

BMJ Open Effects of a new parallel primary healthcare centre and on-campus training programme on history taking, physical examination skills and medical students' preparedness: a prospective comparative study in Taiwan

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ABSTRACT

Objectives The primary healthcare centre (PHCC) is the first place that medical students experience patient contact. Usually, medical students are frustrated by a lack of proper skills training for on-campus history taking (HT), physical examination (PE) and self-directed learning (SDL) to prepare for their PHCC and in-hospital patient contact. For pre-clerks, this study aims to compare the effectiveness of PHCC training and PHCC training in combination with on-campus HT and PE training modules (PHCC+on-campus) on their clerkship preparedness.

Design This comparative study utilised prospective, consecutive, end of pre-clerkship group objective structured clinical examination (GOSCE), beginning of clerkship OSCE and self-administered Preparation for Hospital Practice Questionnaire (PHPQ).

Setting/participants 128 pre-clinical clerk volunteers (64 each year) receiving PHCC training (7 week PHCC training in addition to 7 week assignment based group learning, academic year 2014, controls) and PHCC training in combination with on-campus module training (academic year 2015, 7 week PHCC training in addition to 7 week on-campus sessions) were sequentially assessed before the module (week 1), at the end of the module (week 14) and at the beginning of clerkship (week 25).

Results For overall HT and PE skills, both PHCC and PHCC+on-campus module trained pre-clerks performed better on OSCE than GOSCE. Additionally, the improvement was accompanied by higher self-reported PHPQ scores in 'confidence/coping' and 'SDL' domains. At the end of the pre-clerkship and the beginning of the clerkship stages, the degree of improvement in preparedness in 'confidence/coping' and 'SDL' domains was higher for those in the PHCC+on-campus group than for those in the PHCC group. Among the PHCC+on-campus module participants, a positive association was observed between high mean PHPQ-SDL scores and high OSCE scores.

Conclusions Our study suggests that the PHCC+on-campus module, which is paired faculty led and pre-trained dyad student assisted, is effective in developing a preclinical clerk's

Strengths and limitations of this study

- Similar preparation period before assessments, as well as randomised raters, simulation patients, students and standardised processes in group objective structured clinical examination (GOSCE)/OSCE ensured the comparability of the results of the primary healthcare centre (PHCC) group and the PHCC training in combination with on-campus history taking (HT) and physical examination (PE) training (PHCC+on-campus) group.
- Pre-clerks in both modules, which equally extended the whole fourth year of medical education, were volunteers that were more committed, brighter and motivated; this may have resulted in some degree of selective bias.
- This study evaluated the degree of trained skills degradation over time by comparing each participant's performance at the end of the pre-clerk module GOSCE with the beginning of their clerkship OSCE performance.
- Due to the ethics of students' rights of learning, this study was limited by a lack of a true control group, as PHCC module pre-clerks still received HT and PE skills training.
- The lack of a 'control group,' with pure regular clerkship, limits clarifying whether repetitive practising on simulation patients and receiving structured feedback from well trained faculty in the PHCC+on-campus group will decrease skills degradation over time.

HT and PE skills and intensifying SDL/patient management abilities to prepare for hospital practice in clerkship.

INTRODUCTION

Taiwan's medical training consists of 7 years of post-secondary medical school followed by

residency and fellowship training. During pre-clerkship, the fourth year medical students (pre-clerks) receive intensive training in fundamental clinical skills to ensure preparation for clinical clerkship. Then, medical students enter clinical clerkship in their fifth year, followed by internship for primary care of patients. Generally, pre-clerks are not preoccupied with attempts to make diagnoses and perform management beyond their abilities. Implementation of preclinical basic history taking (HT) and physical examination (PE) skills training has been recommended, as it appears to be associated with increased confidence and improved student performance in clerkship.¹ It has been established that on-campus medical students enjoy the clinical skills programme as it makes them 'feel like doctors'.²

The specialty of internal medicine (IM) historically has been described as 'the mother of all clinical divisions', on which the fundamental instruction of the art of medicine is built.³ Thus students' skills in other areas are developed later and differentiated into other clerkships and skill sets. This may account for why IM faculty members are heavily involved in teaching the 'primary care clinical skills courses' in primary healthcare centres (PHCCs) and hospitals.⁴ Approximately one-third of faculty members in the colleges are internists. Among the IM primary care abilities, HT and PE are basic skills requiring training in the college programme. Hence a well organised IM orientated preclinical skills curriculum is crucial for enhancement of students' future comfort and confidence with PHCC patients and hospital inpatients during their clinical clerkship.⁵ Nonetheless, recent studies have suggested that the HT and PE skills of clinical clerks is already below expectation at the end of the IM clerkship and residency.⁶⁻⁸

