# *ACHIEVEMENT OF COMPETENCY DURING PEDIATRIC ROTATION OF ANESTHESIOLOGY RESIDENTS ACCORDING TO THE EDUCATIONAL STANDARD OF ANESTHESIOLOGY IN FACULTY OF MEDICINE AIRLANGGA UNIVERSITY*

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***ABSTRACT***

***Background:*** *The advancement and development of science and technology in the field anesthesiology and intensive therapy, has become the basis for the need of quality national guideline that is ethically and professionally accountable. This operational guideline can serve as a national guideline in providing anesthesia and intensive therapy services to patients. Until today, there is still no standardize educational evaluation for the pediatric division of anesthesiology to assess whether it is following the expected standards.* ***Aim:*** *To analyze the competency of anesthesiology residents in the pediatric division based on logbook according to the type of cases and procedures, and the number of patients based on the standard curriculum of the pediatric division of anesthesiology Surabaya.* ***Methods:*** *This study was an observational study with retrospective design, evaluating the competency of anesthesiology residents of Airlangga University in pediatric rotation according to the type of cases and procedures, and the number of patients treated and recorded in residents' logbook based on the standard curriculum of the pediatric division of anesthesiology Surabaya. Data collection was performed by taking secondary data from April 2018-April 2020.* ***Result:*** *Median total of eletive cases during rotation and emergency cases during shift treated by anesthesiology resident of pediatric division was 9 (5-13) neonates, 35 (26-44) infants, and 56 (48-62) children. Target of neonates cases was achieved by 35%, infants by 100%, and children by 95% residents. Target of caudal anesthesia was achieved by 100%, inhalation induction by 55%, and IV line insertion by 100%. No resident achieved target for CVC insertion.* ***Conclusion:*** *A more formal and comprehensive guideline to standardize log case recording can be beneficial as it can evaluate residents based on the data collected electronically.*

***Keyword:*** *Competency, Resident, Anesthesiology, Pediatric*

**ABSTRAK**

**Latar Belakang:** Kemajuan dan perkembangan ilmu pengetahuan dan teknologi di bidang anestesiologi dan terapi intensif menjadi dasar diperlukannya pedoman nasional yang

berkualitas dan dapat dipertanggungjawabkan secara etis dan profesional. Acuan kerja ini dapat menjadi pedoman nasional dalam memberikan pelayanan anestesiologi dan terapi intensif kepada pasien. Hingga saat ini belum ada evaluasi standar Pendidikan anestesi divisi pediatri apakah sudah sesuai dengan standar yang diharapkan. **Tujuan:** Menganalisa kompetensi PPDS Anestesi divisi pediatri berdasarkan logbook sesuai dengan jenis kasus, jenis tindakan dan jumlah kasus menurut standar kurikulum anestesi divisi pediatri Surabaya. **Metode:** Penelitian ini merupakan penelitian observasional dengan desain retrospektif, dengan menilai kompetensi PPDS Anestesi Universitas Airlangga rotasi stase anestesi pediatri sesuai dengan jumlah kasus, jenis kasus dan jenis tindakan yang ditangani dan tercatat dalam logbook PPDS menurut standar kurikulum anestesi divisi pediatri Surabaya. Pengumpulan data dilakukan dengan mengambil data sekunder pada periode April 2018 - April 2020. **Hasil:** Median jumlah kasus elektif saat stase dan emergency saat jaga yang dikerjakan PPDS anestesi divisi pediatri adalah 9 (5-13) kasus neonatus, 35 (26-44) kasus bayi, dan 56 (48-62) kasus anak. Target pasien neonatus tercapai oleh 35%, bayi oleh 100%, dan anak oleh 95% PPDS. Target anestesi kaudal tercapai oleh 100%, induksi inhalasi oleh 55%, dan pemasangan IV line oleh 100%. Tidak ada PPDS yang mencapai target pemasangan CVC. **Kesimpulan:** Panduan yang lebih formal dan komprehensif untuk menstandardisasi pencatatan log kasus dapat berguna karena dapat mengevaluasi residen berdasarkan data yang dikumpulkan secara elektronik.

