Effects of educational programs with simulation for life-saving nurses

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Background

Change in environment that surrounds medical treatment in Japan

- Number of surgical operations ↓
- Hospitalization days ↓

Severity of the inpatient ↑

Clinical sudden change risk ↑

- Introduction of a 7:1 patient-to-nurse staffing ratio

Nursing staff ↑

Number of less-experienced nurses ↑

The sudden change cannot be noticed. It is not possible to connect to the rapid response even if it notices.
Purpose

• Five programs have been developed with the aim of educating nurses in the first three years of their career, nurturing professionals who are able to predict sudden changes in patient’s condition, who can deal with these sudden changes appropriately, and who can play roles as both a leader and a team member in response to such situations.

• To verify the efficacy of the five educational programs that have been developed.
Educational program development (1)
Method

- Instructional design
  - Methodology to design and execute education effectively, efficiently, and attractively
  - ADDIE model
Educational program development (2)

Elements of ability necessary for life-saving nurses

1. Physical assessment abilities to notice sudden changes prior to, and not to make them serious
   60-70% of sudden cardiopulmonary arrest cases were not anticipated even though changes of certain symptoms in 6-8 hours prior to the accidents.

2. Abilities in critical scenes that can correspond adequately
   ⇒ Established educational programs (BLA・ACLS) were utilized.
### Educational program development (3) mission 1

To acquire physical assessment abilities to notice sudden changes prior to, and not to make them serious

<table>
<thead>
<tr>
<th>Educational program</th>
<th>participants</th>
<th>goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>First year after graduation</td>
<td>To acquire basic knowledge and skills necessary for physical assessment of the respiratory system, circulatory system, the abdomen</td>
</tr>
<tr>
<td>II</td>
<td>Educational program I completion</td>
<td>To acquire an effective observation method through clinical cases</td>
</tr>
<tr>
<td>III</td>
<td>Educational program II completion</td>
<td>To acquire knowledge and skill necessary for clinical judgment and reporting of patients sudden changes</td>
</tr>
</tbody>
</table>
Educational program development (3)  
mission 2

To acquire abilities in critical scenes that can correspond adequately utilizing established educational programs

<table>
<thead>
<tr>
<th>Educational program</th>
<th>participants</th>
<th>goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLS</td>
<td>First year after graduation</td>
<td>To acquire skills necessary to save lives of patients with cardiac or respiratory arrest or near-arrest</td>
</tr>
<tr>
<td>ACLS①</td>
<td>BLS completion</td>
<td>To acquire knowledge and skills necessary to correspond sudden condition changes in patients</td>
</tr>
<tr>
<td>ACLS②</td>
<td>ACLS① completion</td>
<td>To acquire advanced lifesaving skills to save lives of patients with cardiac or respiratory arrest or near-arrest</td>
</tr>
</tbody>
</table>
To integrate the abilities acquired by mission 1 and mission 2

<table>
<thead>
<tr>
<th>Educational program</th>
<th>participants</th>
<th>goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>Educational program III completion</td>
<td>To acquire knowledge and skills to clarify changes of certain symptoms effectively and to manage conditions in prior to sudden cardiopulmonary arrest</td>
</tr>
<tr>
<td>V</td>
<td>Educational program IV completion</td>
<td>To utilize leadership-membership theory (including non technical skills) and to develop team performance in case of sudden changes</td>
</tr>
</tbody>
</table>
Educational program development (4)
How to progress each educational program

1. Knowledge pre-test
2. Lecture • e-learning
3. Knowledge post-test
4. Practice pre-test
5. Simulation practice
6. Self training
7. Practice post-test

Knowledge is surely acquired before practice
Studying by my pace in e-learning

Simulation training is repeated in a situation near the practice scene
The learning outcome (growth) is confirmed by the test result

Nurses only who had passed the knowledge test and the skill test (with full marks) could advance to the next educational program.
Educational program development (5)
Instructor for educational programs

- Certified Nurse of Critical Care Nursing
- Certified Nurse Specialist of Critical Care Nursing
### Educational program development

