

Study of Space Requirements for the Specialist Orthopedic Hospital in South Surabaya

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ABSTRACT

South Surabaya is an area with a high level of mobility, which is directly proportional to the increasing risk of traffic accidents and bone fractures. The limitations of local facilities cause patients to be referred to the city center, triggering delays in treatment and reducing the effectiveness of recovery. This study aims to examine the functions and space requirements of the Bone Specialist Hospital in South Surabaya as a basis for planning facilities that meet standards. A descriptive qualitative method is used through literature studies, analysis of Ministry of Health regulations, and hospital benchmarking. The study results indicate that this facility requires a strictly structured spatial zoning. These zones must specifically separate emergency services, outpatient care, inpatient care, medical rehabilitation, as well as medical and non-medical support areas. Proper zoning planning and circulation flow are expected to provide optimal, effective, and integrated trauma services and enhance patient safety in the South Surabaya area.

Keywords: *Specialist Hospital, Bone Fracture, Medical Rehabilitation, Space Needs, South Surabaya.*

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INTRODUCTION

Surabaya, as a metropolitan city, has experienced very rapid spatial development, especially in the southern Surabaya area, which is marked by the growth of residential areas and dense transportation activities. The high mobility of the community is directly proportional to the increasing risk of traffic accidents on the roads. The most common trauma injuries resulting from these accidents are cases of bone fractures, which require comprehensive orthopedic management from the emergency phase to the medical rehabilitation stage.

The rapid development of urban areas in the southern region of Surabaya has triggered an increase in population density accompanied by high ground transportation mobility. As one of the main gateway corridors for commuters heading to downtown Surabaya, this southern corridor is characterized by very high traffic density, which is linearly proportional to the increased risk of traffic accidents. Based on trauma epidemiology data, transportation accidents are a major contributor to the high prevalence

of musculoskeletal system injuries, particularly cases of fractures or broken extremity bones.

From the perspective of healthcare architecture, designing a specialized orthopedic hospital requires a space programming approach that is far more specific compared to general medical facilities. Although the urgency level for handling orthopedic cases is high, healthcare facilities specifically dedicated to treating bone fractures in the South Surabaya area are still very limited. The gap between community needs and the availability of these facilities results in most patients having to be referred to hospitals in the city center. This creates several challenges, such as long travel distances, longer response times for treatment, and an accumulation of operational burdens at referral hospitals. Such facilities cannot be equated with general hospitals because they demand high space specifications for surgical procedures and movement recovery.

Based on the issues above, this study specifically aims to examine the functions and spatial requirements of the Bone Specialist Hospital in South Surabaya. The main contribution of this research is to provide a theoretical foundation and practical reference in planning health facilities that are effective, efficient, and comply with quality service regulations for the broader community. Therefore, the need for a dedicated orthopedic hospital should be viewed not only as a response to increasing trauma cases, but also as an effort to shorten referral time and improve treatment efficiency in densely mobile urban areas (Ministry of Health of the Republic of Indonesia, 2014; Ministry of Health of the Republic of Indonesia, 2016; UU No. 44 Tahun 2009).

METHOD

This study uses a qualitative research method with a descriptive analytical approach. This approach aims to map and systematically describe the spatial arrangement and the functional needs of specialized trauma health facilities in the South Surabaya area. The subjects of this study focus on the scope of operational and functional needs at the Bone Specialist Hospital.

The data collection procedure was carried out entirely through literature and regulatory studies. Primary regulatory data was obtained from the analysis of health legislation regulations, particularly the Minister of Health Regulations regarding the classification, licensing, and technical requirements of hospital facilities and infrastructure. In addition, secondary data was collected from literature studies of architectural journals, design standard books, and observations from benchmarking studies of operations at orthopedic hospitals and medical rehabilitation units that are already in operation.

The data analysis process is carried out in the following stages: (1) classifying the main medical service functions, (2) identifying the standard sizes and space requirements for each function, and (3) analyzing the correlation and circulation flow between spaces. The circulation analysis parameters are assessed based on patient movement flow, the work efficiency of medical personnel, and visitor accessibility. The use of regulatory analysis and benchmarking allows the study to compare ideal spatial standards with operational

needs, so the resulting program is not only theoretical but also applicable to hospital planning (Ministry of Health of the Republic of Indonesia, 2014; Ministry of Health of the Republic of Indonesia, 2016).

FINDING AND DISCUSSION

RESEARCH RESULT

The main operational functions at the Specialist Bone Hospital include five specific services: trauma emergency services, orthopedic outpatient services, specialized inpatient bone care, orthopedic surgery services, and medical rehabilitation services. The Trauma Emergency Department (ED) serves as the frontline and main entry point for accident patients. Meanwhile, medical rehabilitation services are dedicated to facilities for physiotherapy, occupational therapy, movement rooms, and consultation areas. This zoning strategy supports a clearer separation between public, semi-public, private, and service areas, which is essential to reduce cross-circulation and maintain patient safety (Ministry of Health of the Republic of Indonesia, 2016).

