

The evaluation of clinical problem based learning and small group discussion in the outcome-based education in revised pharmacy curriculum

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ABSTRACT

Model Core Curriculum for pharmacy Education - 2015 revised edition introduced an outcome-based education system. With this clinical-based curriculum, clinical problem based learning (PBL), small group discussions (SGD) and hands-on skills labs with various activities were implemented.

The outcome-based educational method, with the use of PBL and SGD, theoretically imparts skills and knowledge beyond the more traditional didactic methods. This new program seemed to be an overall positive experience for our students in introducing them to a more clinical-based form of practice. As these educational systems evolve, we strive to achieve a higher level of comprehension from the students. We will continue to adjust the case studies for pharmacy students to better reflect the current health of our community.

Key words: outcome-based education, problem based learning, small group discussion

1. Introduction

In 2006, the Japanese pharmacy education system shifted from a 4-year to a 6-year curriculum, same as medical school. This was in line with the increasing standards of education for pharmacists. Pharmacists have an important role in the prevention of drug induced side effects, and with the expansion of the role of the pharmacists, there has been a transition from merely being a pharmacotherapeutic advisor to a physician. Physical assessment (PA) of patients is the most popular and useful diagnostic tool for physicians. Since 2009, the PA program has been implemented for fourth year pharmacy students as a part of the pharmaceutical care curriculum in Kobe Gakuin University. In 2010, the Ministry of Health Labor Welfare recognized the usefulness of physical assessment for patients as well as the potential conveniences in implementing this within the role of the pharmacists. Our PA program for pharmacy students was published at the poster session at the 5th Asian Association Schools of Pharmacy, held at the Institute of Technology Bandung, Indonesia, on June 16–19, 2011.

Model Core Curriculum for Pharmacy Education-2015 revised edition introduced an outcome-based education system. This revised curriculum proposed 10 professional competencies for pharmacists, including professionalism, patient-oriented attitude, communication skills, inter-

professional team care, basic sciences, medication therapy management, community health and medical care, research, lifelong learning, and education and training (Table 1). With

Table 1. Professional Competencies for Pharmacists.

1. Professionalism: Fulfill the legal, ethical, and professional responsibilities of pharmacists.
2. Patient-oriented attitude: Respect the rights of individuals and promote the health and welfare of patients and consumers.
3. Communication skills: Communicate effectively with patients, consumers, and other healthcare professionals to provide necessary information.
4. Inter-professional team-care: Collaborate with healthcare teams in hospitals and regional communities.
5. Basic sciences: Understand the effects of medicines and chemicals on living bodies and the environments.
6. Medication therapy management: Contribute to the optimal use of medicines through pharmaceutical care.
7. Community health and medical care: Contribute to public health and pharmaceutical hygiene and enhance community healthcare and home care.
8. Research: Engage in research on drug development and the appropriate use of medicines to improve the healthcare environment.
9. Lifelong learning: Continue lifelong professional development in response to the advances in healthcare.
10. Education and training: Contribute to the development of the next generation of professional pharmacists.

Table 2. Schedule of clinical PBL and SGD with hands-on work including physical assessment.