#### Life-saving nurses certification examination

<table>
<thead>
<tr>
<th></th>
<th>Knowledge test</th>
<th>Performance test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidates requirement</td>
<td>Educational program IV completion</td>
<td>Pass the test of the knowledge of the qualifying examination.</td>
</tr>
<tr>
<td>Content</td>
<td>Contents of five educational programs</td>
<td>Three case scenarios; chest pain, dyspnea, headache</td>
</tr>
<tr>
<td>Method</td>
<td>Online examination and reviewing outcomes of previous five educational programs</td>
<td>Examination will be executed by using the case scenarios in six minutes.</td>
</tr>
</tbody>
</table>
Educational program development

Simulator used for performance test

- **SimMan 3G**
- **ALS Advanced**
- **SimMan**
Evaluators
Three evaluators were assigned in each simulator
1. Operating simulator with showing data
2. Evaluating leadership by checklists
3. Evaluating membership by checklists

Participants
Permanence tests conducted in groups of three participants
# Educational program development

## Evaluate of performance test

<table>
<thead>
<tr>
<th>Items</th>
<th>Lower order items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The examinee observes patient's state variation by using own senses.</td>
<td>10 items</td>
</tr>
<tr>
<td>2. The examinee notices patient's abnormality and request assistance.</td>
<td>3 items</td>
</tr>
<tr>
<td>3. The examinee takes patients’ vital signs.</td>
<td>6 items</td>
</tr>
<tr>
<td>4. The examinee prepare oxygen, monitors, and blood routes, when patients had sudden changes.</td>
<td>3 items</td>
</tr>
<tr>
<td>5. The examinee reports on patients’ sudden changes by using SBAR for physicians.</td>
<td>4 items</td>
</tr>
<tr>
<td>6. The examinee communicates to leaders and members when the patient’s conditions are changed suddenly.</td>
<td>5 items</td>
</tr>
<tr>
<td>7. The examinee support the patient’s being alive status (preparation of intubation, preparation of DC and CPR).</td>
<td>3 items</td>
</tr>
</tbody>
</table>
Methods

• Intervention group (trained group)
  • Nurses, who attended all five developed educational programs and passed all knowledge tests and performance tests.

• Control group (non-trained group)
  • Nurses, who have almost the same clinical experience years as of the intervention group, but were not attend all five developed educational programs.
Data analysis

- Performance test score
  - Mann-Whitney U test

- Is there any difference among the two groups (trained and non-trained)?
  - chi-square test
Ethical consideration

- A request letter for collaboration to this research and a consent form were sent in prior to start this project.
- Explained in a document and oral.
- Consent to research collaboration was got before the project start.
Results

• In the score of the skill test, a significant difference between the two groups (p<0.05) was observed. Median value of 31.0 for the trained group, comparing the median value of 29.0 for the non-trained group.
Comparison of the median in Trained group and Non-trained group

<table>
<thead>
<tr>
<th></th>
<th>Trained group</th>
<th>Non-trained group</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>maximum</td>
<td>34.0</td>
<td>34.0</td>
<td></td>
</tr>
<tr>
<td>third quartile</td>
<td>32.5</td>
<td>32.0</td>
<td></td>
</tr>
<tr>
<td>median</td>
<td>31.0</td>
<td>29.0</td>
<td>0.03</td>
</tr>
<tr>
<td>first quartile</td>
<td>29.0</td>
<td>27.0</td>
<td></td>
</tr>
<tr>
<td>minimum</td>
<td>21.0</td>
<td>16.0</td>
<td></td>
</tr>
</tbody>
</table>
Comparison of the median in trained group vs. non-trained group
Trained group and Non-trained group
Comparison of the percentage of done and non-done in each item

Trained group: done [blue] non-done [red]
Non-trained group: done [light blue] non-done [red]
Four items of the checklist observed a significant relationship (p<0.05)

1. #3 “observation of the movement of the thorax”
2. #10 “confirmation of the presence or absence of fever”
3. #16 “auscultation of breath sounds”
4. #32 “preparation for intubation”
Conclusion

- The five programs that have been developed can be considered effective in the professional education of nurses who are able to predict sudden changes in the patient’s condition, who can deal appropriately with these sudden changes, and who can play the role of both a leader and a team member in response to such situations.