Accordingly, this study aims to evaluate the effectiveness of parallel on-campus, faculty led, student assisted training and PHCC basic HT and PE skills training courses on pre-clerks' preparedness for IM clerkship, especially confidence/coping, patient management and self-directed learning. Particularly, the immediate and lasting effects of PHCC training and PHCC training in combination with on-campus HT and PE training modules (PHCC+on-campus) were assessed by group objective structured clinical examination (GOSCE) and objective structured clinical examination (OSCE), as well as self-assessed hospital practice preparedness, to assess the possibility of future application in preclinical skills curriculum.

METHODS

Study design, setting and participants

This prospective comparative study was conducted with pre-clerks in academic years 2014 and 2015 at the Faculty of Medicine, Yang-Ming University, Taipei, Taiwan, which is one of the three largest government funded medical schools supervised by the Taiwan Medical College Accreditation Council for curriculum development and

quality assurance. In their preclinical years, pre-clerks were recruited on a voluntary basis to receive additional training, GOSCE/OSCE, self-assessments and follow-up until the beginning of clerkship. Preparation for this interventional programme lasted for almost 1 year and was done by a group of IM department members of Taipei Veterans General Hospital (TVGH), which is the teaching hospital of Ying-Ming University. TVGH is one of the largest institutions of clinical medical education in Northern Taiwan and has a National Clinical Skills Training Centre. In addition to examining every aspect of the modules, organisers developed serial specific chief complaint based clinical scenarios to intensify learner's basic IM HT and PE skills. Ethics approval was obtained from the ethics committee of our institution, and care was taken to apply the World Medical Association Declaration of Helsinki principles to the research.

PHCC module (control)

A total of 64 pre-clerk volunteers (academic year 2014), randomly divided into eight groups (n=8 in each group), were exposed to a PHCC module, comprising 7 week PHCC weekly sessions and 7 week regular pre-clerkship sessions (figure 1).

PHCC+on-campus module

In academic year 2015, a PHCC+on-campus basic HT and PE skills training module was developed for 64 pre-clerk volunteers who were randomly divided into eight groups (n=8 in each group). In parallel, the PHCC+on-campus module was designed as having an on-campus lecture and small group practice in 1 week, followed by a PHCC session the following week (figure 1). In order to establish clinical skills smoothly, head and neck (H-N), cardiovascular (CV), chest and abdomen specific HT and PE on-campus structured training sessions were arranged after they had finished their corresponding blocks (including lecture, critical thinking and differential diagnosis training) (figure 2).

In addition to intensive training for weekly sessions, all faculty members received a comprehensive teaching manual containing general, H-N, CV, chest and abdomen focused HT and PE, detailed case scenarios, major/minor learning issues, checklists, lecture notes and videos. Additionally, an introduction to structured and motivated feedback techniques was given in the reference booklets. To ensure standardised teaching/feedback during on-campus sessions, consensus on how to lead each session was achieved among faculty members with different levels of experience.

Before each weekly on-campus session, the aforementioned teaching/learning materials for faculty members also were mailed to students for self-directed learning before class and for future reference. The on-campus part of the PHCC+on-campus module followed the 'see a good one do a better one' strategy.⁹ During dyad practice, pre-clerks were

