# Application of Hybrid Training in Clinical Comprehensive Skills Training Courses for Senior Medical Students

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## Background

- The increasing demand for better healthcare among citizens in China has formed urging need for better medical education quality, which traditional clinical training for medical students can no longer suffice.
- Ethical and legal concerns raised particular focus on clinical training of medical trainees without license to practice in real clinical situations, which largely reduced the possible hands-on practice for medical students (only serve as observers and reporters).
- Simulation-based education (SBE) holds great potential to partially substitute clinical training, and previous study suggested clinical hours can be replaced with carefully designed simulation in pre-licensure nursing education (Hayden, *et al.*, 2014), and hybrid simulation might be the key (Friederichs, *et al.*, 2014), .
- Currently there are no carefully designed simulation courses for clinical medicine undergraduates in China to improve their clinical comprehensive skills.

## Objectives

- To develop training courses based on hybrid training method by carefully integrating simulation, which can help to improve the comprehensive competency of the senior medical students.
- To explore and implement the hybrid training method in the clinical comprehensive skills training courses for senior medical students.

## Materials & Methods

- 47 senior medical students were randomly separated into 6 learning groups
  - 24 on their 5th year of 7-year-medical study
  - 23 on their 6th year of 8-year-medical study
- A case of pulmonary embolism (PE) was designed and divided into 6 modules with clear learning objectives, implementation methods used.

| | Modules | Objectives (After this module, the students are able to) | Delivery Methods & Simulation Types |
|---|---|---|---|
| 1 | Patient encounter and preliminary diagnosis | Take a focused history of a patient with chest pain; | Virtual patient and SPs encounter |
| | | Choose the correct physical examination items to be performed on the patient with chest pain; | Virtual patient and SPs encounter |
| | | Select the right lab tests to make or eliminate diagnosis; | Team-based discussion |
| 2 | Clinical reasoning and medical communication training | Demonstrate team-based clinical reasoning and treatment decision making; | Team-based discussion |
| | | Conduct SOAP report and SBAR handoff training | Role play and Team-based discussion |
| | | Explain the condition of the patient to superior(s) | SPs/Confederates & discussion |
| 3 | Patient safety management and assessment of disease deterioration | Manage patient safety during crisis | Simulation of "horror room" |
| | | Primary and secondary investigation of critically illness. | Team-based discussion |
| 4 | Critical ill patient investigation and intervention | Management of disease deterioration | Team-based discussion |
| | | Conduct basic life support | BLS simulation |
| | | Conduct advanced life support | ACLS simulation |
| 5 | Teamwork coordination | Identify the role and responsibility of Rapid response team | Team-based discussion |
| | | Perform patient management as a code team and demonstrate professionalism of teamwork. | Mega-code test (High fidelity simulator) |
| 6 | Case and clinical competency discussion | Conduct case report and cased-based discussion | Case report & Team-based discussion |
| | | List competences that a doctor should have | Team-based discussion |

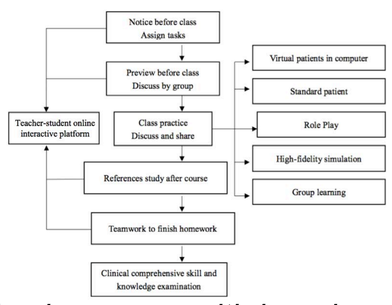


**Figure 1.** *Outline of 6 modules in course, with learning objectives, content delivery methods and simulation types (**Left**); Workflow of for each module from before each session to after the session, in a flipped classroom manner (**Right**).*

- Participating students are required to go through each of the 6 modules with the assistance of online interactive platform (QQ):
  - 3 hours of learning session for each module;
  - Reading materials and pre-course work were given 3 days prior to each session, and homework should be submitted to instructors 3 days post each session;
  - Pre-course and post-course assessment were conducted as well.

**Figure 2.** *Pre-course materials delivery and pre-course and post-course homework submission.*

a.

**Figure 3a.** *Students were asked to take a focused history within limited time from a trained SP (**Left**); during role plays, Students were reporting to senior physician (**Middle**) and were communicating with the patient's relative (**Right**).*

b.


