Validation of a learning portfolio to assess the competency in anesthesia residents: A pilot study

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Abstract

Objectives: To demonstrate validity, reliability and practicality of a learning portfolio in general competency assessment according to Thai Medical Council's learning objectives in first year anesthesia residents.

Methods: A learning portfolio was developed from Thai Medical Council general competencies, academic activities and performance assessment in several modalities including self- reflection and development plan. Twenty four first year anesthesia residents and 8 mentors were enrolled. One mentor took care 3 residents and rated their competencies in portfolios twice, 4-month apart. Content validity was assessed by 6 content experts. Concurrent validity of portfolio was determined by agreement with faculty global rating and in-training examination. Inter-rater reliability of portfolio was evaluated by 5 faculties rated 24 residents. Practicality was commented by all mentors and residents in questionnaire.

Results: All content experts accepted that this portfolio could assess general competencies of the first year anesthesia residents. Concurrent validity of portfolio was demonstrated by high overall agreement with faculty global rating and in-training examination (91.7 and 79.1%). Inter-rater reliability was good (Intraclass correlation = 0.8144). Majority of mentors and residents (>70%) agreed with the benefit of portfolio based on learning development and competency assessment. However, half of residents did not satisfy with the burden from portfolio.

Conclusions: A learning portfolio was valid and reliable in competency assessment, but not practical in residents' point of view.

Key words: portfolio, competency, development, anesthesia, resident

To date, increasing demand of anesthesiologists has doubled or tripled number of anesthesia residents in our country. Achievement of general competencies according to Thai Medical Council requirement are questionable via traditional structure –and –process based educational system. This system is based on "exposure to specific content for a prescribed period of time".[1] Under faculties' global rotation evaluation, residents may be judged satisfactory in spite of substandard performance. The reasons are due to "unstructured obsrvation",[2] "comparisons with other residents (norm – referenced assessment)",[3]. or well-co-operated team[4].

In United States, The Accreditation council for Graduate Medical Education (ACGME) has recommended a competency-based educational system instead of a structure-and-processed based system[5]. Steps of curriculum development include (1) competency identification (2) determination of care competency and performance levels (3) competency evaluation and (4) overall assessment of the process[1]. General competencies of our Medical Council are identified as medical knowledge, clinical skill, procedural skill, research skill, communication skill and professionalism.

To assess competency and performance in clinical practice, portfolios, have become increasingly popular in health professionals[6,7] and reliability education.[4,8] This pilot study developed a portfolio as a tool for learning improvement, formative and summative evaluation of first year anesthesia residents' competency. The objectives of this study were to determine validity, reliability and practicality of this portfolio as a tool for competency assessment.

Methods

This prospective descriptive pilot study was approved by Institutional Ethical Review Board. Twenty-four first year anesthesia residents and 8 faculties as mentors were enrolled in academic year 2008. Our learning process for first year anesthesia residents included lectures, academic conferences, basic anesthesia procedural skills, clinical anesthetic care for simple cases in perioperative period and skills in research methodology and presentation. Traditionally, there were only official summative evaluations at the end of academic years such as in-training examination (MCQ, Essay, MEQ, OSCE and oral examination), faculty global rating and research proposal evaluation.

The steps of this study included (1) portfolio development (2) content validity evaluation (3) training residents and mentors in using portfolios (4) concurrent validity evaluation (5) inter-rater reliability evolution and (6) practicality evaluation (Figure 1).

Portfolio development

The items of portfolio were derived from (i) general competencies from anesthesia residency training documented by Thai Medical Council i.e. clinical skills (patient care), medical knowledge, procedural skills (practice based learning and development), communication skill and professionalism. (ii) learning processes involvement included records of attending academic activities, lectures, conferences (iii) competencies assessment which were modified from portfolio of anesthesia training in United Kingdom[9] included A. Case Based Discussion (CBD): a report discussed about anesthetic management of the patients, B. Anesthetic-Clinical Evaluation Exercise (Anes-CEX): an evaluation of clinical skills in anesthesia care for simple patients which involved preoperative evaluation and preparation, intraoperative and postoperative care, communication skill and professionalism, C. Direct Observation of Procedural skills (DOP) : an evaluation of procedural skills of first year residents such as endotracheal intubation, undermask teachnique, spinal block, epidural block, etc. The evaluation also included patient consideration, inform consent obtained, situation awareness, help seeking and communication skill. D. Multisource Feedback: 360° team assessment (MSF) : an evaluation of operation, patient safety care, communication skill and professional, patient safety care, communication skill and professionalism from attending faculties and nurse anesthetists, E. Log book: a file which residents recorded cases that they provided anesthetic care or procedural skill. The minimum cases for passing criteria of Log book in first year resident were 100 cases of endotracheal intubation, 50 cases of spinal block, 10 cases of epidural block and 10 cases of undermark techniques, F. Literature search, presentation and critical appraisal skill assessment: evaluated by faculties and other residents in journal club presentation, G. Research development: As Research manuscript was compulsory for third year residents in applying for Board examination. Therefore, passing criteria for this category in first year resident was research proposal subscription at the end of the year. (iv) Self assessment and development plan: a reflective note which residents assess themselves and discussed the appropriate plan with their mentors.