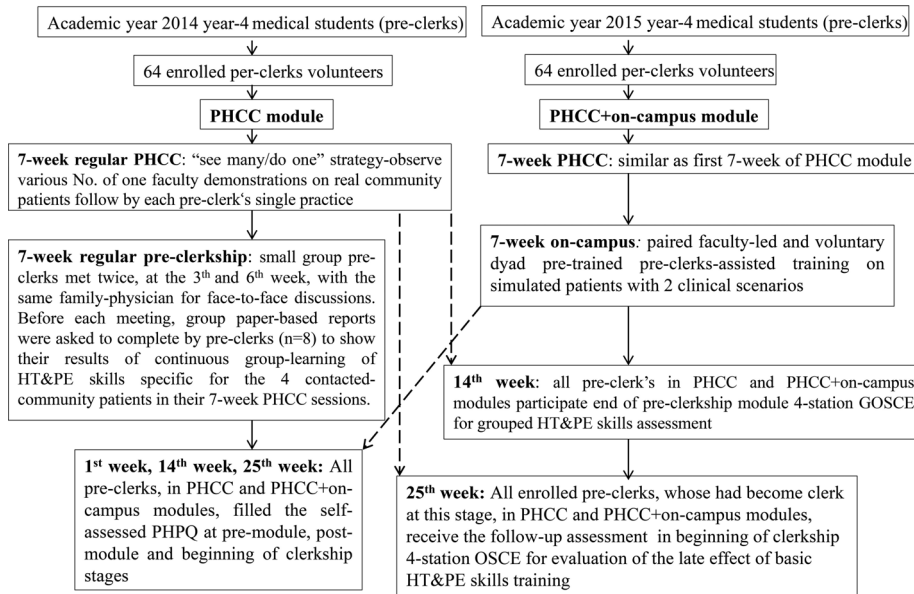


Figure 1 Flowchart for the primary healthcare centre (PHCC) basic history taking (HT) and physical examination (PE) skills training module in academic year 2014. Both weekly PHCC and on-campus sessions were run as small groups (n=8) of pre-clerks and their specific faculty within 4 hours. At the second 7 week assignment based group learning stage, small group pre-clerks met twice, at the third and sixth weeks after the 7 week PHCC weekly sessions, with the same family physician for face to face discussions of their continuous group learning of HT and PE skills specific to the community contacted patients within their first stage (7 week PHCC sessions). GOSCE, group objective structured clinical examination; OSCE, objective structured clinical examination (OSCE).

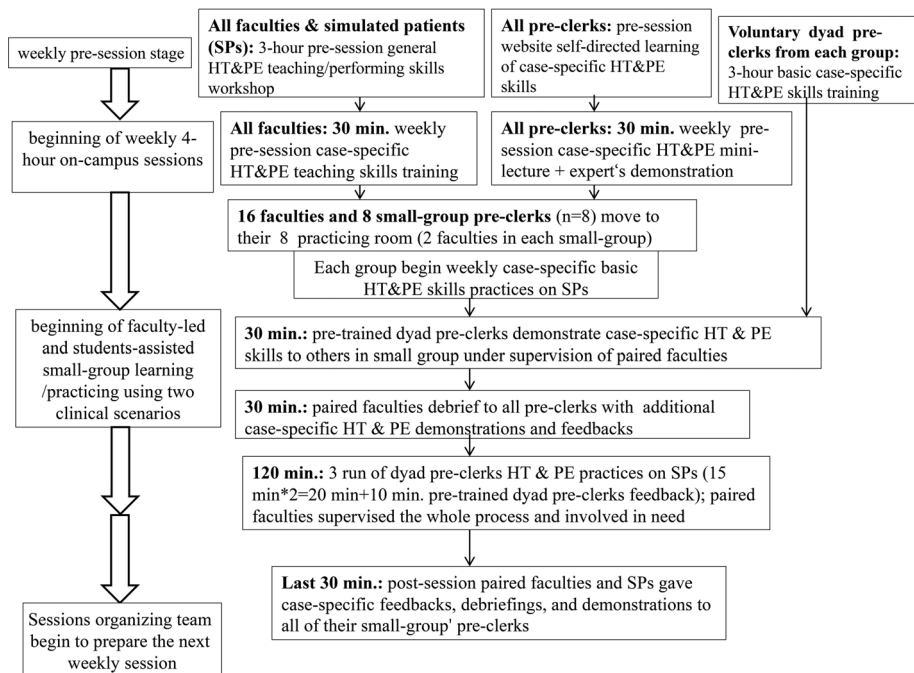


Figure 2 Flow chart for the primary healthcare centre (PHCC) in combination with on-campus basic history taking (HT) and physical examination (PE) skills training module in academic year 2015.

instructed to alternate actively between HT and PE parts, and instructed to observe their partner. The first pre-trained dyad students, who were responsible for HT and PE demonstration, received pre-class tutorials for preparation to provide their peers with precise/corrected case based HT and PE skills (figure 2).