**Figure 3b.** *Students entered "horror room" and were asked to identify the crisis of the patient within limited time (**Left**) and were working as a code team to manage the deteriorating patient (**Middle**); debriefing was conducted after each simulation and group discussions were also provoked at each session (**Right**).*

## Results

- Multiple clinical skills were trained among those senior medical students focusing on patient encounter, history taking, making preliminary diagnosis, reporting to senior physician, interpersonal communication, patient safety management, crisis management of disease deterioration, BLS of the code team, advanced life support and the ability of reporting a case, as well as perform a cased-based discussion within on simulated case.
- Post-course survey were conducted in comparison with the base-line of the students formed from the pre-course survey (Results shown in **Figure 4.**).

a.

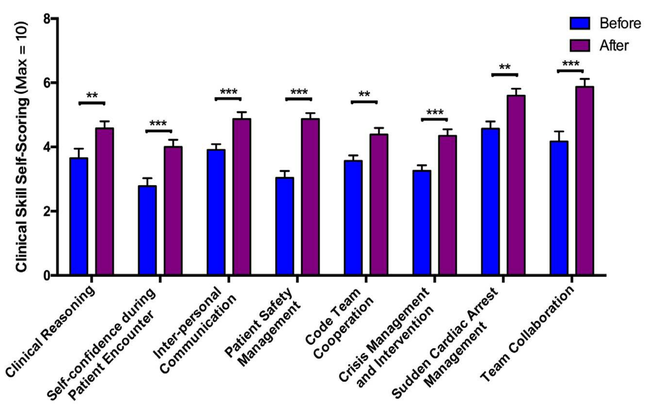


**Figure 4.** *Survey on students' self-evaluation of clinical skill improvement before and after training showed that every aimed-to-train clinical skills (Clinical Reasoning, Self-confidence during Patient Encounter, Inter-personal Communication, Patient Safety Management, Code Team Cooperation, Crisis Management and Intervention, Sudden Cardiac Arrest Management, Team Collaboration, Data Gathering & Processing) has significantly improved after training (** P < 0.01, *** P < 0.001, n = 47).*

**Table 1.** Learning Evaluation and Students Test Scores

| Items （Max Score） | Score (N = 47, Mean ± SD) |
|---|---|
| Group Homework－Summary of the disease diagnosis the treatment process（20′） | 17.7±0.8 |
| Group Homework－Video Correction（20′） | 17.0±1.6 |
| Group Homework－Summary of Competency required （20′） | 16.3±0.8 |
| Paper test（10′） | 5.2±1.1 |
| Comprehensive Simulation test（10′） | 6.5±1.0 |
| OSCE examination（20′） | 15.1±1.2 |
| Total（100′） | 77.7±3.7 |

**Table 1.** *Hybrid examinations consisted of different tests (items covering knowledge, skill and attitude, format varies depending on the target items to be assessed) were conducted and results analyzed, and all students passed the tests, demonstrating that all students who attended the course has improved clinical performance as the average score for each item is satisfactory.*

- Post-course tests were conducted and format varies depending on the items to be assessed and results were analyzed (**Table 1.)**

## Discussion

- A hybrid simulation integrated with blended learning training course pattern (hybrid training) was established by simulating key procedures of dealing with a certain patient to train the students to improve clinical comprehensive skills; this can be applied in any other diseases and can expand to other clinical comprehensive skill training.
- The application of such course design and implementation pattern could possible provide more chances for pre-licensure medical students to improve their clinical skills, therefore providing opportunities to behave like Interpreters and Patient-care Managers of the ORIME framework.
- Hybrid teaching method and Team-based learning help students do more learning activity both in and out of class.
- Hybrid training in the clinical comprehensive skills training courses was a student centered, results oriented method lead to active and effective learning, developed a new way for clinical competency training.

## References

- Hayden, Jennifer K., et al. "Supplement: The NCSBN National Simulation Study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education." *Journal of Nursing Regulation* 5.2 (2014): C1-S64.
- Friederichs, Hendrik, et al. "Combining simulated patients and simulators: pilot study of hybrid simulation in teaching cardiac auscultation." *Advances in physiology education* 38.4 (2014): 343-347.

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