner as the other students did in 2017. In addition, they spent a larger amount of time working with the attending physicians of inpatients who they were assigned to. Once a day, each student wrote a medical record on the inpatients under their charge, and the supervising physician provided them with some feedback on it. The students participated in the attending physician's routine rounds of their inpatients every morning and evening, and each round took approximately 30 minutes. During the rounds, the patients' current condition, any changes in their condition since the last round or during the course of the disease, or the plans of the treatment were discussed. Approximately 9.5 hours were spent in the rounds in 2 weeks. Additionally, twice a week, the students participated in a round by a Professor or an Associate Professor of the department of all inpatients, and were provided a bedside lecture. They also joined case conferences on all inpatients once a week. Consequently, the length of classroom lectures from faculty members in the afternoon was reduced to 12 hours from the previous 20 hours.

Questionnaire and Survey Methods

Four of the faculty members conducted a narrative review of the essential competencies for general physicians that must be acquired at university hospitals. They subsequently developed a questionnaire for self-assessment to measure students' achievement through training in the Department of GM (Table 1).

The questionnaire consisted of 23 questions. These questions covered all of the indispensable skills required for the practice of general physicians regarding medical knowledge, clinical reasoning, clinical decision-making, clinical skills, attitude, and the ability of practicing EBM.[6,10–16] Questions #1 to 3 were related to the assessment of medical interviews,[6,10–13] #4 to 7 to physical examinations,[6,10,12,13] #8 to 10 to clinical reasoning,[6,12,13] #11 to 12 to comprehension of necessary examinations for diagnosis,[6,13] #13 to judging the necessity of consultation,[6] #14 to 17 to planning of treatment,[6] #18 to 19 to judging the necessity of follow-up,[6,10–13] #20 to 21 to presentation skills,[6,14] and #22 to 23 to the ability of practicing EBM.[6,15,16] We had students complete the same self-assessment questionnaire twice, at the beginning and the end of their clinical training. The students filled out the questionnaire themselves. The second survey was administered without showing the students their responses to the first survey. The students responded to each question with the 4-point Likert scale (3: very satisfied, 2: satisfied, 1: dissatisfied, 0: very dissatisfied).

Statistical Analysis

Pre- and post-training scores of the questionnaire provided to Group O and to Group H were tallied up, and the mean and standard deviation were subsequently calculated. Initially, in each of the two groups, we compared the scores of questionnaire items between pre- and post-training using the Wilcoxon signed-rank test. We then also compared each of the pre- and post-training scores of questionnaire items between Group O and Group H using the Mann–Whitney test. We defined an improvement in clinical competency due to the hands-on clinical clerkship when a score in the post-training questionnaire of Group H was significantly higher than that in Group O, without any significant difference in

