*RESEARCH*

# Anesthesia Services for Children's Radiotherapy During Pandemic COVID-19 in 2020: Experience from East Indonesia

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***ABSTRACT***

**Background**: The global COVID-19 pandemic has significantly strained the healthcare sector, with overwhelmed health services in affected countries worldwide. Despite the need to sustain vital oncology treatments, particularly for children, radiotherapy practitioners are unsure how to treat during the pandemic. At the same time, several anesthesia procedures may increasingly expose anesthesia providers to COVID-19. The challenging services for handling oncology cases in children at Dr. Soetomo Hospital during the COVID-19 pandemic can be carried out properly with various adjustments.
**Objective:** The purpose of this study was to describe how the radiotherapy center in East Indonesia responds to the challenge in this pandemic era.
**Method**: During 2020, we gathered information by using administrative datasets on the number of patients, the types of anesthesia services provided, and undesired events in the radiotherapy room. We use descriptive statistics to describe what is going on in our data.
**Result:** The total number of patients who underwent radiotherapy was 12, with 188 sessions, and uncooperative children received midazolam and propofol during the procedure. The result showed that there was no untoward incident in 2020.
**Conclusion:** Therefore, it indicates that we provided relatively safe sedation services for children's radiotherapy.

**Keywords**: COVID-19 pandemic; pediatric; propofol; radiation therapy; sedation

## INTRODUCTION

SARS-CoV-2 is causing a pandemic that is increasingly disrupting healthcare delivery for all patients globally, including children with a lifelong impact on their health. The age distribution of 44,672 symptomatic confirmed cases described in the journal *Zhonghua Liu Xing Bing Xue Za Zhi*, 416 patients aged 0-9 years and 549 patients aged 10-19 years in China.[1] The fact that there were no children involved in the initial instances in Wuhan, China, suggested that the disease did not manifest in youngsters.[2] Now that there are more than 90,870 confirmed cases worldwide and 3112 fatalities (as of March 3, 2020).[3] Though the data served by Morand et al. (2020) suggest that children seem to have been spared the direct mortality impact of COVID-19,[4] the indirect effects of overburdened health systems and disruptions to life-saving health services can lead to disastrous increases in child mortality. The pandemic has the potential to reverse decades of progress in ending needless child mortality around the world.

Approximately 400,000 children and adolescents aged 0-19 are diagnosed with cancer each year.[5] Generic drugs and other treatments with curative intent, such as surgery and radiotherapy, can cure most childhood cancers. As a result, a careful balance would be required between avoiding severe chemotherapy during the present pandemic and continuing recommended curative treatment despite the possibility of a rise in COVID-19 related consequences in the immunocompromised host with insufficient supportive care. Most kids between the ages of 5 and 6 can be sedated successfully, but younger kids frequently need general anesthesia.[6] There are various problems in providing safe and effective anesthesia for pediatric oncology patients undergoing radiotherapy. Though the process is usually quick, the patient must stay still and prone during the procedure. A range of anesthetic medicines and procedures have been employed in the past, including intramuscular and intravenous methohexital; inhalation anesthesia; oral, intravenous, and intramuscular ketamine; intravenous thiopental; intravenous meperidine; intravenous midazolam; and oral chloral hydrate to facilitate pediatric radiotherapy.[7] When employing intravenous thiopental, even general anesthesia administered twice daily for 4-5 weeks of hyperfractionated radiation has been demonstrated to be practical and safe.[8] The use of those anesthesia needs to be adjusted since several anesthesia procedures such as inhalation and intubation may expose anesthesia providers to COVID-19.

As a tertiary referral hospital in East Java, Dr. Soetomo Hospital has increased the capacity of its isolation room from 14 beds to 225 beds for handling COVID-19 cases.[9] With the outgrowing cases in Indonesia, most radiotherapy centers couldn't dedicate one machine for COVID-19 patients. Furthermore, the majority of treatment centers reported a decrease in the number of external beam radiation therapy (EBRT) and brachytherapy patients.[10]

In this article, we will discuss how the radiotherapy center in East Indonesia responds to the challenge. This article is expected to serve as a resource for many other radiotherapy centers that can adopt these practical strategies to deal with the anticipated surge of patients during and after the COVID-19 pandemic.

## METHOD

This study was a retrospective descriptive review by collecting data of pediatric radiotherapy patients in Dr. Soetomo Hospital during 2020, including the number of patients, repeated procedures, sedation used, age distribution, diagnosis, treatment, and the number of undesired incidents in the radiotherapy room. What is meant by repeated procedure is the administration of radiation by fractionation (giving the dose divided into several fractions) depending on the type of cancer. If the cells are sensitive, radiation is sufficient with 20 fractions, the responsive cells can be 25-30 fractions, while the resistant cells can be 35 fractions or more.