Date and Step	1st day (Wed.) STEP1			2nd day (Tues.) STEP2				3rd day (Wed.) STEP3				4th day (Tues.) STEP4			
Contents	Orientation (Case A–D) 15 min			Orientation 5 min				Orientation 5 min				Orientation 5 min			
	ECG	Spirometer	SGD (STEP1)	Nutrition	Feeding route	Blood pressure	SGD (STEP2)	BLS AED	Simulator	Tuning fork SpO ₂	SGD (STEP3)	Inhaler	Insulin	Simulator	SGD (STEP4)
Faculty	1	2	2	1	1	2	1	1	1	1	2	1	1	1	2
place	CP287	CP286	CP275	CP286		CP287	CP275	CP287	CP286		CP275	CP287		CP286	CP275
Group No and time	A, B, C 40 min	D, E, F 40 min	G, H, I J, K, L	A, B, C 40 min	D, E, F 40 min	G, H, I 40 min	J, K, L 40 min	A, B, C 40 min	D, E, F 40 min	G, H, I 40 min	J, K, L 40 min	A, B, C 40 min	D, E, F 40 min	G, H, I 40 min	J, K, L 40 min
	D, E, F 40 min	A, B, C 40 min	40 min×2	D, E, F 40 min	A, B, C 40 min	J, K, L 40 min	G, H, I 40 min	D, E, F 40 min	A, B, C 40 min	J, K, L 40 min	G, H, I 40 min	D, E, F 40 min	A, B, C 40 min	J, K, L 40 min	G, H, I 40 min
	G, H, I 40 min	J, K, L 40 min	A, B, C D, E, F	G, H, I 40 min	J, K, L 40 min	A, B, C 40 min	D, E, F 40 min	G, H, I 40 min	J, K, L 40 min	A, B, C 40 min	D, E, F 40 min	G, H, I 40 min	J, K, L 40 min	A, B, C 40 min	D, E, F 40 min
	J, K, L 40 min	G, H, I 40 min	40 min×2	J, K, L 40 min	G, H, I 40 min	D, E, F 40 min	A, B, C 40 min	J, K, L 40 min	G, H, I 40 min	D, E, F 40 min	A, B, C 40 min	J, K, L 40 min	G, H, I 40 min	D, E, F 40 min	A, B, C 40 min
Out come	Poster Presentation			Poster Presentation				Poster Presentation				Poster Presentation			

Abbreviations: ECG = electrocardiogram; SGD = small group discussion; BLS = basic life support; AED = automated external defibrillator; SpO₂ = saturation of percutaneous oxygen

this curriculum, pharmacy students should be able to demonstrate proficiency in these 10 competencies upon graduation from the 6-year course. The pharmacy practical experience of the revised model core curriculum includes pharmaceutical care of eight common diseases: cancer, hypertension, diabetes mellitus, heart diseases, cerebrovascular disease, neuropsychiatric disease, immunologic and allergic diseases, and infectious disease (Ozawa, 2018).

At the time of implementation, we particularly focused on professionalism, patient-oriented attitude, medication therapy management, community health and medical care through clinical problem based learning (PBL) and small group discussions (SGD) about four of the common diseases from the list of eight common diseases.

The purpose of this report was to evaluate our implementation of the new program derived from the revised curriculum.

2. Methods

2.1. Educational Environment

Fourth-year pharmacy students at Kobe Gakuin University were divided into five groups and further divided into 3 or 4 students designated with letters A through L.

On four separate days (one day for each STEP), these groups were shuffled into three to four blocks comprised of two to three blocks of hands-on experience (40 minutes each) and a 40 to 80 minute block dedicated to SGD. On each day, these blocks were preceded by an orientation and followed by poster presentations from each group (Table 2).

2.2. Cases and Educational STEPs

We prepared four clinical cases with SGDs focused on pharmaceutical care management step by step from STEP1 to

STEP4 (Table 3). Within the small group discussions, day 1 started with STEP1, and each group was given the four case studies. The students were provided with subjective patient information but limited objective information (e.g. certain vital signs and laboratory data).

Case A is a 56-year-old man who comes to the drug store to buy a cold patch for pain. His symptoms are chest tightness with heartburn, more than 20min of cold sweat, and pain radiating from his left shoulder. He has diabetes mellitus; however, he does not have medication and loves smoking tobacco.

Case B is a 4-year-old girl whose mother brings her into the community pharmacy. Her symptoms are wheezing and cough with phlegm. She has a dairy allergy. Her recent medical history includes a common cold for a week. Her

Table 3. Contents of STEP1 to STEP4 of clinical PBL and SGD.