Table 1 Questionnaire Pre- and Post- Training

Question Item	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied
Medical interviews				
1. Can understand the patient's visiting process to the outpatient clinic of the Department of GM (reasons and process leading to a visit) and their interpretation of the self-condition model (patient's feelings, ideas, function, and expectations) while developing a good patient–physician relationship	3	2	1	0
2. Can summarize the patient's medical history while clarifying the chief complaint on the basis of an interview on the onset, course of the symptoms, lifestyle, or risk factors	3	2	1	0
3. Can record the medical history quickly and accurately in the medical chart, taking proper care of the understanding of other people who read it	3	2	1	0
Physical examinations				
4. Can prioritize urgent procedures or physical examinations by observing the patient's general condition	3	2	1	0
5. Can perform a systemic physical examination quickly and efficiently	3	2	1	0
6. Can recognize the necessity of systematic physical examinations (eg, dermatological, musculoskeletal, neurological, breast, rectal, and genitourinary), depending on the patient's problems, and perform them correctly	3	2	1	0
7. Can clearly describe positive and negative findings in physical examinations for understanding the patient's pathophysiology	3	2	1	0
Clinical reasoning				
8. Can understand the overall problems of a patient on the basis of interviews and physical examinations or basic laboratory tests by describing them in a problem list	3	2	1	0
9. Can prioritize treatment for an emergency and severe condition of the patient regardless of whether a diagnosis is made	3	2	1	0
10. Can develop a diagnostic hypothesis on the basis of pathophysiological or clinical-epidemiological issues, and clarify essential information for verifying a hypothesis or excluding a diagnosis	3	2	1	0
Comprehension of necessary examinations for a diagnosis				
11. Can recognize the necessity of examinations and select appropriate examinations while considering their characteristics, such as sensitivity and specificity	3	2	1	0
12. Can choose examinations while taking into consideration costs, the time required, and their invasiveness	3	2	1	0
Judging the necessity of consultation				
13. Can assess the necessity of consultation and select the most appropriate specialty department to refer the patient	3	2	1	0
Planning of treatment				
14. Can discuss the necessity for hospitalization and choose the appropriate specialty department to refer the patient	3	2	1	0
15. Can develop an approximate plan of necessary treatment.	3	2	1	0
16. Can clearly explain the current medical condition, therapeutic options, or risks associated with treatment, and discuss the process for obtaining informed consent	3	2	1	0
17. Can understand the characteristics of the patient's life and relationship with family members leading to the development of disease, and discuss advice on lifestyle (eg, diet, exercise, and sleep)	3	2	1	0
Judging the necessity of follow-up				
18. Can judge the necessity for follow-up and the appropriate length of observation	3	2	1	0
19. Can accurately assess the clinical course during follow-up and evaluate adherence of the patient to treatment from an interview, physical examination, or investigations	3	2	1	0

(*Continued*)

Table 1 (Continued).

Question Item	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied
Presentation skills				
20. Can make a case presentation in accordance with the POMR	3	2	1	0
21. Can select the necessary information to make a case presentation according to the purpose and allotted time	3	2	1	0
Ability of practicing evidence-based medicine				
22. Can select appropriate reference literature using databases such as PubMed	3	2	1	0
23. Can understand the general structure and content of medical articles by reading them critically	3	2	1	0

Note: All 23 items are rated on a 4-point Likert scale.
Abbreviations: GM, general medicine; POMR, problem-oriented medical record; EBM, evidence-based medicine.

pre-training scores between the two groups. Analyses were performed using SPSS (version 25; IBM Corp., Armonk, NY, USA) The level of statistical significance (p value) was set at 0.05.

Results

In Group O, 99 of 99 (men: n=60, 61%) students responded, and 121 of 123 (men: n=69, 57%) responded in Group H, with an overall response rate of 99%. Table 2 shows the mean ± standard deviation score of each item of the questionnaire administered each year at pre- and post-training. The post-training scores for all items were significantly higher than pre-training scores in both groups (all $p<0.001$).

Table 2 Questionnaire Scores Pre- and Post- Training

Item	Group O (n=99)		Item	Group H (n=123)	
	Pre-Training	Post-Training		Pre-Training	Post-Training
Medical interviews					
1***	1.65 ± 0.521	2.21 ± 0.458	1***	1.73 ± 0.500	2.24 ± 0.429
2***	1.58 ± 0.555	2.22 ± 0.526	2***	1.62 ± 0.536	2.17 ± 0.422
3***	1.11 ± 0.493	1.81 ± 0.566	3***	1.17 ± 0.454	1.88 ± 0.543
Physical examinations					
4***	1.10 ± 0.525	1.78 ± 0.526	4***	1.17 ± 0.420	1.85 ± 0.511
5***	0.89 ± 0.449	1.46 ± 0.521	5***	0.99 ± 0.456	1.62 ± 0.567
6***	0.99 ± 0.463	1.53 ± 0.595	6***	1.11 ± 0.462	1.66 ± 0.613
7***	1.12 ± 0.520	1.75 ± 0.522	7***	1.24 ± 0.548	1.90 ± 0.611
Clinical reasoning					
8***	1.24 ± 0.573	2.04 ± 0.588	8***	1.44 ± 0.561	2.13 ± 0.515
9***	1.12 ± 0.627	1.80 ± 0.670	9***	1.37 ± 0.549	2.03 ± 0.621
10***	0.93 ± 0.520	1.68 ± 0.586	10***	1.05 ± 0.425	1.74 ± 0.613
Comprehension of necessary examinations for a diagnosis					
11***	0.90 ± 0.463	1.53 ± 0.578	11***	1.02 ± 0.524	1.60 ± 0.664
12***	1.08 ± 0.665	1.64 ± 0.597	12***	1.18 ± 0.632	1.73 ± 0.671
Judging the necessity of consultation					
13***	0.94 ± 0.626	1.65 ± 0.760	13***	1.13 ± 0.604	1.73 ± 0.683