***Kata Kunci:*** *Kompetensi, PPDS, Anestesi, Pediatri*

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## INTRODUCTION

The development of science and technology today requires health service providers to provide quality services. Therefore, to improve the public health status, improving the quality of services is one essential aspect.[1]

Competency-based medical education is an output-based approach that involves identifying the abilities doctors need and then designing a curriculum to support these predefined competencies. Competency-based medical education requires a robust and multidimensional assessment system. Various data are needed to assess resident competence. The assessments required may include a combination of performance in the classroom, clinical, and simulation

environment based on predetermined criteria.[2]

The anesthesiology resident upon graduation is required to have Competency Standards as an Anesthesiology Specialist and Intensive Therapy, which is following the College of Anesthesiology and Intensive Therapy in the 2008 Curriculum Catalog. An anesthesiology resident is required to meet competency achievements, namely the achievement of the minimum number of cases handled during the education of an Anesthesiology Specialist and Intensive Therapy.[3] This competency achievement target is recorded and documented independently by a resident in a logbook. The same is done by anesthesiology resident programs worldwide, such as in Canada, the United Kingdom, and the United States, which require to enter case logs in a central database electronically.[4] Measurement of the number of cases is used to represent the clinical experience of residents, and one of the reasons for monitoring cases performed by residents or trainees is that an increase in the number of cases handled is associated with an increase in the learning curve of some procedures.[5]

The importance of this research is to find out whether the standard of pediatric anesthesia in Surabaya is following the curriculum standards, which are recorded in the resident's logbook and adjusted to the patient's medical record because until now, there has been no standard evaluation of the pediatric anesthesia education division whether it is following the standard expected.

## SUBJECT AND METHOD

a sampling technique in the form of total sampling, by assessing the competence of the Airlangga University Anesthesia resident of the rotation of pediatric anesthesia according to the number of cases, types of cases, and types of action handled and recorded in the resident logbook according to the anesthesia curriculum standard of the Surabaya pediatric division. Sample data has been grouped according to the rotation of the April 2018-April 2020 period. The data collected were analyzed using descriptive statistics of IBM SPSS Statistics software, version 21..

## RESULT

The sample size in this study was 40 people. The sample consisted of 6 people in the pediatric division of anesthesiology residents in the 4th semester (15%), 31 people in the 5th semester (77.5%), two people in the 6th semester (5%), and one semester 7 (2.5%). Figure 1 shows the distribution of the number of elective cases, emergencies, and total elective + emergency handled by each resident of the pediatric division of anesthesia.

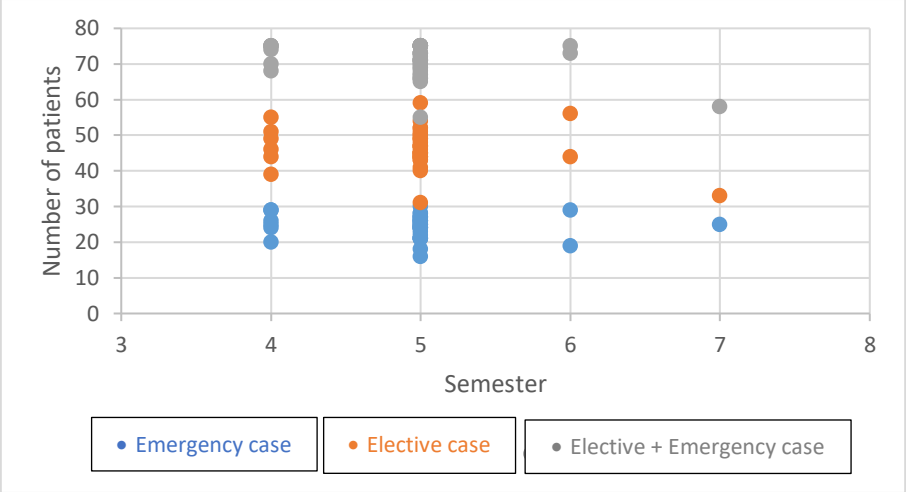


**Figure 1.** The number of pediatric patients who were treated by the pediatric division of anesthesia residents

**Table 1.** Number of elective + emergency pediatric cases handled by anesthesiology residents in the pediatric division by semester

| | Semester | | | | p-value |
|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | |
| Neonatates | 10 (8-11) | 9 (5-13) | 10 (8-12) | 6 (6) | 0,022* |
| Infants | 36 (35-41) | 35 (26-44) | 35 (34-36) | 26 (26) | 0,082* |
| Pediatrics | 54 (51-57) | 56 (48-62) | 57 (57) | 54 (54) | 0,200* |
| Elective and emergency total cases | 74 (68-75) | 71 (55-75) | 74 (73-75) | 58 (58) | 0,172* |

* Kruskall-Wallis test, significant if p <0.05. Data on the number of pediatric patients in the form of a median (range)

There was no significant difference in the number of infants, children, and total elective + emergency cases handled between residents with different semesters (p> 0.05). There was a significant difference in the number of elective + emergency neonatal cases handled by residents with different semesters (p <0.05). The highest median total number of elective and pediatric emergency cases was in semester six residents, namely 74 (73-75) cases, while the lowest was in semester 7, namely 58 cases (Table 1). All residents met the target number of infant patients. A total of 38 residents reached the target number of pediatric patients, and 14 people reached the target number of neonatal patients. There are still seven residents who only achieved 50-74% of the target. 40 (100%) residents met the target of caudal anesthesia, inhalation induction by 22 (55%) residents, and IV (intravenous) line insertion by 40 (100%) residents. None of the residents achieved the target of CVC (central venous catheter) insertion in pediatric cases. (Table 2).