The number of undesired incidents or anesthesia-related complications was grouped into five categories: hemodynamic complications "when the systolic blood pressure less than 90 mmHg, bradycardia (less than 60 times per minute, low oxygen saturation, cyanotic skin colour abnormal electrocardiogram, and abnormal urine production", airway obstruction, apnea, minor airway complications, and oxygen desaturation (Oxygen saturation level <95%). Before patients underwent radiotherapy, they were asked to perform PCR or antigen swab test as a screening to detect any infection of SARS-CoV-2 (Table 1).

## RESULT AND DISCUSSION

Twelve patients underwent 188 procedures (Figure 1) in Dr. Soetomo Hospital in 2020, with 56 performed without sedation while the rests were propofol based. This study shows a minimum age of four years and a maximum age of 15 years, with a median age of nine years. Each patient has a different diagnosis and was treated with 172 radiotherapy sessions and 16 stimulations. We recorded no anesthesia-related complications in this study.

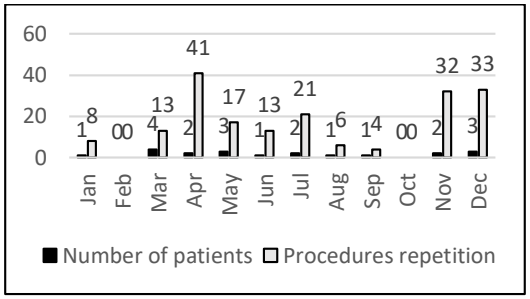


**Figure 1**. Number of patients and radiotherapy procedures repetition in Dr. Soetomo Hospital during 2020.

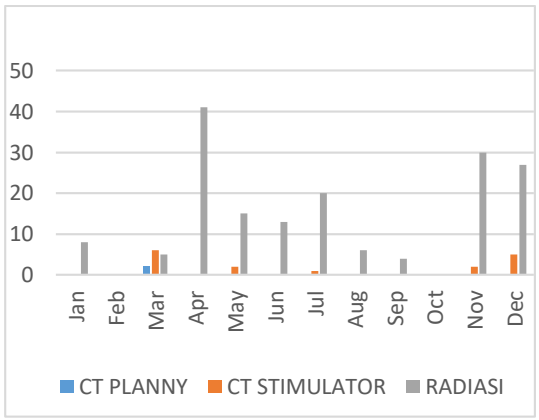


**Figure 2**. Number of radiotherapy procedures during 2020.

In Indonesia, 1,528 confirmed COVID-19 cases and 136 deaths linked to the disease as of March 31, 2020. The country's case fatality rate (CFR) is 4.9% higher than in the People's Republic of China.[11] With the increasing number of patients, Indonesia's president finally decided to implement large-scale social restrictions in cities and provinces at the end of March 2020. In addition to delaying the peak, the measure can reduce the number of cases at the epidemic peak by 25%.[12] It's critical to prevent an epidemic peak that would overwhelm the healthcare system.[13] This restriction impacted the number of radiotherapy treatments during the COVID-19 pandemic, as there were

adjustments done by most centers in Indonesia.[11] The reduction of cases treated in most centers was also due to the inability of the patients to come for treatment as the government emphasizes the need to stay at home for all Indonesian citizens.[11,14]

During the pandemic of COVID-19, Indonesian radiotherapy centers need to undergo operational changes in four essential areas: staffing, facilities, operations, and patient treatment. This is due to the necessity to handle the surge of inevitable lining-up cancer patients. Our strategies to deal with the challenge were improving staff competency, ensuring the equipment maintenance program, and adding procedures requiring the patients to have a COVID-19 screening test before the radiotherapy treatments.

While 29.7% of treatments were done without sedation, the rest were done under midazolam and propofol. Since its introduction into clinical practice, intravenous midazolam has been the cornerstone of pediatric sedation. The anxiolytic and amnestic profile of this medicine is so good that many patients can finish their whole treatment with it alone. In the absence of other sedatives, intravenous midazolam has a long track record of safety. Because x-ray therapy (XRT) is a painless procedure, narcotics are not required to enhance the benzodiazepine.[15] Although in other services, sedation services may be carried out by non-anesthesiologist, we perform all sedation services by anesthesiologist or anesthesiology registrar under the supervision of an anesthesiologist. Adverse events (hemodynamic complications, airway obstruction, apnea, minor airway complications, and oxygen desaturation) did not occur throughout 2020. This has made an excellent contribution to the hospital because it involves costs and the center for medical education as clinical education for prospective anesthesiologists and general practitioners.

