Vol. 9, No. 2, Oktober, 2024, pISSN 2527-2853, eISSN 2549-2985
DOI : 10.12962/j12345678.v9i2.20367

Space Programming as an Approach to Produce Recommendation of Virtual Wayfinding Design Guidelines in Puskesmas

Siti Chadijah*[1], Reno Fanthi[1], Fauzia Latif[1], Dewi Kumoratih[2]
[1] Interior Design Department, School of Design, Bina Nusantara University, Jakarta, Indonesia
[2] Visual Communication Design Department, School of Design, Bina Nusantara University, Jakarta, Indonesia

Corresponding Author
* siti.chadijah@binus.ac.id

ABSTRACT

Health facilities in Jakarta are facing several challenges to enhance their services, especially addressing the space limitation. One of the vital facilities needed to be provided is space programming and wayfinding to help health facilities improve their service such as separating health patients and patients with unhealthy conditions. In fact, there is a lack of information regarding the flow of activities that visitors must go through while visiting the health facility. Provision of information on this flow of activity still depends on the availability of officers. This study provides a recommendation for a better space development of the community health facility as well as more adequate information on the health facilities in Jakarta. Gibson (2009) has encapsulated which types of wayfinding can perform well in indoor areas. Based on the types, this research aims to unravel the limitations of information and provide appropriate access for users. The research was conducted through data collection of facilities and activities in Community health center (*Puskesmas*). Space limitations can be resolved by providing accessible and easily understood information. Moreover, the result provides data of information that can be developed on an integrated virtual wayfinding design to achieve efficiency and sustainability in health services.

Kata kunci: *space anaylis; health facilities; virtual wayfinding*

INTRODUCTION

Community health center (*Puskesmas*) is the basic health services owned by the government that provides health services with the main function of preventive (disease prevention) and promotive services (health improvement). This is in accordance with the Regulation of the Ministry of Health of the Republic of Indonesia concerning Community health center (*Puskesmas*), which outlines the function of Community health center (*Puskesmas*) in the implementation of public health efforts and individual health efforts by prioritizing promotive and preventive measures to improve the degree of public health in their work area. However, the increasing needs in the community health center also requires Community health center (*Puskesmas*) to provide comprehensive services to curative (treatment) and rehabilitative (health recovery) services (Juliansyah, 2012, p.46) as well as referrals to health service levels above.

A. Space Functionality of Puskesmas

Community health center (*Puskesmas*) is the smallest unit among all health facilities in Indonesia. Community health center (*Puskesmas*) prioritizes services for visitors with healthy conditions as a preventive and promotive effort (maintaining the quality of public health). However, the development of health service needs in the community makes Community health center (*Puskesmas*) expand its services to curative and rehabilitative aspects. This research is conducted a study case in Kemanggisan Health Center (*Puskesmas Kemanggisan*), health service unit at the district level (*Kelurahan*) which located in the work area of Kemanggisan, West Jakarta. The Community health center (*Puskesmas*) building underwent renovation in 2018 and operated with a new building in 2020. In carrying out its role to provide general health

services, Kemanggisan Health Center (*Puskesmas Kemanggisan*) serves two types of health services, namely services for visitors with healthy conditions and health services for visitors in sick conditions or the visitors with symptoms. The services for the health visitors included including nutrition monitoring, immunization and vaccination clinics, environmental health, services for pregnant women, babies, and toddlers named *Posyandu Program*, and dental clinic. In the other hand, there are facilities for the unhealthy visitors such as polyclinics and Tuberculosis (TB) ward. To support these two services, the Kemanggisan Health Center (*Puskesmas Kemanggisan*) is also facilitated with pharmaceutical installations and drug warehouse. In addition, the Kemanggisan Health Center (*Puskesmas Kemanggisan*) also has administrative activities which are facilitated by a multifunction meeting area and room for the staff.

B. Challanges and Opportunities

The increasing number of visitors triggered a rise in needs for health services in the community. It makes the need for the facilities at the Kemanggisan Health Center (*Puskesmas Kemanggisan*) grow even more. This complexity is formed by the increasing number of visitors and development of the facilities and infrastructure available at the Community health center (*Puskesmas*). This complexity does not always equal the availability of adequate space. Land acquisition has created limited space around the community health center building. It causes the expansion of physical facilities to be very limited. In addition, the availability of a development budget is also not always available at the same time it is needed. This condition led Community health center (*Puskesmas*) adjust with the space limitations and be flexible in adapting to the available space. For example, during the Covid-19 pandemic, several work areas and service rooms had to undergo a conversion to accommodate special needs, such as storage of medical equipment, personal protective equipment (PPE), and special staff areas that handle covid patients.