**Table 2.** Achievement of the number of cases and actions (elective + emergency) performed by anesthesiology residents in the pediatric division based on the standard target of the Surabaya anesthesiology curriculum

| Cases/ procedures | Surabaya anesthesiology curriculum minimum required of cases | Median (Range) | Achievement* | | | |
|---|---|---|---|---|---|---|
| | | | <50% | 50-74% | 75-99% | ≥100% |
| Neonates | 10 | 9 (5-13) | 0 (0%) | 7 (17,5%) | 19 (47,5%) | 14 (35%) |
| Infants | 15 | 35 (26-44) | 0 (0%) | 0 (0%) | 0 (0%) | 40 (100%) |
| Pediatrics | 50 | 56 (48-62) | 0 (0%) | 0 (0%) | 2 (5%) | 38 (95%) |
| Caudal anesthesia | 10 | 12 (7-16) | 0 (0%) | 1 (2,5%) | 0 (0%) | 39 (97,5%) |
| Inhalation induction | 25 | 20 (12-25) | 3 (7,5%) | 15 (37,5%) | 19 (47,5%) | 3 (7,5%) |
| IV line insertion | 25 | 24 (14-37) | 0 (0%) | 2 (5%) | 18 (45%) | 20 (50%) |
| CVC insertion | 5 | 0 (0-1) | 40 (100%) | 0 (0%) | 0 (0%) | 0 (0%) |

*Number of residents, n(%) based on the percentage of cases achieved with the target

The target can be achieved if the accumulated number of cases or elective + emergency measures has reached the Surabaya anesthesia curriculum standard's minimum target. All residents in semesters 4, 6, and 7 have achieved the target number of cases of infants and children, the number of caudal anesthesia procedures, and IV line installation. All five-semester residents have reached the target number of infant patients, caudal anesthesia, and IV line insertion. There are no residents in semesters 4, 5, 6, and 7 who achieved the CVC insertion target (Table 3).

**Table 3.** The number of residents in each semester who reach the standard target of the anesthesia curriculum in Surabaya

| Cases/procedures | Surabaya anesthesiology curriculum minimum required of cases | Semester* | | | |
|---|---|---|---|---|---|
| | | 4 | 5 | 6 | 7 |
| Neonates | 10 | 3 (50%) | 10 (32%) | 1 (50%) | 0 (0%) |
| Infants | 15 | 6 (100%) | 31 (100%) | 2 (100%) | 1 (100%) |
| Pediatrics | 50 | 6 (100%) | 29 (94%) | 2 (100%) | 1 (100%) |
| Caudal anesthesia | 10 | 6 (100%) | 31 (100%) | 2 (100%) | 1 (100%) |
| Inhalation induction | 25 | 5 (83%) | 17 (55%) | 0 (0%) | 0 (0%) |
| IV line insertion | 25 | 6 (100%) | 31 (100%) | 2 (100%) | 1 (100%) |
| CVC insertion | 5 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |

*Number of residents who reached the target, n (%

## DISCUSSION

Competency targets for individual anesthesia procedures that must be meet during the pediatric anesthesia stage in Indonesia are ten neonatal cases, 15 infant cases, 50 child cases, ten caudal anesthesia cases, IV-line insertion cases in infants and pediatric is 25 patients, and insertion of peripheral CVC in pediatric patients in 5 patients. Meanwhile, based on ACGME, the minimum number of cases and procedures required for pediatric patients is five pediatric patients aged less than three months, 20 pediatric patients less than three years old, and pediatric patients less than 12 years old as many as 100 patients.[6] Concerning clinical training, case procedure records can be used instead of clinical competence. Defined national requirements for the minimum number of cases in various subspecialties currently exist in the United States. Other countries such as Brazil have a minimum number of cases overall but do not divide them further into subspecialty case types. Although Brazil does not have a specific minimum number for certain subspecialty case types, there is a minimum percentage of annual workload for the following domains: pre and postoperative care (minimum 10% of annual workload), ICU and emergency departments (minimum 15%), elective anesthesia (minimum 45% of annual workload) and obstetrics(minimum 10%).[7] The number of cases and procedures applied in the Department of Anesthesia, Faculty of Medicine, Airlangga University, follows the standard anesthesia college curriculum that has been adjust to international standards. However, it is difficult to determine whether the number and type of cases can represent the resident's psychomotor abilities during their education due to the need for a reliable, feasible, valid, effective, and comprehensive assessment and involves several domains to assess the abilities that have been achieved by each resident, so it is difficult if only judging traditionally.[8]