The results of the layout needs study prove that the hospital structure must be divided into a zoning system to separate infectious and non-infectious circulation flows and maintain sterilization. The zoning of space requirements can be outlined in the following table:

Table 1: Zoning Classification and Space Requirements for a Specialized Bone Fracture Hospital

ZOONING CATEGORY	ACCESS CHARACTERISTICS	MAIN ROOM FUNCTION AND REQUIRMENTS
Public zone	free access by the wider community	regristation area, main lobby, waiting room, polyclinic facility, and pharmacy
Semi public zone	Requires access control	Medical rehabilitation installation room and advanced medical consultation facility
Private Area	Limited, controlled, and sterile standarts	Patient inpatient rooms, operating room (OC), intensive care unit (ICU), Nurse area, and doctors rest areas
Zooning Service	A dedicated pathway is separate from the patient area.	Central kitchen, laundry, medical waste treatment plant, utility room (MEP), and area logistic.

Spatial circulation dictates that the movement of emergency patients must have the shortest route connecting the ambulance drop-off area directly with the emergency room, radiology installation, and operating room. The circulation of outpatient patients must be completely separated from the inpatient service routes and service distribution areas.

Spatial needs analysis in the Emergency Department (ED) for trauma indicates the necessity of providing a dedicated ambulance drop-off area that is directly connected to the triage room, resuscitation procedure room, and isolation room. Physical accessibility for fracture patients with mobility limitations requires the implementation of very generous spatial geometry standards. In the corridors of private and semi-public areas, the clear width of circulation paths is set at a minimum of 2.4 meters to provide free space for two patient beds (stretchers) passing each other simultaneously (Ministry of Health of the Republic of Indonesia, 2016). In addition, the entrances to procedure rooms and patient care rooms must have a minimum door opening width of 1.2 meters to facilitate emergency evacuation.

In the central surgical installation sector, the identification of operating room layout requirements demands the division of interior areas into three sterility sub-zones: clean zone, very clean zone, and sterile zone. The circulation of clean air uses a centralized HVAC system with HEPA filter filtration to produce positive air pressure in the sterile zone. The direct connection between the emergency department, radiology, and operating room is a crucial architectural response to trauma cases, because it reduces delay in the patient transfer process and improves the effectiveness of emergency care (Ministry of Health of the Republic of Indonesia, 2016; Ministry of Health of the Republic of Indonesia, 2014).

For the medical rehabilitation installation area, the space requirements are designed with the principle of horizontal connectivity close to outpatient and inpatient zones. Physical exercise therapy rooms require floors with anti-slip material and are equipped with load-bearing walls (handrails) along the pathways for patient mobility independence exercises. The functional relationship between these spatial components is linearly connected through a vertical circulation system in the form of ramps with a maximum slope of 1:10 and specialized bed lifts with high load capacity to anticipate horizontal evacuation obstacles. In addition, placing rehabilitation facilities near outpatient and vertical circulation areas strengthens continuity of care, since recovery in orthopedic cases depends on the transition from surgery to mobility training (Ministry of Health of the Republic of Indonesia, 2016).

