Development of Neuroanesthesia Laboratory Model as a Practicum Learning Media for Students of STKA Poltekkes Ministry of Hospital Yogyakarta

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Abstract---This study aims to develop a neuroanesthesia laboratory model and an appropriate learning device. This research method is development research with 4D design at the Health Polytechnic of the Ministry of Health Yogyakarta. The define step is by analyzing the superior curriculum, study program, material analysis and formulation of objectives, the design step by making a prototype lab with all the completeness of the instrument including learning guide devices. The development step is testing the contents of both the lab and manuals through a Focus Group Discussion of anesthesiologists and expert validators and all their input. The results of this study have produced three learning products: first, a learning syntax model for neuroanesthesia practice that is relevant to the achievement of student competencies. Second, the prototype model of the neuroanesthesia laboratory setting both pre, intra and post anesthesia. Third, the learning product is a guide to neuroanesthesia techniques and procedures for undergraduate students of applied nursing anesthesiology study program. The results of this study have produced three learning products.

Keywords---anesthesiology nursing, anesthetist, neuroanesthesia lab, neuroanesthesia practice, practicum learning.

42

Introduction

The laboratory in nursing is a learning facility for all students in the nursing department that plays an important role in producing nursing experts in Indonesia, one of which is in the field of neuroanesthesia. The neuroanesthesia laboratory model as a practicum learning medium for undergraduate students of applied nursing anesthesiology at the Health Polytechnic of the Ministry of Health, Yogyakarta is one of the supports for the educational process to produce professional anesthesiology staff. The neuroanesthesia laboratory model is a facility for implementing anesthesiology nursing education curriculum in order to equip students to apply their knowledge in health facilities, especially in hospitals. Neuroanesthesia laboratory learning seeks to provide opportunities for students to apply the knowledge learned in class into real situations in order to gain real experience to achieve professional abilities (intellectual, technical, and interpersonal).

One form of effort to support the learning process of undergraduate students in Applied Anesthesiology Nursing (STKA) Poltekkes Kemenkes Yogyakarta (Polkesyo) in accordance with their specialization, namely neuroanesthesia, it is necessary to have an ideal neuroanesthesia laboratory so that it can improve learning processes and activities to be of higher quality. Currently, STKA Polkesyo students still have difficulty in carrying out the learning process, especially learning carried out in the laboratory because of limitations and laboratory conditions which can be said to be not ideal. Therefore, the institution makes an ideal neuroanesthesia laboratory so that it can facilitate the learning process and can improve the quality of students (Anglada, 2007; Budiarta et al., 2016).

In the Polkesyo laboratory, the neuroanesthesia specialty is planned to have several learning media. Like the anatomy of the body, which prioritizes the brain and nervous system. In addition, there is also some equipment for neuroanesthesia procedures as well as technical instructions on how to use these tools, Standard Operating Procedures (SOP) for actions, and demonstrations of actions in the form of videos of anesthesia actions. Meanwhile, one of the activities that the Polkesyo STKA Study Program can do in the neuroanesthesia laboratory is a pre-clinical exam. Preclinical exams are expected to determine student readiness before students will be deployed in various services at health facilities. To support the success of the preclinical test, students are able to carry out learning activities, especially practicals in laboratories that are already available at Polkesyo.

The neuroanesthesia laboratory model as a practicum learning medium for undergraduate students of applied nursing anesthesiology aims to produce professional and competent anesthetic staff in the field of neuroanesthesia. The creation of a professional anesthesiologist will be supported by the existence of an ideal neuroanaesthesia laboratory and must be in accordance with the competence of the anesthesiologist.

Therefore, the formulation of the problem in this study is "How is the Neuroanesthesia laboratory model as a learning medium for practicum students of the Applied Bachelor of Nursing in Anesthesiology? The objectives of this

research are: 1) To find a practical learning model that is relevant to the achievement of student competencies 2) To produce learning products in the form of a procedure manual and assessment of STKA student learning outcomes in the Neuroanesthesia lab (Mursid, 2013; Rosyad, 2020; Saz et al., 2015).