During three months of pediatric rotation, all residents (100%) had achieved the minimum target number in infant cases, 95% in pediatric cases, 100% in caudal anesthesia, and 100% in IV line insertion. Most of the residents had not achieved the target number of neonatal cases and inhalation induction procedures, and none had achieved the target of CVC insertion. The lack of targeted cases and procedures may be due to the number of cases obtained per resident depending on the number and proportion of pediatric surgery patients (pediatric surgery, eye surgery, orthopedics, urology, etc.) who are performed electively in the operating room. Besides, the number of cases and procedures handled also depends on the distribution of patients by the chief resident

in the operating room who regulates the number of personnel, and not all pediatric surgery patients can be handled by anesthesia residents during pediatric rotation. The problem in this study is also illustrated in Yamamoto et al. (2016) research. There were seven residents in 2013 and 2 residents in 2014 who did <50% of the class average for pediatric cases less than three months old, whereas there were two residents in 2013 and 1 resident in 2014 who did more than 200% of the class average.[5]

Although there are still residents who have not reached the minimum target, both the number of cases (neonates and children) and the number of procedures (inhalation induction and CVC insertion), the assessment in this study only focuses on when the residents underwent the pediatric stage for three months. According to the researchers, this assessment period is relatively short to be able to assess the overall competence of the resident because after going through the pediatric rotation, the resident can still handle pediatric cases in other rotations such as TKV (thoracic and cardiovascular) surgery, the neuro anesthesia division, the urology division, and others, so that this pediatric rotation can be considered as a stepping stone in managing subsequent pediatric cases with a higher degree of difficulty. Increasing the number of rotations may be useful in increasing the number of cases and measures as mentioned by Yamamoto et al. (2016) in his research, which states that the increase in the number of cardiology cases handled by residents has increased significantly with an increase in the number of cardiology rotations undertaken.[5]

A number alone cannot be predicted to be projected into a person's competence or proficiency. A resident may fail most of their procedures but still report several acceptable cases to Accreditation Council for Graduate Medical Education (ACGME).[9] For example, a study by Filho (2002) that attempted to determine learning curves for various procedural skills showed that after 36 spinal anesthesia, only 7 out of 11 residents had an acceptable block failure rate. This study also revealed that although most residents could receive intubations after performing 43 intubations, some residents needed more than 100 intubations to achieve basic competence (not even ability). Thus, the variability in skill use between different procedures and between individuals may be considerable.[10]

In competency-based education programs, reporting a better number of cases is not enough. Routine data collection should not only include quantity data. However, it should also include quality and performance to give the program and students feedback on whether participants acquire a new skill level. With a minimum

level of procedural quantity achieved, the search for quality in current training can involve (1) close monitoring of case numbers and variations between learners, (2) clear conceptualization of the educational framework around teaching procedural skills, (3) understanding objectives and assessment strategies for regional anesthesia education, and (4) utilizing specific assessment tools with longitudinal monitoring of skills attainment.[9]

There are still limitations to this study, such as the lack of objective data on cases conducted with cases reported by residents. This can cause variability in the total cases and procedures performed. This research only examines one study center, so it does not necessarily reflect other centers. This study's assessment only focused on when the resident was in the pediatric rotation for three months. This study does not describe competence comprehensively but only based on the number, types of cases, and types of action. Meanwhile, the competence of a specialist can come from attitude, affective, and psychomotor.

## CONCLUSION

Based on the accumulated number of cases/elective + emergency measures, the target number of infant cases, the number of caudal anesthesia procedures, and IV line insertion were fulfilled by all anesthesiology residents in the pediatric division. Most pediatric anesthesiology residents have met the target number of cases / minimum procedures for pediatric patients. The target number of cases / minimum treatment for neonatal patients and inhalation induction is still not fulfilled by some pediatric anesthesiology division residents. None of the residents achieved the target in pediatric cases. More research is needed to understand better which residents did not record anesthetic cases and procedures. Logbook recording in a better, more formal, and comprehensive manner will help evaluate residents based on the collected case data.

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