GOSCE and OSCE raters, SPs and student training

Raters and simulated patients (SPs) were walked through the forms and the teaching points of each station prior to the end of the pre-clerkship module GOSCE and at the beginning of the clerkship OSCE. All raters, who were blinded to the aim of the study and its design, were

randomly assigned to GOSCE/OSCE stations. Prior to the GOSCE/OSCE, the enrolled pre-clerks met in a conference room to view the structure and objectives of the GOSCE/OSCE.

End of the pre-clerkship module GOSCE

The GOSCE was designed as a formative experience where pre-clerks were encouraged to learn from each other by performing IM related HT and PE on SPs. Simultaneously, all enrolled pre-clerks were divided into eight groups ($n=8$ in each group) to run eight GOSCE stations, in two parallel tracks (see online supplementary table 1) and to be evaluated with an assessment form (see online supplemental table 2).

Beginning of clerkship OSCE

After finishing their pre-clerkship, all enrolled pre-clerks commenced their clerkship at TVGH and received OSCE. All enrolled pre-clerks had no further HT and PE skills training between the end of the pre-clerk module and the beginning of their clerkship. Therefore, we used the beginning of their clerkship OSCE to assess the late effects of either PHCC or PHCC+on-campus by comparison of the beginning of clerk OSCE performance of each pre-clerk with their earlier end of pre-clerk module GOSCE performance. Using a specific assessment form (see online supplemental table 3), each clinical clerk needed to run four OSCE stations (H-N, CV, chest and abdomen), as showed in online supplemental table 4.

Self-reported PHPQ

The Preparation for Hospital Practice Questionnaire (PHPQ) is a valid and reliable 41 item self-reported questionnaire containing eight subscales (interpersonal skills, confidence/coping, collaboration, patient management and practical skills, understanding science, prevention, holistic care and self-directed learning) designed to assess key areas of medical hospital practice independently in different clinical settings.¹⁰ In this study, the 17 items assessing capabilities in the confidence/coping, patient management/practical skills and self-directed learning (evaluation of performance, identification of learning needs) subscales of the PHPQ were completed by all enrolled learners (see online supplemental table 5).

All enrolled learners in PHCC and PHCC+on-campus module were asked to finish the same selected items in the PHPQ at the start of the module (week 1), at the end of the module (week 14) and at the beginning of their clerkship (week 25).

Statistical analysis

The information gathered from different stages was input and analysed using the Statistical Package of Social Sciences (SPSS, V.20.0). Data are presented as mean \pm SD or medium (IQR). A two sample t test, oneway ANOVA and the Mann–Whitney U test were used to study significant difference between numerical or ordinal data

between groups. A p value <0.05 was considered statistically significant.

RESULTS

Table 1 shows that weekly session hours, number of pre-clerks in each small group, time point to complete the GOSCE, OSCE and sequential HHPQ, total enrolled pre-clerks, gender distribution, mean age and percentage of participants with previous HT&PE trainings were similar between the PHCC and PHCC+on-campus modules.

Group's performance at end of pre-clerkship module GOSCE stations

In comparison with the PHCC group, the 'HT and PE communication/care skills, techniques, item content and time control' were significantly improved in the PHCC+on-campus group (table 2). Nonetheless, the PHCC group performed significantly better in the HT and PE sequence compared with the PHCC+on-campus group. In addition to better performance in H-N, CV, chest and abdomen GOSCE stations, a significantly higher proportion of grouped pre-clerks had high OSCE scores (>300) in the PHCC+on-campus module than those in the PHCC module (figure 3A and table 3). The grouped students' CV GOSCE station performance, however, was significantly lower than the other three GOSCE stations in both the PHCC and PHCC+on-campus modules (table 3). The inter-rater reliability for the GOSCE scores was acceptable (0.81, $p=0.02$).

Individual pre-clerk's performance at the beginning of clerkship OSCE stations

The inter-rater reliability for the OSCE scores was 0.87 ($p=0.03$). In OSCE, the overall HT and PE performance of PHCC module participants was better than PHCC+on-campus participants. Nonetheless, among PHCC module participants, their average beginning of clerkship OSCE performance on HT and PE 'technique, item content and time control scores' were poorer than their early end of module grouped GOSCE performance (table 2). In addition, the PHCC module participants' 'H-N and abdomen' beginning of clerkship OSCE performance were decreased. Among PHCC+on-campus module participants, however, the average beginning of clerkship OSCE performance on HT and PE 'sequence, item content and time control' was better than the early end of module grouped GOSCE performance. Further, in comparison with their end of module grouped GOSCE performance, the PHCC+on-campus module participants' 'CV, chest and abdomen' beginning of clerkship OSCE performance increased (table 3). Finally, a significantly higher proportion of individuals attained high OSCE scores (>300) in the PHCC+on-campus module than those in the PHCC module (figure 3A).