All items except records of academic activities attending were rated in 4 levels: 1 = below expectation, 2 = borderline, 3 = meet expectation, 4 = above expectation. The determination of evaluation techniques related to competency and passing criteria were demonstrated in Table 1.

Content validity evaluation

The developed portfolio was assessed for content validity by 2 faculties with teaching experience more than 20 years, 2 faculties with teaching experience 10-15 years and 2 faculties with teaching experience 3-5 years. Content and scaling of all items were rated as following 0 = not applicable, 1 = partially applicable, 2 = absolutely applicable. All opinions were brought to improve portfolio.

Training residents and mentors in using portfolio

Definition, objectives and benefits of portfolio were clarified to all residents and mentors. Researchers also explained flow of study, data collection and criteria for passing. One mentor took care 3 residents. Most of paper works, documents and evaluated scores were collected by 2 research assistants.

Data collection had started since November 2008. Then, the first residents-mentors meeting were arranged in January 2009. Mentors thoroughly assessed portfolio, discussed with their residents about reflective note and supported residents to improve themselves. The second meeting were arranged in May 2009.

Concurrent validity evaluation

Portfolio scores were tested for agreement with global rating scores from 12 faculties (passing scores ≥ 3) and in – training examination (passing scores > mean – 1 SD).

Inter-rater reliability evaluation

Five faculties independently rated 24 residents' portfolio without knowing the owners.

Practicality evaluation

Questionnaires were used to survey satisfaction scores which also rated of 4 levels. Scores of 3 or more were considered passing .

Statistical analyses

Demographic data and practicality rating were analyzed by using descriptive statistics as mean $\pm$ SD, median $\pm$ IQR, minimum, maximum and percentage.

Content validity was analyzed by using descriptive statistics as mean $\pm$ SD, median $\pm$ IQR, minimum, maximum and percentage. If there was any item with average score less than 1, the content validity of that item would be questionable.

Concurrent validity was analyzed by using overall agreement between portfolio rating VS faculty global rating and portfolio rating and in-training examination[11].

$$\text{Overall agreement}(\%) = \frac{100 \times \text{number of cases with the same observed agreement by 2 tests}}{\text{Number of all residents}}$$

Inter-rater reliability of 5 observers rated same portfolio of 24 residents were analyzed by using intraclass correlation

Results

This project started from December 2008 to May 2009 which was the middle to the end of academic year 2008. There were 24 first year residents and 8 mentors enrolled in this study. Residents had mean age of 27.8± 0.9 years (range 26-29 years) and mean grade point average from medical school of 3.21± 0.27 (range 2.71-3.65).

Content validity

Mean and lowest scores of all items were more than 1 and there was no content expert opposed any item (Table 2). All experts absolutely agreed with the content designed to measure competency of patient care. They also rated high scores on the content of items to assess practice based learning, professionalism, interpersonal and communication skills. Interestingly, an item with least scores was medical knowledge content which 3 experts addressed that they were uncertain to use this item for this competency measure without including in-training examination scores. However, scoring system of all items were acceptable rated of more than 1.5.

Concurrent validity

There was only 1 resident failed by using portfolio evaluation, 4 residents failed by using in-training examination and 3 residents failed by using faculty global rating.

Table 3 showed 79.17% agreement between portfolio score and in-training examination which was lower than agreement between portfolio rating and global rating score (91.67%, Table 4)

Inter-rater reliability

Agreement between 5 faculties rated portfolio of same resident were quite good, intraclass correlation was 0.8144

Practicality

Most residents and mentors accepted that portfolio project did aid in learning improvement and measuring the expected competencies (70-87.5%). This project received good co-operation from majority of residents and mentors (83.3-91.7%). Even though residents could realize the closed attention from mentors, nearly half of them (41.7%) resisted this project due to sense of burden. However, majority of mentors (87.5%) preferred portfolio to assess competency and to reflect residents' self assessment and learning development plan.