(*Continued*)

Table 2 (Continued).

Item	Group O (n=99)		Item	Group H (n=123)	
	Pre-Training	Post-Training		Pre-Training	Post-Training
Planning of treatment					
14***	1.02 ± 0.606	1.56 ± 0.610	14***	1.18 ± 0.532	1.91 ± 0.645
15***	0.83 ± 0.516	1.48 ± 0.734	15***	0.92 ± 0.510	1.58 ± 0.602
16***	0.87 ± 0.665	1.59 ± 0.639	16***	1.01 ± 0.540	1.79 ± 0.647
17***	1.11 ± 0.604	1.68 ± 0.683	17***	1.32 ± 0.608	1.86 ± 0.567
Judging the necessity of follow-up					
18***	0.68 ± 0.512	1.41 ± 0.655	18***	0.89 ± 0.545	1.55 ± 0.670
19***	0.74 ± 0.562	1.57 ± 0.574	19***	1.04 ± 0.507	1.66 ± 0.627
Presentation skills					
20***	0.95 ± 0.660	1.82 ± 0.560	20***	1.09 ± 0.592	1.92 ± 0.627
21***	0.99 ± 0.598	1.81 ± 0.511	21***	1.18 ± 0.532	1.93 ± 0.602
Ability of practicing evidence-based medicine					
22***	0.87 ± 0.680	2.11 ± 0.587	22***	1.14 ± 0.767	2.18 ± 0.632
23***	0.76 ± 0.555	1.87 ± 0.565	23***	0.88 ± 0.535	1.95 ± 0.575

Notes: The English version of the questionnaire with 23 items is shown in Table 1. The scores for Groups O and H were analyzed using Wilcoxon Signed-Rank test. Values are mean ± standard deviation. Group O included medical students who were going to have observation-based training mainly in the outpatient clinic in 2017. Group H included medical students who were going to participate in the new-style hands-on clinical clerkship as one of the group practice members in 2018. *** $p<0.001$.

We compared the scores of the pre-training questionnaire between the groups. Group H showed significantly higher scores to Question #8 ("Can understand the overall problems of a patient on the basis of interviews and physical examinations or basic laboratory tests by describing them in a problem list"), Question #9 ("Can prioritize treatment for an emergency and severe condition of the patient, regardless of whether a diagnosis is made"), Question #10 ("Can develop a diagnostic hypothesis on the basis of pathophysiological or clinical-epidemiological issues, and clarify essential information for verifying a hypothesis or excluding a diagnosis"), Question #13 ("Can assess the necessity of consultation and select the most appropriate specialty department to refer the patient"), Question #14 ("Can discuss the necessity for hospitalization and choose the appropriate specialty department to refer the patient to"), Question #17 ("Can understand the characteristics of the patient's life and relationship with family members leading to the development of disease, and discuss advice regarding lifestyle [e.g., diet, exercise, and sleep]"), Question #18 ("Can judge the necessity for follow-up and the appropriate length of observation"), Question #19 ("Can accurately assess the clinical course during follow-up and evaluate adherence of the patient to treatment from an interview, physical examination, or investigations"), Question #21 ("Can select the necessary information to make a case presentation according to the purpose of the presentation and allotted time") and Question #22 ("Can select appropriate reference literature using databases such as PubMed") than Group O (Table 3).