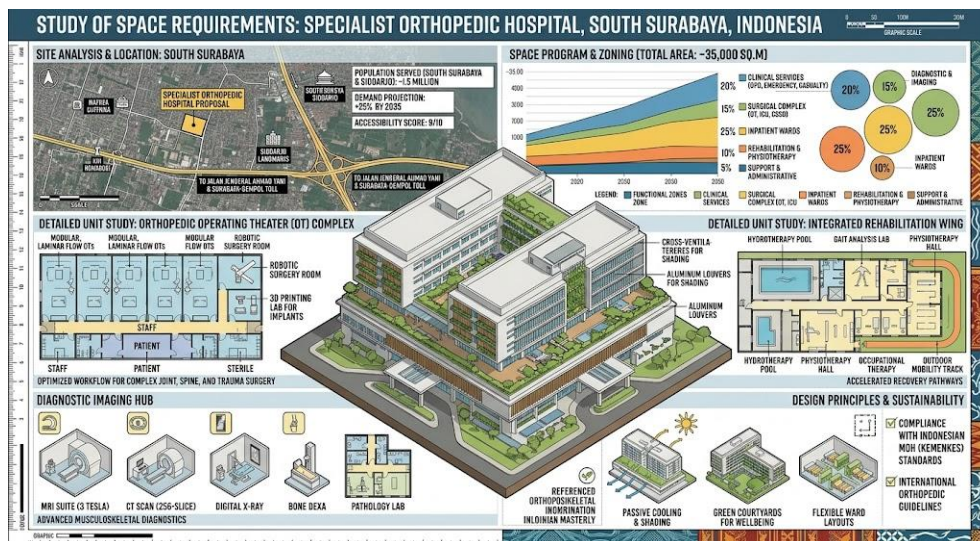


Figure 1; Specialist Orthopedic Hospital in South Surabaya

DISCUSSION

Findings from the mapping of space requirements and the classification of access hierarchy at the Specialized Orthopedic Hospital (Table 1) affirm that the efficiency of spatial layout plays a crucial role in determining the success of medical management for trauma patients. The designed linear integration between the Emergency Department (ED) and supporting diagnostic and procedural facilities, such as the radiology unit and central surgical installation, is an architectural solution to eliminate treatment delays. In cases of orthopedic emergencies due to traffic accidents in South Surabaya, every second of delay in horizontal circulation can worsen the patient’s clinical condition. Therefore, conditioning emergency circulation flow to be free from visual and physical obstacles—such as overlapping with general visitor traffic—becomes a determining factor in reducing post-trauma mortality and morbidity rates.

The implementation of zoning that clearly separates public, semi-public, private, and service areas aligns with the principles of modern healthcare facility design oriented toward patient safety. Based on the spatial analysis in the Results section, the separation of infectious and non-infectious corridors, as well as the arrangement of a minimum clear corridor width of 2.4 meters, directly addresses the requirements of national regulations (Ministry of Health of the Republic of Indonesia, 2016). This spatial configuration not only facilitates the smooth simultaneous mobilization of two stretchers during emergency evacuation conditions but also minimizes the risk of nosocomial infection (cross-infection) between care rooms, which can slow down the biological tissue recovery process of patients.

The close functional relationship within the central surgical complex requires the fulfillment of very strict technical room specifications to support the efficiency of fracture reduction and fixation procedures. The architectural design implications of this requirement demand planners to minimize the placement of structural column elements within the

operating room to provide movement flexibility for medical personnel and the arrangement of mechanical casings.

Furthermore, this study shows that the presence of rehabilitation medical facilities designed to be inclusive and accessible is a functional transition phase that cannot be separated from the overall healing cycle of orthopedic patients. Placing physiotherapy and exercise therapy areas close to outpatient zones and vertical circulation access facilitates the mobility of patients with independent physical limitations.

On a macro level, the practical implications of this research provide a tangible contribution to spatial planning in South Surabaya. The provision of a specialist hospital with a capacity of 200 beds that has adaptive space programs and complies with technical regulations (Ministry of Health of the Republic of Indonesia, 2014) can decentralize the trauma service burden that has so far accumulated in central Surabaya. Although this study has limitations because it focuses on a descriptive approach to macro space programming without simulating micro circulation digital modeling, the resulting spatial framework remains valid for use as a foundational document (design brief) in the advanced architectural design stages.

The findings from the spatial needs mapping above underscore the urgency of spatial efficiency in handling orthopedic injuries. Systematic integration between the Emergency Department (ED) and supporting facilities (such as radiology and operating rooms) is absolutely essential to eliminate delays in treatment for trauma patients. The separation of circulation flows between outpatient, inpatient, and services, as outlined in the Results, directly addresses the need to prevent overlapping activities (cross-circulation) that could compromise user safety and comfort in the hospital.

The standard for grouping spatial zoning obtained (Table 1) confirms and aligns with modern medical architectural guidelines. Furthermore, the placement of the medical rehabilitation zone as a crucial post-operative transition is highly determinant of the speed of patients' physical independence recovery percentage and the minimization of permanent disability.

This research found significant practical implications for the urban development of South Surabaya. An architectural plan based on precise zoning—including public areas to service areas—can be directly implemented as the foundation of a master plan for medical infrastructure development by local developers. By adhering to health operational standards (Ministry of Health RI, 2014; Ministry of Health RI, 2016), the provision of this specialist hospital will address the medical referral issues that have accumulated in the city center.

CONCLUSION

This study concludes that the provision of a Specialized Fracture Hospital facility in the South Surabaya area has a very high urgency. This is a logical response to traffic congestion and the surge in accident risks that trigger orthopedic trauma. Delays in medical treatment due to the need to refer patients to the city center can be addressed by designing a facility with a clear hierarchy of spaces and zoning (public, semi-public, private, and

service). This facility must synergize emergency functions, outpatient clinics, intensive inpatient care, surgery, and medical rehabilitation comprehensively. It is expected that the results of this spatial identification can be utilized by designers and policymakers as a fundamental guideline framework in realizing an optimal, safe orthopedic trauma healthcare center that prioritizes patient recovery. Overall, the proposed spatial framework can serve as a practical guideline for hospital design and can support local health planning policies in South Surabaya (Perda Kota Surabaya No. 4 Tahun 2021; Perpres RI No. 38 Tahun 2018).

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