Table 1 Comparisons of the PHCC and PHCC+on-campus modules

	PHCC module	PHCC+on-campus module
Weekly session hours	4	4
No of pre-clerks in each group	8	8
Cases in each weekly PE session	Varying number of real patient encounters in the community	No real patient encounters; two clinical scenarios by simulated patients
Weekly session faculties	One family medicine faculty lead small group students	Two IM faculty members lead and supervise the small group (n=8) practice with feedback/debriefing at the beginning and end of the session
Ways of weekly basic IM HT and PE skills practice	Grouped pre-clerks observe faculty conduct HT and PE skills followed by single practice	Dyad pre-trained learner's demo and dyad pre-clerks take turns to practice three times, pre-trained pre-clerks feedback between each dyad practice
Time point to receive GOSCE after entering module (week)	14	14
Time point to receive OSCE after entering module (week)	25	25
Time points to complete self-assessed PHPQ after entering module (week)	1, 14, 25	1, 14, 25
No of enrolled pre-clerks (% among all pre-clerks of academic year)	64 (67.8%)	64 (68.4%)
Sex (men/women)	45/19	44/20
Age (years)	23.8±2.9	26.1±1.3
Previous experience* with HT training (yes/no)	6/58	6/58
Previous experience* with PE training (yes/no)	3/61	4/60

*Defined as at least three previous formal training sessions for history taking/physical examination skills.

GOSCE, group objective structured clinical examination; HT, history taking; IM, internal medicine; OSCE, objective structured clinical examination; PE, physical examination; PHCC, primary healthcare centre; PHPQ, Preparation for Hospital Practice Questionnaire.

Self-reported hospital practice preparedness

At the pre-clerkship module stage, the self-assessed preparedness in confidence/coping, patient management (PM) and self-directed learning (SDL) domains were similar between the PHCC and PHCC+on-campus pre-clerks (figure 3B). In contrast with the PHCC module learners, higher post-module PHPQ confidence/coping, PM and SDL scores than their corresponding pre-module scores were noted in the PHCC+on-campus module pre-clerks. Comparing post-module PHPQ confidence/coping and PM scores, the trend for improvement in these two scores at the beginning of the clerkship stage was higher among PHCC+on-campus module pre-clerks than the trend in PHCC module pre-clerks (figure 3B–D). In other words, the late positive effect of the PHCC+on-campus module on PHPQ confidence/coping and SLD scores was better than those in PHCC module pre-clerks (figure 3B–D).

Additionally, the comparable positive late training effectiveness of PHCC and PHCC+on-campus modules was noted in the 'PM' domain at the beginning of the clerkship (follow-up) stage (figure 3B–D). Both for PHCC and PHCC+on-campus module pre-clerks, the gradual

improvement in PHPQ PM scores was accompanied by a progressive increase in PHPQ confidence/coping and PHPQ SDL scores at this follow-up stage.

Correlation between self-assessed hospital practice preparedness and rater assessed OSCE performance at the beginning of the clerkship stage

In this correlation analysis, we defined high OSCE pre-clerks as having OSCE scores higher than the mean value of pre-clerks in the same module and defined low OSCE pre-clerks as the opposite. In figure 3E–F, high OSCE pre-clerks had significantly higher mean PHPQ confidence/coping scores than those in low OSCE pre-clerks in PHCC and PHCC+on-campus modules. Nonetheless, the association between high mean PHPQ SDL scores and high OSCE scores was observed only among PHCC+on-campus module participants. In contrast, the mean PHPQ PM scores were not different between high OSCE and low OSCE pre-clerks in PHCC and PHCC+on-campus modules.