We also compared the scores of the post-training questionnaire between the groups. Group H showed significantly higher scores to Question #5 ("Can perform a systemic physical examination quickly and efficiently"), Question #9, Question #14, Question #16 ("Can clearly explain the current medical condition, therapeutic options, or risks associated with treatment, and discuss the process for obtaining informed consent"), and Question #17 than Group O (Table 4).

As a result, the improved clinical competencies by self-assessment using the hands-on clinical clerkship were related to Question #5 ("Can perform a systemic physical examination quickly and efficiently") and Question #16 ("Can clearly explain the current medical condition, therapeutic options, or risks associated with treatment, and discuss the process for obtaining informed consent"). The results of an additional analysis of covariance analysis to help interpret the results of this study are shown in Supplementary Table 3.

Table 3 Pre-Training Questionnaire Scores

Item	Group O n=99	Group H n=123	*p*-value
Medical interviews			
1	1.65 ± 0.521	1.73 ± 0.500	0.235
2	1.58 ± 0.555	1.62 ± 0.536	0.524
3	1.11 ± 0.493	1.17 ± 0.454	0.331
Physical examinations			
4	1.10 ± 0.525	1.17 ± 0.420	0.376
5	0.89 ± 0.449	0.99 ± 0.456	0.123
6	0.99 ± 0.463	1.11 ± 0.462	0.063
7	1.12 ± 0.520	1.24 ± 0.548	0.118
Clinical reasoning			
8	1.24 ± 0.573	1.44 ± 0.561	0.014
9	1.12 ± 0.627	1.37 ± 0.549	0.005
10	0.93 ± 0.520	1.05 ± 0.425	0.042
Comprehension of necessary examinations for a diagnosis			
11	0.90 ± 0.463	1.02 ± 0.524	0.066
12	1.08 ± 0.665	1.18 ± 0.632	0.328
Judging the necessity of consultation			
13	0.94 ± 0.626	1.13 ± 0.604	0.031
Planning of treatment			
14	1.02 ± 0.606	1.18 ± 0.532	0.044
15	0.83 ± 0.516	0.92 ± 0.510	0.202
16	0.87 ± 0.665	1.01 ± 0.540	0.057
17	1.11 ± 0.604	1.32 ± 0.608	0.013
Judging the necessity of follow-up			
18	0.68 ± 0.512	0.89 ± 0.545	0.004
19	0.74 ± 0.562	1.04 ± 0.507	0.000
Presentation skills			
20	0.95 ± 0.660	1.09 ± 0.592	0.109
21	0.99 ± 0.598	1.18 ± 0.532	0.017
Ability of practicing evidence-based medicine			
22	0.87 ± 0.680	1.14 ± 0.767	0.008
23	0.76 ± 0.555	0.88 ± 0.535	0.084

Notes: The English version of the questionnaire with 23 items is shown in Table 1. The scores for Groups O and H were analyzed using the Mann–Whitney test. Values are mean ± standard deviation. Group O included medical students who were going to have observation-based training mainly in the outpatient clinic in 2017. Group H included medical students who were going to participate in the new-style hands-on clinical clerkship as one of the group practice members in 2018.

Discussion

This study showed that students' self-confidence in their ability to perform a systemic physical examination and explain the patient's medical options and understand the process of obtaining informed consent were improved by the hands-on clinical clerkship. However, the post-training scores of all items were significantly higher than the pre-training scores in both groups. This finding suggests that even the traditional-style observation-based training had a good educational effect