1st day (Wednesday) STEP1
1) Triage of patient's condition
2) Diagnosis in line with clinical data gathering from patients
3) Differential diagnosis based on patient's presenting signs and symptoms
2nd day (Tuesday) STEP2
1) Evaluation of patient's nutrition
2) Recognition of feeding route
3rd day (Wednesday) STEP3
1) Designing an appropriate medication regimen
2) Short term and long term treatment
4th day (Tuesday) STEP4
1) Drug therapy monitoring (Providing medication information about efficacy monitoring parameters and toxicity monitoring parameters to patients)
2) Patient education and advocating lifestyle changes that can improve the outcomes of medical therapy

Table 4. Patient's information of Case A to D.

	Case A	Case B	Case C	Case D
Age and Sex	56 Y.O, male	4 Y.O, girl	77 Y.O, male	76 Y.O, male
Environment	Come to buy cold patch for pain	Mother brings her into the pharmacy	Come to buy Vitamins	Come to consult with a pharmacist
Symptoms	Chest tightness with heart burn, more than 20 min with cold sweat, pain radiating from his shoulder	Wheezing and cough with phlegm (common cold for a week)	Sudden weakness on his right hand	Cough with lots of phlegm for 2 weeks, presented with fever today and feeling like leg edema
Past History	Diabetes Mellitus (no compliance)	N.P.	Hypertension (carvedilol* 10 mg once daily) * Sometimes he forgot to take medicine	Emphysema, Splenectomy Hypertension (Amlodipine 2.5 mg once daily)
Family History	N.P.	Her father has asthma	N.P.	N.P.
Others	Heavy smoker	Dairy allergy	Recently lost his wife Has not had proper meals (eating instant foods)	Stopped smoking a year ago
Patient's vital signs and laboratory data	HR: 108/min, RR: 24/min BP: 98/70 mmHg BT: 36.8°C FBS: 138 mg/dl HbA _{1c} : 8.5% ECG: ST elevation	HR: 118/min, RR: 28/min SpO ₂ : 92–94% BT: 37.2°C	HR: 99–114/min, irregular RR: 16/min, BT: 36.6°C BP: as below Home: 150–160/100–110 mm/Hg Clinic: 148/94 mmHg ECG: atrial fibrillation	BH: 175 cm, BW: 42 kg HR: 120/min, RR: 28/min SpO ₂ : 89% BP: 110/70 mmHg BT: 38.8°C RSST: 3/30sec

Abbreviations; N.P. = not particular; HR = heart rate; RR = respiratory rate; BP = blood pressure; BT = body temperature; FBS = fasting blood sugar; HbA_{1c} = hemoglobin A_{1c}; ECG = electrocardiogram; BH = body height; BW = body weight; SpO₂ = saturation of percutaneous oxygen; RSST = repetitive saliva swallowing test.

father has bronchial asthma.

Case C is a 77-year-old man who comes to buy vitamins from the pharmacy. His symptoms include sudden weakness in his right hand. He has not had proper meals aside from instant foods because he lost his wife recently. Furthermore, before the manifestation of the symptoms he had gone for a walk in the mountains without any water, so he thought he was lacking vitamins.

Case D is a 76-year-old man who comes to consult with a pharmacist. His symptoms are cough with lots of phlegm for two weeks followed by a fever today and a feeling of leg edema. He has also been experiencing a loss of appetite. He stopped smoking a year ago; however, he was previously diagnosed with emphysema. He had a splenectomy due to a traffic accident at a young age. His only home medication is amlodipine 2.5mg once a day (Table 4).

On the 1st day (Wednesday), STEP1 of the clinical PBL and SGD consists of triage, diagnosis and differential diagnosis for the patients. The first step in pharmaceutical care at a community pharmacy or drug store is to evaluate the condition of patients who came to the pharmacy. The students discuss whether or not to call an ambulance or consult with a home doctor or medical telephone service (#7119 or #8000). After the initial triage, the students are provided with objective measurements, including vital signs and laboratory data. Then the students discuss about the diagnosis and differential diagnosis based on the patients' symptoms, vital signs and laboratory data. STEP1 reflects on professionalism, patient-oriented attitude and community health and medical

care in line with the revised model core curriculum.