DISCUSSION

As medical education becomes more streamlined with evolving work hour restrictions, preclinical basic

Table 2 Five aspects of history taking and physical examination scores at the four station end of module GOSCE and the beginning of the clerkship OSCE

Overall HT and PE skills across 4 GOSCE/OSCE stations						
Five aspects in 4 GOSCE/OSCE stations	Communication (examination)/care					
	Communication skills	HT and PE technique	HT and PE sequence	Items content	Time controls	
PHCC module participants' performance	Average of 8 grouped pre-clerks' scores in GOSCE stations	12.4 (3.9)	13.8 (3.4)	14.2 (2.7)	15.7 (3.6)	14.6 (2.2)
	Average of 64 pre-clerks' scores in OSCE stations	13.1 (2.1)	11.9 (2.2)	15.1 (1.9)	13.9 (1.8)	12.1 (1.4)
	Overall trends (increase (↑), decrease (↓), similar (-)) of follow-up OSCE scores compared with early GOSCE scores	~	↓	~	↓	↓
PHCC+on-campus module participants' performance (faculty led and student assisted)	Average of 8 grouped pre-clerks' scores in GOSCE stations	15.9 (5.4)*	16.1 (5.1)*	12.9 (2.5)*	14.2 (3.9)*	13.0 (2.7)*
	Average of 64 pre-clerks' scores in OSCE stations	16.7 (3.2)*	16.9 (2.9)*	17.8 (3.1)*	17.6 (2.8)*	16.5 (4.8)*
	Overall trends of follow-up OSCE scores compared with early GOSCE scores	~	~	↑	↑	↑

Data are expressed as medium (IQR).

*p<0.05vs PHCC participants' performances. For each dyad (pre-clerks in GOSCE and a single clerk in OSCE), 5 aspects of HT and PE performance assessed by two raters are added in each station. So, for each dyad or single trainee, each aspect score will range from 4 to 20. In all 4 GOSCE/OSCE stations, the HT and PE performance in 5 HT and PE skills were assessed by Likert scale with 1=very inappropriate to 5=very appropriate.

GOSCE, group objective structured clinical examination; HT, history taking; OSCE, objective structured clinical examination; PE, physical examination; PHCC, primary healthcare centre.