Table 4 Post-Training Questionnaire Scores

Item	Group O n=99	Group H n=123	*p*-value
Medical interviews			
1	2.21 ± 0.458	2.24 ± 0.429	0.698
2	2.22 ± 0.526	2.17 ± 0.422	0.369
3	1.81 ± 0.566	1.88 ± 0.543	0.360
Physical examinations			
4	1.78 ± 0.526	1.85 ± 0.511	0.292
5	1.46 ± 0.521	1.62 ± 0.567	0.036
6	1.53 ± 0.595	1.66 ± 0.613	0.123
7	1.75 ± 0.522	1.90 ± 0.611	0.081
Clinical reasoning			
8	2.04 ± 0.588	2.13 ± 0.515	0.241
9	1.80 ± 0.670	2.03 ± 0.621	0.005
10	1.68 ± 0.586	1.74 ± 0.613	0.322
Comprehension of necessary examinations for a diagnosis			
11	1.53 ± 0.578	1.60 ± 0.664	0.512
12	1.64 ± 0.597	1.73 ± 0.671	0.377
Judging the necessity of consultation			
13	1.65 ± 0.760	1.73 ± 0.683	0.365
Planning of treatment			
14	1.56 ± 0.610	1.91 ± 0.645	0.000
15	1.48 ± 0.734	1.58 ± 0.602	0.389
16	1.59 ± 0.639	1.79 ± 0.647	0.026
17	1.68 ± 0.683	1.86 ± 0.567	0.020
Judging the necessity of follow-up			
18	1.41 ± 0.655	1.55 ± 0.670	0.081
19	1.57 ± 0.574	1.66 ± 0.627	0.235
Presentation skills			
20	1.82 ± 0.560	1.92 ± 0.627	0.291
21	1.81 ± 0.511	1.93 ± 0.602	0.118
Ability of practicing evidence-based medicine			
22	2.11 ± 0.587	2.18 ± 0.632	0.309
23	1.87 ± 0.565	1.95 ± 0.575	0.287

Notes: The English version of the questionnaire with 23 items is shown in Table 1. The scores for Groups O and H were analyzed using the Mann–Whitney test. Values are mean ± standard deviation. Group O included medical students who were going to have observation-based training mainly in the outpatient clinic in 2017. Group H included medical students who were going to participate in the new-style hands-on clinical clerkship as one of the group practice members in 2018.

to some extent. In particular, items regarding medical interviews, case presentations, and EBM showed higher scores after the training in both groups, regardless of the change in training methods.

With regard to the ability of performing a systemic physical examination, the post-training score for Question #5 was significantly higher in Group H than in Group O, with no difference in the pre-training score. Students in Group H were involved in the treatment of inpatients by performing a physical examination of them or recording relevant information in the medical chart daily, which were not required to be performed by those in Group O. Subsequently, the supervising

physician reviewed the medical records that the students wrote and provided some feedback, which could have provided a beneficial educational effect on the students. Feedback from supervising physicians on basic clinical competencies improves trainees' skills of medical interviews, physical examinations, and communication.[17] In particular, general physicians are able to provide more learner-centered feedback than other specialists.[17] This better feedback is achieved by spending a longer time in engaging in discussions regarding the patients and providing guidance or advice to learners.[18] In addition, a study reported that residents supervised by general physicians received higher scores on the General Medicine In-Training Examination than those supervised by specialists.[19] This examination covered main four medical competencies of medical interviewing and professionalism, symptomatology and clinical reasoning, a physical examination and its procedures, and knowledge of diseases. Therefore, feedback and clinical instructions from general physicians could have been especially effective in the improvement of students' self-confidence in their ability to perform a systemic physical examination in those who participated in the hands-on clinical clerkship in this study.