Variations among residents' reflective notes were allocated into 3 groups. First, residents worried about their reading skill, how to pick up the important points and how to organize their memory for preparation for examination. Second, they concerned about their weakness in skill for epidural block and peripheral nerve block. Third, they were aware of their weakness in research methodology for research proposal preparation and presentation.

Mentors suggested residents how to improve reading skill, and technical skills for epidural block and nerve block. They also reduced residents' anxiety because those blocks were not compulsory in our first year residency training. They needed more practice in their second and third year of training. Lastly, the problems of research proposal were conveyed to their research advisors for further discussion with their advice. On the second meeting with mentors, most residents were satisfied with their development plan and results.

Discussion

In spite of many different types of portfolio, our learning portfolio was designed as a collection of evidences over time to demonstrate a resident's education and performance achievement. This portfolio was allocated into 5 items of competencies related to Thai Medical Council requirement. We used this portfolio as a formative and summative assessment. The main purposes were to ensure a certain minimum level of competencies and to help restore competence for quality of practice in level of first year anesthesia resident training. As we absolutely agreed with Wilkinson, et al. that a good assessment system should not reflect only competence destination but also a journey to improve performance or excellence.[10]

We had extensively reviewed several portfolios for residenct competency assessment related to ACGME[4,8,12,13] and portfolio component in United Kingdom[9,10], Then, we allocated our learning activities, research activities, log book, perioperative performance assessment, case based discussion and 360° multisource feedback into 5 expected competencies. Finally, criteria for passing was also determined for formative and summative assessment. Majority of mentors were satisfied with the easy scoring system from objective evidences and precise criteria for passing.

In content validation, all items were accepted for their meaning and scoring, only the item of medical knowledge yielded least scores from content experts. The evidences collected in this items comprised of learning activities and performance appraisal of searching literatures, gathering informations, presentation skills in English which was not mother language. In addition, scoring of cases based discussion which were the reports of anesthetic management in cases of various specialties in anesthesia were also included. Based on their opinion, the coverage of portfolio to measure this competency might not be as efficient as in-training examinations. In addition, the purpose of portfolio was not only for assessment but also for learning improvement. As a result, it was demonstrated that only 1 resident failed from portfolio assessment whereas 4 residents failed from in-training examination. Therefore, combination of in-training examination to portfolio should be used for summative assessment to cover all expected competencies.

According to concurrent validity, agreement of scores between portfolio vs in-training examination (79.17%) were less than agreement of scores between portfolio vs faculty global rating (91.67%). The reason might be related to ability of portfolio to measure performance similar to faculty global rating more than cognitive domain.

The good inter-rater reliability of our portfolio to measure competencies might be attributed to the objective assessment form all evidences collected by residents and departmental personals including precise criteria for passing.

In practicality aspect, both residents and mentors realized the benefit of portfolio in learning development and competency assessment. Our results demonstrated positive feedback from mentors because evaluation was a part of their regular jobs. Portfolio system did encourage residents to actively collect all evidences and data such as log books, reports and evaluation forms. These processes helped mentors in formative evaluation combined with residents' reflective note to improve their weak competencies. Moreover, the closed relationship between mentors and residents aided in early detection of residents' stress and depression which led to proper management. Based on residents' aspect, only 58% of residents satisfied with this method. They resisted this project for the sense of burden. They were not acquainted with their active participation in data collection. They often compared themselves with the second and third year residents who were assessed by traditional

in-training examination and faculty global rating once or twice a year. These results were similar to O' Sullivan's study[8].

The objectives of this pilot project were to improve quality of learning and practice in residents with different capability to achieve the minimum expected competencies. In our department, there was a problem of faculties and residents relationship due to numerous faculties and trainees including residents, fellows, medical students and anesthesia nurse students. Portfolio was a tool for resident to strengthen their closed relationship with faculties. They could reflect their learning problems or complaints to their mentors who would help them solve those problems and improve themselves.

The study was only a pilot project. The weakness might be related to a small sample size for generalization our results to other population. The routine resident evaluation and records of attending learning activities alleviated the burden of this project. In addition, the voluntary enrollment of residents and mentors might shift their opinion to more positive side and less resistance than real situation.

In our experience, we used portfolio as a formative assessment and brought the residents' reflective note and their development plan for learning improvement. In summative assessment, we used combination of portfolio, in-training examination and faculty global rating. For further application, future research is recommended for designing a portfolio to measure appropriate level of second and third year resident competencies including a novel technique for evaluation to reduce a sense of burden.

Conclusions

From our findings, learning portfolio was a valid and reliable for competency assessment in our first year residents. Based on practicality, mentors appreciated this tool more than residents. The reason was attributed to residents' sense of burden.

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