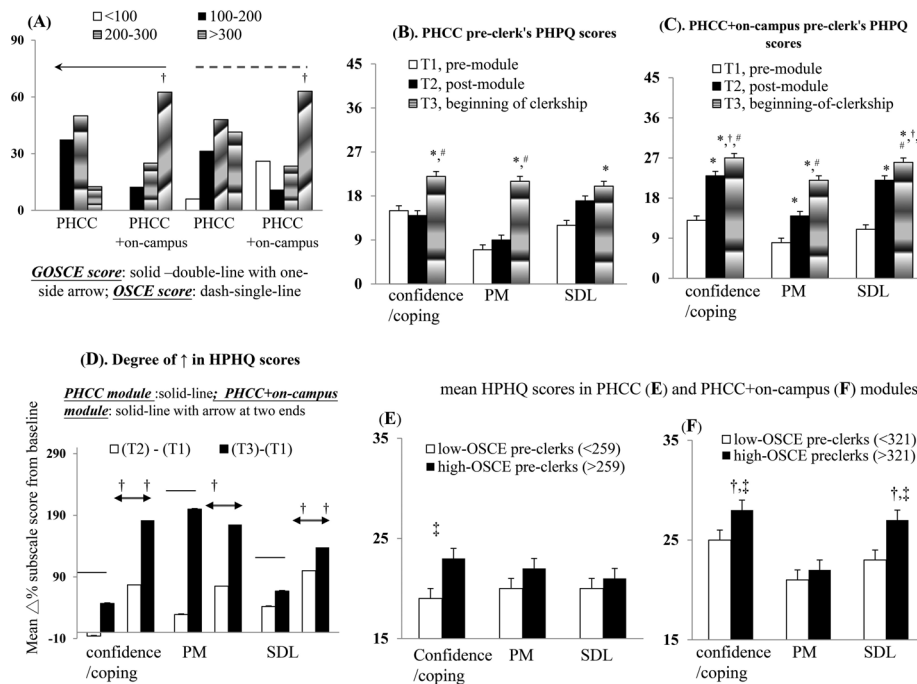


Figure 3 Distribution of (A) grouped pre-clerks' end of pre-clerkship group objective structured clinical examination (GOSCE) and individual pre-clerk beginning of clerkship objective structured clinical examination (OSCE) scores of PHCC and PHCC+on-campus module participants. (B–D). Comparison the impact of primary healthcare centre (PHCC) and PHCC+on-campus history taking (HT) and physical examination (PE) training modules on the sequential changes of the self-assessed Preparation for Hospital Practice Questionnaire (PHPQ) scores for 'confidence/coping,' 'patient management (PM)' and 'self-directed learning (SDL)' subscales. (E–F). Mean PHPQ confidence/coping, PHPQ-PM and PHPQ-SDL scores among high OSCE pre-clerks (beginning of clerkship OSCE scores higher than mean level in the same module) and low OSCE pre-clerks. * $p < 0.05$ vs pre-module score; # $p < 0.05$, $p < 0.01$ vs post-module ends; † $p < 0.05$ vs PHCC module pre-clerks data; ‡ $p < 0.05$ vs low OSCE pre-clerks.

IM related HT and PE skills training is playing a pivotal role in preparing students for clerkship. For years, considerable feedback from faculty members and students has suggested that most preclinical clerks have difficulty taking a proper history and conducting appropriate physical examinations during their IM clerkship. This study compared the effectiveness of PHCC and PHCC+on-campus modules for augmentation of pre-clerks' IM HT and PE skills, which were evaluated at the end of module GOSCE, at the beginning of the clerkship OSCE and by serial self-assessment of hospital practice preparedness during clerkship. In our study, PHCC+on-campus pre-clerks valued this small group dyad practising approach as instructive and helpful to augment their PHCC learned basic PE skills by identification of points that need to be improved.

Additionally, courses directors reported the decline in basic IM related HT and PE skills over time when these skills are taught early in the curriculum. So, our PHCC and PHCC+on-campus modules were extended over the entire fourth year of medical education. GOSCE provides an opportunity to gain clinical experience by peer observation. GOSCEs also are a resource effective tool for evaluation of basic HT and PE skills as they cost less and require fewer raters per learner than a traditional OSCE.^{11–13} Enrolled pre-clerks in our study reported that end of module GOSCE and follow-up beginning

of clerkship OSCE provided them the opportunities for self-reflection and the motivation for continuous bedside learning.

Preclinical students, with limited clinical experience, need intense supervision during the learning process in PHCC, a setting with a variety of patients to practice basic HT and PE skills training. Hence our PHCC+on-campus module is characterised by sufficient on-campus learning resource and continuous community real cases exposure. Notably, our integrated PHCC+on-campus model gradually prepares pre-clerks by linking their PHCC and on-campus learnt skills with in-hospital clerkship, which have relatively more ill patients than PHCC. By initial PHCC, on-campus stimulation and activating pre-clerk's continuous SDL, general improvement in HT and PE skills on the follow-up OSCE, as well as on hospital practice preparedness, was found in our study. In particular, additional benefits of on-campus courses are specifically designed sessions and dedication of simulated patients responsible for performing a variety of clinical scenarios. Most of the dedicated faculty members in PHCC+on-campus courses reported that the pre-clerks went through the whole programme with enthusiasm and dedication.

In our weekly HT and PE sessions of PHCC+on-campus module, every pre-clerk had repetitive training for skills within 4 hours. This is because previous studies have

Table 3 Grouped pre-clerks' performance in end of pre-clerk module GOSCE/single clerk' performance at beginning of clerkship OSCE

Name of GOSCE/OSCE stations	H-N	CV	Chest	Abdomen	Overall
PHCC module participants' performance	Average grouped GOSCE score in each station 72 (5) Average grouped OSCE score in each station 68 (4) Overall trends (increase (↑), decrease (↓), similar (→)) of follow-up at the beginning of clerkship OSCE scores compared with end of pre-clerkship module GOSCE scores	60.7 (4) 61.3 (5) ~	65.1 (2.2) 63.9 (4.7) ~	69.3 (5.4) 64.7 (3.1) ↓	267 (11) 257 (16) ↓
PHCC+on-campus module participants' performance (faculty led and student assisted)	Average grouped GOSCE score in each station 77.6 (7.3)* Average grouped OSCE score in each station 78.2 (4.1)* Overall trends of follow-up at the beginning of clerkship OSCE scores compared with end of pre-clerkship module GOSCE scores	69(3)* 79(6)* ↑	76(5)* 86(7)* ↑	75(7)* 84(9)* ↑	297.6 (12)* 329(28)* ↑

Data are expressed as medium (IQR);