On the 2nd day (Tuesday) during STEP2, the students assess the patient's nutritional status based on subjective and objective information and data. STEP2 reflects on patient-oriented attitude to promote patient health and welfare which is also in line with the revised model core curriculum.

On the 3rd day (Wednesday) during STEP3, the students design an appropriate medication plan for both short term and long term treatment. STEP3 reflects on medication therapy management and planning that contributes to the optimal use of medicines through pharmaceutical care in line with the revised model core curriculum.

On the 4th day (Tuesday) in STEP4, the students select appropriate monitoring parameters for efficacy and toxicity for each case. Moreover, the students need to provide patient education and advocate lifestyle changes that can improve the outcomes of their therapy. STEP4 reflects on medication therapy management and patient-oriented attitude in line with the revised model core curriculum.

Overall the strategies to enhance the learning outcome of the students consisted of PBL, SGD and hands-on work in each block with faculty members who acted as facilitators.

During the four block sessions, students were given the opportunity to learn about the different PAs including ECG, spirometry, and measurement of blood pressure. Additionally, they also receive hands-on training with regards to feeding route, disease state simulation using a computerized mannequin doll, cardiopulmonary resuscitation, the use of various tools (e.g. AED, hammer, tuning fork, pulse

oximeter), the demonstration of inhalers for respiratory diseases such as asthma and COPD, and the proper use of insulin syringes for DM (Table 2).

2.3. Data analysis

Achievement and satisfaction of SGD with clinical PBL were evaluated by students based on their feedback on a scale of 1 to 5 on a questionnaire. The results of which are summarized on pie, bar charts and box-and-whisker plot. In addition, major descriptive opinions were summarized and presented.

3. Results

This educational program was initiated from April to July in the 2018 academic year. A total of 227 fourth year students (81 male and 146 female) participated. Students were divided into 12 (From A to L) small groups, consisting of 3 or 4 students per group. This program involved 12 faculty members in our school of pharmacy, including two physicians, 3 guest pharmacists (to provide training on how to use inhalers), and 3 teaching assistants who are 5th grade students in our school of pharmacy.

The students' feedback on this new program are summarized and presented in Figures 1-5.

1) What did you think about this PBL and SGD program?

About 76% of the students selected either 'interesting' or 'very interesting'. Students were interested in having different goals from STEP1 to STEP4. Therefore, most of the students felt that this program was either interesting or very interesting (Figure 1).

2) How much did you participate in this clinical PBL and SGD program?

87 % of the students selected either 'proactive' or 'very proactive'. In a small group of 3-4 students, the students can see other's faces and create a friendly atmosphere. Therefore, almost 90% students were able to proactively contribute to the discussions (Figure 2).

3) How would you rate your level of understanding or achievement (scale of 1 to 5) in each STEP?

Regarding the degree of achievement, the average ratings for both STEP2 and STEP3 were 3.6 out of 5, 3.5 for STEP1, and 3.4 for STEP4. STEP2 and STEP3 showed slightly higher levels of perceived accomplishment than the other STEPs (Figure 3).

4) Which cases were particularly interesting or difficult among Cases A to D?

About one third of the students were interested in Case B and a quarter of the students were interested in Case D. Case A and C were interesting to above one fifth of the students. On the other hand, more than half of the students felt Case D was particularly difficult (Figure 4).

5) What did you think about the clinical PBL, SGD and hands-on work?

Nearly 90% of the students felt that the program was

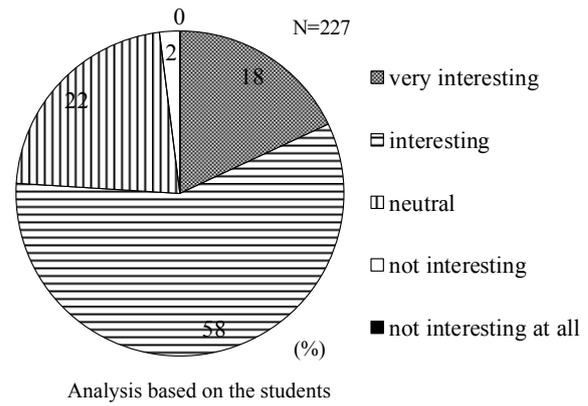


Figure 1. Student feedback on PBL and SGD program.