Propofol is frequently the favored drug of choice for most anesthesiologists in the XRT suite when benzodiazepine therapy is insufficient due to continued patient agitation, especially when working with children. An initial propofol bolus in the range of 0.5–0.8mg/kg has been proven to give appropriate sedation for placement and manipulation on the XRT couch while still allowing for spontaneous respiration and airway control after benzodiazepine pretreatment as previously described.[16] Throughout the therapy phase, a continuous propofol infusion in the range of 7.4 mg/kg/hr[11] to 10 mg/kg/hr [12] is administered. Within four minutes of stopping the injection, spontaneous eye-opening was noted.[17] In combination with midazolam, Propofol gives excellent therapeutic conditions throughout the treatment.[18]
Based on research by Seiler et al.[19], the use of propofol is relatively safe in radiotherapy services for children. In our study, repeated propofol administration in the same patient also did not cause complications. Events such as the study conducted by Kang et al.[20] did not occur in our study.

During the 2020 COVID-19 pandemic, we provided relatively safe sedation services for children's radiotherapy and the staff who provided the services. When the number of COVID-19 patients increased, our services were reduced to suppress the spread of COVID-19. In a previous study that aimed to determine the incidence of complications related to anaesthesia in children undergoing

radiation therapy, it was found that the incidence of complications related to anesthesia was low (1.3%). In the study between July 2004 and June 2006, propofol was used in 3833 procedures (3611 radiation sessions and 222 simulations) in 177 patients. Complications occurred during 49 anesthesia (1.3%).

## CONCLUSION

During the pandemic of a deadly disease such as COVID-19, it is necessary to prioritize the implementation of services. We are reducing the number of services in this radiotherapy area to prioritize COVID-19 emergency services first. With orderly service screening, awareness of officers and patients to implement Health protocols is the key to safe services during this pandemic.

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**Table 1**. Screening for SARS-CoV-2 infection.

| MAYOR | SCORE | NOTES |
|---|---|---|
| 1. S/O: History of contact with confirmed COVID-19 patients (without standard PPE) PLUS > 1 objective minor finding<br>2. O: Chest X-ray: Bilateral occlusion Basal<br>3. O: Bilateral GGO CT Scan | If the major criteria 1-3 are met 1 or more, score = 20 | Rapid screening is carried out by utilizing information (a quick history and physical examination) and other available objective data to quickly determine the COVID-19 Risk Level. In further investments the COVID-19 Risk Level may change according to additional information obtained. This rapid screening is primarily for the safety of staff and the hospital environment. S: Subyektif 0: Obyektif |
| MINOR | SCORE | |
| 1. S: Work / attend mass gatherings / places of worship / parties / or places of service<br>2. S: Living or traveling in an area/community that has been infected (domestic and overseas)<br>3. S: Family (1 house) works or travels to places with risky cases<br>4. S: The surrounding environment has confirmed cases (place of residence or work) | If these 1-4 minor criteria are met 1 or more, score = 4 | |
| 5. S/O: Have a history of fever in the last 14 days (> 37.5 C)<br>6. S/O: Anosmia (decreased sense of smell)<br>7. S/O: Gastrointestinal symptoms (Diarrhoea/nausea/abdominal pain)<br>8. S/O: Respiratory Symptoms (Cough/Rough/Tightness) | If the minor criteria numbers 1-4 are met 1 or more, the score = 4 | |
| 9. O: Co-morbid factors DM/HT/CKD/Malignancy/Autoimmune/Cardiovascular disorders/Obesity/Pregnancy) | 1 | |
| 10. O: Leukopenia (<5000/cmm) | 1 | |
| 11. O: NLR (Neutrophil Lymphocyte Ratio) >3.5 | 1 | |
| 12. O: Platelets decreased (<180k) | 1 | |
| 13. O: CRP (>5x Normal) | 1 | |
| 14. O: Chest X-ray: Bilateral occlusion (peripheral basal) | 1 | |
| 15. O: Chest X-ray: Bilateral Diffuse occlusion | 1 | |
| 16. O: Chest X-ray: Unilateral occlusion | 1 | |
| 17. O: Chest X-ray: Central Bilateral cloak | 1 | |
| 18. S: History of contact with confirmed COVID-19 patients (without standard PPE) No other findings Score 1-4 = Low risk, Score 5-19 = Medium risk, Score >20 = High risk | 10 | |