Method

This research is a type of research and development whose purpose is to create a product. The development research in question is to develop a neuroanesthesia laboratory in accordance with the needs of the anesthesia study program at Polkesyo with neuroanesthesia excellence. The laboratory can later be used as a student learning media to improve competence. In carrying out this research, we collaborate with expert practitioners or expert instrumentators and students to test the feasibility of the neuroanesthesia laboratory model as a practical learning medium. The experts in question are anesthesiologists specializing in neuroanesthesia, neurosurgery specialists and practicing anesthesiologists in the field of neuroanesthesia.

The model used in this study is a 4D model developed by Tiagarajan. The selection of this model is based on the consideration that this model is more based on the theoretical foundation of learning design. By doing the stages in the 4D model, namely Define, Design, Development, Dissemination.

Define (Analysis)

At this stage a needs analysis is needed, which consists of Semester Learning Design (RPS) analysis, analysis of neuronaesthetic practice material, and analysis of laboratory conditions and STKA students at Polkesyo. The purpose of this analysis stage is to obtain information on the needs needed to develop laboratories, especially in the field of neuroanesthesia.

Design

The design stage is carried out in the form of designing and compiling a model that is presented in graphic design media in the form of a neuroanesthesia laboratory layout based on existing theories and adapted to the basic competencies achieved so that it can be used as a practice medium for STKA students.

Development

The development stage begins with developing a graphic design media for a neuroanesthesia laboratory model based on the initial design. The developments carried out by the researchers include: a) Making layouts or models of the neuroanesthesia laboratory using the Adobe Illustrator application with two-dimensional images which will later describe the neuroanesthesia laboratory model; b) Carry out the design in the laboratory at Polkesyo to validate the model by a team of laboratory experts or laboratory instructors, neuroanesthesiologists and STKA study program lecturers; c) Improving the neuroanesthesia laboratory model in accordance with suggestions and input from a team of laboratory

experts or laboratory instructors, neuroanesthesiologists and STKA study program lecturers so that there are comparative results from the initial model and after it was revised.

The data collected in this development research is qualitative data. Qualitative data were obtained from the results of comments/suggestions from the FGD which were assessed by anesthesiologist practitioners in hospitals that have neuroanesthesia facilities and neuroanesthesia laboratory instructors (Darmadi, 2017; Ismail, 2020). Product validation by anesthesiology education experts (Aipkani), vocational education experts and education labs as well as anesthesiology specialists.

Results

Research description

This research is in the form of a practicum learning model product along with lab settings and learning tools to obtain the expected competencies, according to the study program's characteristics, namely Neuroanesthesia. The product development is designed to assist students in gaining neuroanesthesia competence in a practical (laboratory) context before they gain clinical experience in a hospital as prospective anesthesiologists.

This development research is divided into several stages which can be described in the following table:

Table 1
Steps of development activities

No	Development Procedure	Name of activity
1	Define stage	a. Study plan analysis
		b. Needs analysis (materials, lab,
2	Design Stage	a. Material preparation
		b. Laboratory settings (lay out)
3	Development Stage	a. Production of learning models
		b. Reconstruction/engineering Lab.
		c. Forum Group Discussion
4	Disseminate Stage	Provide trials of learning devices to students who are going to do neuroanesthesia practicum.

Results of the defining phase (Define)

At this stage the data is taken from various analysis of semester learning plans that characterize the study program starting from semesters 4, 5, and 8 related to neuroanesthesia learning in the form of theoretical lectures, practicum, assignments and neuroanesthesia clinical practice. From some of the existing lessons, competencies/skills that focus on neuroanesthesia have not been obtained, because they are still based on Permenkes 722 concerning general anesthesia caretaker competency standards for anesthesiologist graduates, as

well as anesthesia management standards issued by the anesthesiologist organization (IPAI). The distribution of the specifications of the Semester Learning Plan (RPS) analysis can be seen in the following table 2:

Table 2
Distribution of neuroanesthesia semester learning plans during study at the undergraduate applied anesthesiology nursing study program (STKA) Polkesyo

No	Course Title	Credit Value	Study Focus	Placement
1	Neurological and Sense Diseases	2	Theory	Sem 4
2	Anatomy, physiology and pathophysiology, respiration, heart and nervous system	3	Theory and practical lab	Sem 4
3	Ask for Special Surgery and Neurology	4	Theory and practical lab	Sem 5
4	PKK Neuroanesthesia	6	Clinical Practice	Sem 8
5	Ask Clinic	3	Scientific papers	Sem 8
	Amount	18 SKS		

Of the targeted number of credits of 145 credits, 18 credits of which are courses related to the specialty of neuroanesthesia. This course is what will be broken down into several competencies that need to be achieved by students in accordance with the specialization of the study program, through studying in the Neuroanesthesia laboratory.

In addition to the RPS, which is a reference for development, it also looks at the competencies required in the Minister of Health 722 of 2020 regarding the competency standards of anesthesiologists, by adding some specifics that need to be added to the log book of competency achievement during neuroanesthesia clinical practice. Considering that the achievement of neuroanesthesia clinical competence will soon be implemented in the 8th semester of the regular program in 2022, it is deemed necessary to add some competencies that may be obtained in a clinical setting (hospital). So far, the existing laboratory conditions have not allowed it to be carried out considering that learning tools are not yet available and learning models that might be developed as student learning media (Nursalam, 2009; Nurhidayah, 2011).

Results of the design phase (Design)

In the second stage, namely the design is to compile learning device materials by inviting resource persons, especially anesthesiologists, through several meetings and topics related to anesthesia and neuroanesthesia in particular, the

researcher looks at every material that can be done by students in the operating room during their studies and the competencies they have. expected to be achieved upon graduation. Then, develop product concepts in the form of learning flows, lab settings and learning tools.

Development stage results (Develop)

In this development stage, the activities carried out are developing learning device models that directly discuss and validate with experts through direct face-to-face either in the form of learning video calls as well as discussions and conversations via cell phone media. The learning model devices can be displayed in the following figure:
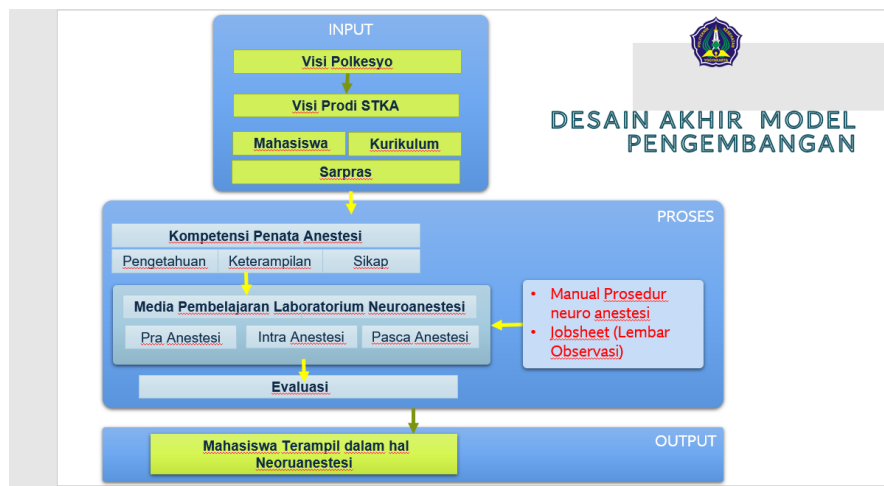

Figure 1. Final design of learning path development model in neuroanesthesia

The second product resulting from this development is in accordance with the material developed either through RPS, expert intake, FGD, expert validation and evaluation of the neuroanesthesia lab setting as follows:

Figure 2. Setting of the neuroanesthesia operating room as a student learning media at the anesthesiology laboratory at Polkesyo

Figure 3. Neuroanesthesia post anesthesia lab room settings (recovery) at Polkesyo