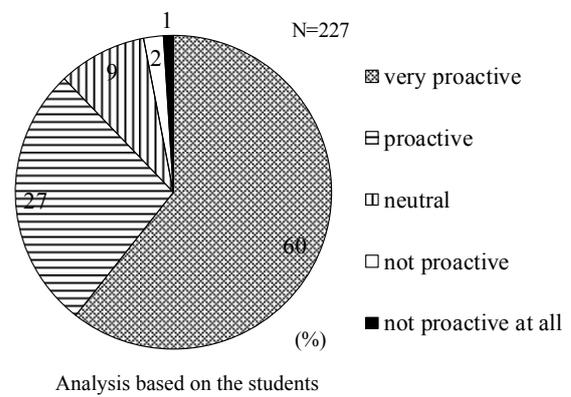


Figure 2. Students self-reported level of participation on PBL and SGD.

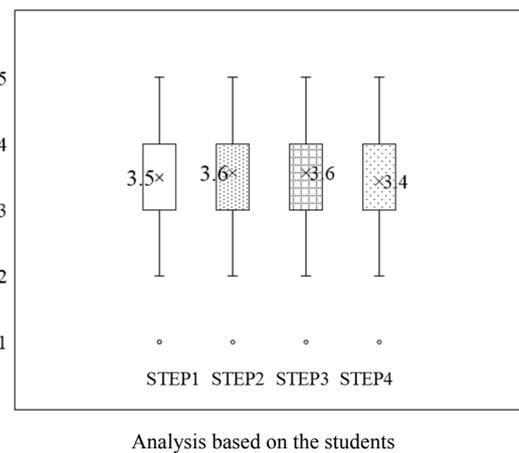


Figure 3. Students' self-reported level of each STEP.

'useful' or 'very useful'. Students felt that hands-on work enhanced their understanding of the topics (Figure 5).

4. Discussion

The ratio of the elderly population to the total population has exceeded 25%. Our government's strategy regarding

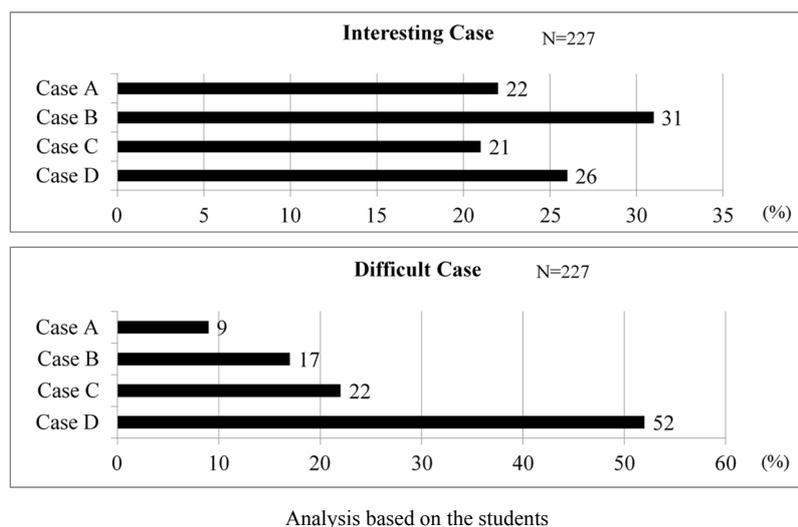


Figure 4. Interesting and Difficult Case.