* $p < 0.05$ vs PHCC participants' scores. Each GOSCE/OSCE stations' cumulative 5 aspects scores ranged from 20 to 100 points (table 2). Each paired pre-clerk needs to run 1 GOSCE station randomly (online supplemental table 2). So, every small group (n=8) will have 1 H-N, 1 CV, 1 chest and 1 abdomen GOSCE score and their specific overall GOSCE score is the addition of each of their 4 GOSCE stations' scores. In contrast, each single clerk needs to run H-N, CV, chest and abdomen OSCE stations. After finishing 4 OSCE rotations by all group members (n=8), each clerk's small group will have 8 H-N, 8 CV, 8 chest and 8 abdomen scores (online supplemental table 4). For analysis, the average of 8 H-V OSCE scores of 8 members is defined as the average H-V OSCE score for the specific small group. Then, overall group OSCE scores is the addition of the average H-V, CV, chest and abdomen OSCE scores of a specific small group. Notably, the average group GOSCE scores and group OSCE scores in the H-N, CV, chest and abdomen stations were the average of 8 small group scores.

C, cardiovascular; H-N, head and neck; GOSCE, group objective structured clinical examination; HT, history taking; OSCE, objective structured clinical examination; PE, physical examination; PHCC, primary healthcare centre.

reported that repetitive skills training and expert feedback increase the long term effectiveness of skills training.^{14 15}

Medical students need to acquire a number of learning skills, such as confidence and preparation for lifelong SDL.¹⁶ Within the protected on-campus environment, the well trained structured feedback and debriefing skills by faculty members and SPs increased PHCC+on-campus trainees' PHPQ confidence/coping scores. The active involvement of each pre-clerk in demonstrating clinical scenario based HT and E skills resulted in the late positive effects of the PHCC+on-campus model on pre-clerks' PHPQ-SDL scores. This observation is compatible with the previous report that peer assisted and SDL enhanced the learning efficiency of complex skills in medical education.¹⁷ In contrast with the rotation of GOSCE station by dyad pre-clerks, every pre-clerk needs to run and complete the task in the four OSCE stations independently. Among participants in the PHCC+on-campus module, the positive association between mean PHPQ SDL scores and high OSCE scores further confirms the role of OSCE to examine the skill performance and SDL ability of each clerk.

It has been reported that observing peers' performances can enhance the confidence and proficiency of learner HT and PE, which is a mix of cognitive and motor skills.^{9 18 19} In our study, PHCC+on-campus module's pre-clerks had opportunities to make repeated observations of their peers' performances on simulated patients. Taken together, it is reasonable to observe the lack of skills degradation over time in OSCE performance and PHPQ SDL scores among the PHCC+on-campus group in our study. In contrast, pre-clerks practising in PHCC are alone due to limited time per patient encounter. Moreover, training in PHCC has been characterised as opportunistic with an uncontrolled mix of cases, which interferes with the standardisation of training. Compatible with previous observations, our study suggests that the CV HT and PE skills are not easy to improve by PHCC or on-campus training courses alone.^{6 20} These results suggest the need for further training of CV PE skills in IM internship and residency.

The PHCC module in our current study was 7 weekly PHCC sessions followed by 7 week assignment based group learning before GOSCE and OSCE. As the positive roles of small group PHCC sessions has been established in training of basic PT and PE skills,^{5 21} in our study, the PHCC+on-campus module was conducted as 7 week PHCC and 7 week on-campus weekly sessions that ran every 2 weeks alternatively (figure 1). It is possible that the length and modules of the PHCC sessions as well as additional resources of PHCC+on-campus module will affect the degree of improvements in the learning outcomes of pre-clerks' HT and PE skills. Therefore, a third group who receive 14 weeks of pure and consistent PHCC training should be included in future studies.

With regard to generalisability, our study design was based on the positive roles of PHCC+skillslab training in Indonesian and Dutch preclinical students.^{5 21}

Nonetheless, positive results for our PHCC+on-campus module are limited to Chinese pre-clerks; the degree to which this parallel module can be extrapolated to training in other countries needs to be validated in a future large scale multicentre study.

CONCLUSIONS

This prospective comparative study suggests that an integrated PHCC+on-campus module can train preclinical clerk's history taking and physical examination skills effectively and intensify their self-directed learning and patient management abilities to prepare for hospital practice in clerkship.

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