With regard to the ability of understanding patients' treatment options and the process of obtaining informed consent (Question #16), the post-training score was also significantly higher in Group H than in Group O, with no difference in the pre-training score. The students in Group H were assigned to inpatients, and spent a larger amount of time working on and communicating with actual inpatients. In addition, they participated in the attending physician's routine rounds of their inpatients every morning and evening. The main purposes and benefits of hospital ward rounds were gathering information, a better understanding of the patients, reviewing the diagnosis, developing a treatment plan, and communicating with patients. These factors could be extremely educational to medical students.[20] The participation in the rounds could have allowed the students to deepen their understanding of patients. Additionally, this participation could have enabled students to learn the supervisors' thinking processes of making diagnoses and choosing treatments through their closer communication with patients and supervisors. Listening to the patient thoroughly and understanding their social background in addition to their disease are important. This process is better than simply considering the patient as a person with a disease, especially patients of GM who tend to have complicated and multiple problems.[21] Engel proposed that understanding the aspects of the patient's personality and relationship with family members, other people, or surrounding community is necessary for the holistic understanding of the patients, while biomedical aspects are also essential in healthcare.[22] These findings suggested that improved quality and an increased amount of communication with inpatients or their supervisors through a hands-on clinical clerkship at the Department of GM enabled students to better understand the patients. These students were able to focus on the psychological and social background of the patients, or plan examinations and treatment, which would have caused higher self-confidence in these students.

Finally, the post-training score of self-confidence in the ability to perform medical interviews, case presentations, and EBM were much higher than those of pre-training in both groups, with no significant difference between the groups. This finding indicated that even observation-based training was effective for these items. The skill of performing a medical interview is essential for healthcare workers, contributing to 76% of the process of making a diagnosis.[13] To train for this skill, small-group workshops involving role-play and interviews with a simulated patient, virtual patient, or actual patient, followed by discussion and feedback using a video review, have become popular as an educational method.[23] In addition, feedback from supervisors is especially effective in improving skills of interviews and communication.[17] At the Department of GM of Saga University Hospital, we have practiced an educational approach of allowing medical students to record the medical history and give presentations on their outpatients while receiving feedback from their supervisors since before 2017. This has been performed even in the era of traditional-style observation-based training. This educational approach enabled students to experience the process repeatedly, which could have improved their self-confidence in their ability for medical interviews, even after observation-based training. Furthermore, students need to improve their oral presentation skills through trial and error by their own efforts.[14] Since before 2017, we have provided every student with two opportunities to give presentations on each patient, immediately after their medical interview with the patient and at the outpatient conference later. Students might also have improved their self-confidence in the skill of giving a presentation through such frequent opportunities of practice. In addition, the revised Model Core Curriculum in 2016 added the ability of practicing EBM as one of the required competencies. Therefore, medical students were required to acquire the ability to generalize an individual problem or clinical question gained from one patient to that of the entire population.[6] Since before 2017, we also have provided students with instructions on how to identify clinical problems or

questions about the patients they were allocated to, with a subsequent search and critical review of the literature. This information also might have improved their self-confidence in the skill of EBM.

Limitations

This study has several limitations. First, the effectiveness and validity of the questionnaire using the 4-point Likert scale that we developed in this study have not been verified. This issue could have negatively affected the reliability of the results of this study, indicating an improvement in the students' self-evaluation of their medical skills. Further studies using verified indicators or those aiming to verify our indicators are warranted because the present study used original indicators without validation. Second, 5th-grade medical students of two different years were included in the study, which might have affected the results because of differences in population backgrounds. Third, we defined an item of competency as improved using a hands-on clinical clerkship provided by the Department of GM when a score of the post-training questionnaire in Group H was significantly higher than that in Group O, with no significant difference in the pre-training score between the groups. However, there were 10 items that showed differences in the pre-training scores between the two groups, which we failed to analyze or discuss in this study.

Conclusions

Hands-on clinical clerkships at the Department of GM of university hospitals could improve medical students' self-confidence in performing a physical examination, and understanding patients' treatment options and the process of informed consent compared with observation-based training.

Abbreviations

EBM, evidence-based medicine; GM, general medicine.

Data Sharing Statement

The datasets generated during the current study are available from the corresponding author on reasonable request.

Ethics Statement

The ethics committee of the Faculty of Medicine, Saga University waived the need for ethical approval for this study because no clinical information was being collected. All students were informed about the use of their educational data for research upon enrollment to our university after having provided comprehensive consent to participate in the study. Their personal information was anonymized in the analysis.

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Author Contributions

All authors made a significant contribution to the original text, including the conception, study design, execution, acquisition of data, analysis and interpretation, or all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

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