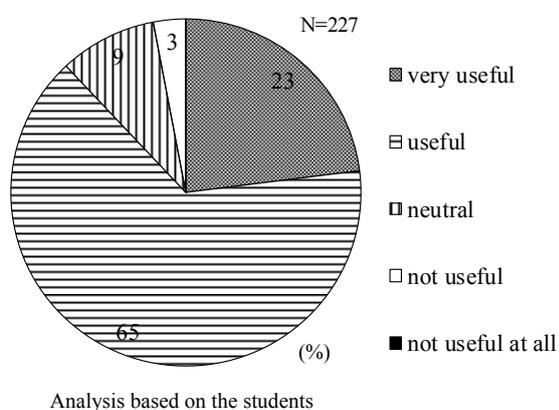


Figure 5. Students impressions of PBL, SGD and hands on work.

patient care has shifted from hospital to home health care activities. It has been advocated in the last few decades that pharmacists should participate in team based health care practice with physicians, nurses, and other health care professionals in order to improve patients' drug therapy outcomes at home. However, there are many four-year pharmacy program graduates who are working in clinical practice sites that do not know how to handle home health care with physicians and nurses. Because the previous four-year Japanese pharmacy curriculum was focused mainly on drugs, there were few programs within the curriculum focusing on applied pharmacotherapy and/or pharmaceutical care.

Despite the changes in the new 6-year Japanese pharmacy curriculum, there remains an ever-increasing social demand for quality assurance in pharmacy education, especially the education of health care professionals.

Model Core Curriculum for Pharmacy Education-2015 revised edition introduced an outcome-based education system. This revised model core curriculum proposed 10 professional competencies for pharmacists (Table 1) that

pharmacy students should acquire upon graduation from the 6-year course.

The program presented in this paper was designed to help students achieve a better understanding of pharmaceutical care and clinical pharmacy practice.

The clinical competencies of the revised model core curriculum are professionalism, patient-oriented attitude, communication skills, inter-professional team-care, basic sciences, medication therapy management, and community health and medical care.

Occasionally, the state of the patients may deteriorate at community pharmacy, drug store and home health care settings. Triage is the first step of STEP1 for professionalism. Patients in these cases were in different phases of their illness, some recovering, and some still deteriorating. If the pharmacist encountered a deteriorating patient, what should the pharmacists do? Triage involves the presenting condition being assessed for urgency and a decision on how soon treatment is required. Moreover, the triage encompasses the full range of presentations from minor to life threatening. However, in community pharmacy, drug store, or home care settings, there are many situations which pharmacists are not able to treat, even if they are considered relatively minor and non-urgent. Therefore, it is necessary for the students to be able to recognize the urgency of the patient's condition. In Japan, there is a unique public telephone service (by dialing #7119 and #8000) in which everyone can receive a consultation about any health-related concerns. Judging from a patient's assessment, the pharmacist needs to be able to assess the urgency of the patient's condition and determine if the use of such resources would be appropriate. Triage contributes to patient safety and potential reductions in medical expenditures.

Similarly, developing effective triage services in community pharmacy has the potential to reduce pressure on other health services by reducing costs associated with unnecessary

use of other more expensive healthcare services, such as general physicians (GPs) and accident and emergency departments at hospitals (Curley, 2016). In the year 2006 to 2007, it was reported in the United Kingdom that there were 59 million consultations with GPs involving a minor ailment, which had an estimated cost of £2 billion per annum (Baqir et al., 2011). In Canada, two provinces (Nova Scotia and Saskatchewan) added minor ailments as an expanded aspect of practice in 2011. This new legislation broadened pharmacists' scope of practice, enabling them to prescribe certain medications for minor self-limiting and self-diagnosed ailments from a list of agents previously only able to be prescribed by a doctor (Mansell et al., 2015).

For most pharmacy students, the practical aspect of PA is quite foreign as it may not typically be performed in the pharmacies where they are employed. The exercises involving application of PA skills allowed students to learn when certain assessments may be appropriate. At the same time, students gained experience in performing assessment techniques that they could use in practice. Moreover, the simulation mannequin provided students with additional experience (e.g. auscultation) in evaluating abnormal findings that should be reported (Bolesta et al., 2011).