The resulting learning tools are in the form of practical training modules which are validated through FGDs of lab practitioners and also in-depth interviews with anesthesiology education experts, and anesthesiologists (Kodiyah et al., 2015; Nursalam, 2014). The focus group discussion was attended by anesthesiologists who have experience handling neurosurgery cases in various hospitals that have neuroanesthesia facilities for neurosurgery, including Cipto Mangunkusumo Hospital, Jakarta, Budi Asih Hospital Jakarta, RS. Margono Sukaryo Purwokerto, Dr Chasbullah Hospital Bekasi, Pekalongan Hospital, Suwandi Hospital

Surabaya, PKU Muhammadiyah Hospital Yogyakara, Chair of the DIY IPAI DPD and also Sem 5 and 7 students of STKA Polkesyo.

As for the results of the FGD some of the recommended competencies/skills are:

- Understanding of IV line, syringe pump, airway, GCS, mechanical ventilator, pain concept, ambulation
- Understanding of neural anatomy, neuroanesthesia position, special management of neuroanesthesia, monitoring of neuroanesthesia, understanding of neuroanesthesia patients with special conditions
- Instrumentation variations, and resource persons regarding neuroanesthesia
- Adding various anesthetic tools and instruments
- Selection of neuroanesthesia-specific instruments and pharmacology
- Documentation of medical records, data, supporting examinations and condition of pre neuroanesthesia patients
- Providing education and psychological support to patients
- Neuroanesthesia management in pediatrics
- The need for collaboration with doctors Sp.BS
- Debriefing students related to hemodynamic monitoring
- Providing in-depth neuroanaesthesia orientation
- Mastery of the basics of anesthesia is more concerned
- Haemodynamics, pharmacology and patient position are considered
- Monitoring the patient's condition after surgery
- ECG understanding and monitoring

From the results of the FGD, it can be concluded that some of the skills needed by students during their study at STKA are the mastery of Neuroanesthesia Competencies in the Practical Laboratory of Pre, Intra and Post Neuroanesthesia:

- BHD
- ECG
- IV line
- Syringe Pump
- Airway
- GCS
- Bispectral Index
- Anxiety Screening
- Mechanical Ventilator
- Haemodynamics
- Pain Management
- Ambulation
- Neuroanesthesia Instrumentation
- Pharmacology related to neuroanesthesia
- Central Monitoring

The products developed from the required skills are as follows:

Figure 4. Guidelines for neuroanesthesia examination techniques and clinical procedures

Results of the dissemination phase (Disseminate)

At the dissemination stage, this is in the form of information and product services for developing learning models, lab settings and product assessments of learning outcomes. Dissemination is carried out to students who will study practicum which will be carried out in the semester concerned. Of course, costs related to lab equipment can only be obtained by students through soft copies which will be given before practicum. However, the implementation of practice in this pandemic era will be regulated according to strict health protocols and allowable procedures (Tegeh et al., 2015; Munadliroh et al., 2015).

Conclusion

This Neuroanesthesia learning device was developed with a 4D approach, namely define, design, development and dissemination. From the four steps of the method, the following learning tools are produced:

- Obtaining a learning model in the form of flow and stages of learning until the achievement of student competence
- Produced a prototype of a neuronaesthesia lab setting at the per, intra, and post-anaesthesia stages in accordance with the competencies obtained in the laboratory.
- The results of learning tools in the form of technical guidelines and neuroanesthesia examination procedures.

Based on the review of the product that has been revised, the researchers provide suggestions for readers or other researchers who will conduct similar research as follows:

- The learning tools in this study can be used as an alternative to learning in the neuroanesthesia laboratory to reduce competency gaps in education and the field (hospital).
- The resulting learning tools still need to be tested on students more broadly in various semesters so that the learning tools are truly effective in improving student skills, because testing on students in this study has not yet reached that stage.
- This research is limited to producing only products, so to find out how effective this learning tool is and how it differs from other learning, it is necessary to continue with other research such as experiments or applied to classroom action research.

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