PBL has been an increasingly utilized method in pharmacy education since the year 2000. The standards for such a curriculum has been published by ACPE (The American Council for Pharmacy Education), which states that 'the educational process should promote lifelong learning through the emphasis on active, self-directed learning and the curricula should include teaching strategies to ensure the adeptness of critical thinking and problem-solving (American Council on Pharmaceutical Education, 2000).

The implications of integrate PBL in pharmacy education have 2 aspects such as students and pharmacy educator who works as facilitators. It was implied that the implementation of PBL can enhanced the pharmacy students' competencies and that generally the students were satisfied with the PBL course. These positive outcomes occurred when the teacher works as a facilitator of discussion in clinical environment (Khumsikiew et al., 2015).

In Japan, The Evaluation Standards 2011 by JABPE (Japan Accreditation Board for Pharmaceutical Education) introduced education for nurturing problem solving ability. According to this problem-finding and solving approach to learning, education for nurturing the ability for identifying and solving problems must be carried out systematically, effectively and written in the syllabus. Learning methods, such as type of participation, group learning, and self-learning, must be carried out effectively so as to nurture an ability for identifying and solving problems. Japanese pharmacy school must set an index to evaluate the competency of students in education related to nurturing the ability for identification and solving problems and must

appropriately judge student competency based on that index. The amount of class credits for education in nurturing the ability for identifying and solving problems should be set at over 10% of total credits required for graduation. (Japan Accreditation Board for Pharmaceutical Education, 2011) Generally speaking, Japanese students tend to be shy when it comes to public speaking and group discussions. However, the students in our SGD program seem to have had little difficulty in conducting active discussion with their classmates. The questionnaire survey showed that nearly 90% of students were able to speak positively (Figure 2). Two reasons for this could be that these SGDs were mostly student-centered (i.e. the facilitator played a more minor role in discussions) and that the limited amount of time allowed for SGDs facilitated proactive participation for the purpose of time optimization.

Nowadays 1 in 4 Japanese people is over the age of 65 years. Pneumonia is the fourth leading cause of death in Japan. As the result of this study, Case D was particularly difficult for students, perhaps due to difficulties in differentiating aspiration pneumonia from community acquired pneumonia (Figure 4).

Training the pharmacy students to improve patients' pharmaceutical care in line with the revised model core curriculum not only requires didactic knowledge but also the problem solving and hands-on skills highlighted in this program.

As students' opinion, there are "Through clinical PBL and SGD, it became possible to think about how concretely to handle cases-treatment and patient education".

In America, this educational style in pharmacy curriculum is not new. However, in Asian countries such as Japan, training students to practice in a patient-centered focus is new. From this revised model core curriculum, we are confident that implementing clinical PBL and SGD with PA contributes to team based healthcare and community health and well-being (Figure 6).

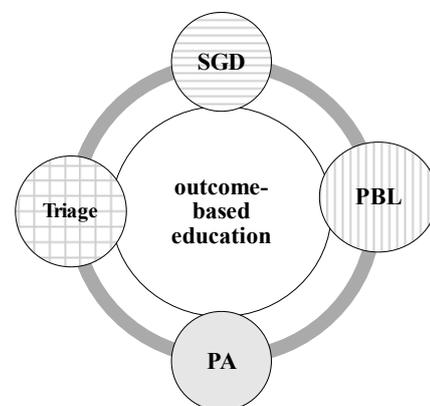


Figure 6. Strategy of pharmaceutical care.

Abbreviations : SGD=small group discussion; PBL = problem based learning; PA=physical assessment

5. Conclusions

An outcome based educational system, with the use of clinical PBL and SGD has given students a better opportunity to experience close-to-practice pharmaceutical experiences. This new implementation of educational learning had a better learning outcome for students than a lecture based learning style for these topics. As these educational systems evolve, we strive to achieve a higher level of comprehension from our students by continuing to adapt the case studies to better reflect the current health of our community.

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