The result of observations in the field showed that the increasing number of visitors at the Community health center (*Puskesmas*) often caused crowd points in certain areas. The crowd points are formed from the queue of visitors when registering and waiting for patient call. In this case, not all visitors understand the visit route while they are visiting Community health center (*Puskesmas*). Patients' blockages can be created by the accumulation of the visitor density in certain areas. It can prolong the duration of health services and become inefficient for both patients/visitors and the staff to find the destined areas. This is a challenge for the Community health center (*Puskesmas*) to be able to improve health services more efficiently.

From the challenges above we can address two main factors to be resolved in reaching more efficient services in community health center; space limitation and providing information. These two factors can affect the way Community health center (*Puskesmas*) develops to fulfill its basic functions in health services over time. Limited space means limited expansion and provision of the facilities, which can be reflected in the service rooms, especially when Community health center (*Puskesmas*) has the urgency to rehabilitate and cure the unhealthy patients. Facilities that are mentioned above included rooms with certain health service functions (Rukmini, Roosihermatie, & Nantabah, 2021) and the provision of information. Information related to the context of the space here includes symbols, route, directions for the circulation of visitors and patients and other information that makes it easier for visitors to reach their destination health services. More importantly, separating healthy visitors and unhealthy is also crucial to prevent the spreading the diseases. The provision of this information is also needed to minimize the risk of nosocomial (infection obtained from health facilities) due to the intersects of healthy and sick patients on the same place at a certain period.

One of the facilities in Community health center (*Puskesmas*) is the facility of providing

Vol. 9, No. 2, Oktober, 2024, pISSN 2527-2853, eISSN 2549-2985
DOI : 10.12962/j12345678.v9i2.20367

information related to service rooms and visitor circulation flows. The provision of this facility is prioritized to separate healthy visitors with the unhealthy visitors who come with sick conditions/sick symptoms. This can be facilitated by wayfinding as a guide and regulator of the flow of visitor circulation. By applying good wayfinding, visitors can understand the visit route at the Community health center (*Puskesmas*) and position the role of themselves in a predetermined path.

RELATED STUDY

Wayfinding planning in health facilities such as Community health center (*Puskesmas*) is important considering its role to be part of the problems solving which can contribute to determining and navigating the user to destination and recognize the destined areas (Arthur & Passini, 1992). Limited vision and physical limitation can also be problems for the space user caused by the lack of wayfinding system design (Chen, Chang, & Chang, 2009). There are several benefits from good quality design system of wayfinding in the health care, it covers efficiency for the medical staff, encourage the better management systems, and offers better experiences for the patients (Pati, Harvey, Willis, & Pati, 2015) (Ulrich, et al., 2008). Ineffective wayfinding and disruptive environment, in fact, can drive to certain level of stress for the staff (Cooper, 2010). It can impact on the bad impression of health care in general, which also affected the nurses, visitors, and patients (Larsen & Tatarka, 2008). In contrast, a good wayfinding design system will help the visitors, patients, and staff to find and arrive in the destined areas in a more effective way. Moreover, Effective wayfinding means a better space to accommodate human activities in gaining better health services. Considering these relations, it is not only applicable to what extent the large scale of health services can afford efficiency, but also become an issue for the smaller units of health care such as polyclinic, pharmacy, and other health care units. From the analysis, it is obvious that the wayfinding design can be one of the parameters to the space quality, considering the service quality in public facilities circulation (Hale & Stanney, 2014).

METHODS

This study investigated the space programming within Kemanggisan Health Center (*Puskesmas Kemanggisan*) to produce recommendation for wayfinding guidelines, possibility of wayfinding to obtain a better development on physical and virtual facility at Kemanggisan Health Center (*Puskesmas Kemanggisan*), West Jakarta. The research was conducted by qualitative data analysis through design simulation method. Data was collected through site observation and interview. It produces a scheme of visitors' circulation and planning for signs allocation. At the final stage, this research will produce recommendations for physical and virtual wayfinding. In addition, the recommendation of wayfinding system can be used as a guidance for the future building development, to ensure the effectiveness of circulation and areas connectedness in virtual wayfinding; include topics such as logical floorplans, clearly understandable directional signs, highly visible landmarks, and architectural designs that prompt movement toward information areas and patient and visitor destinations (An & Lee, 2010).

RESULT AND DISCUSSION

Inside the building, there are health services provided on the whole four floors areas in Kemanggisan Health Center (*Puskesmas Kemanggisan*). The high level of Health Center (*Puskesmas*) visits encourages the management of Kemanggisan Health Center (*Puskesmas Kemanggisan*) to separate the visitor flow of activity. It contains separation of the healthy visitors who are destined services such as immunizations, vaccines, infant health checks, etc., and sick visitors (visitor with symptoms). Visitors with symptoms are highly served on the 1st

floor. Healthy visitor services are spreading over the 2nd and 3rd floors. Meanwhile, staff and general activities are focused on the 4th floor. The flow of visitor circulation in general is shown in the following figure.

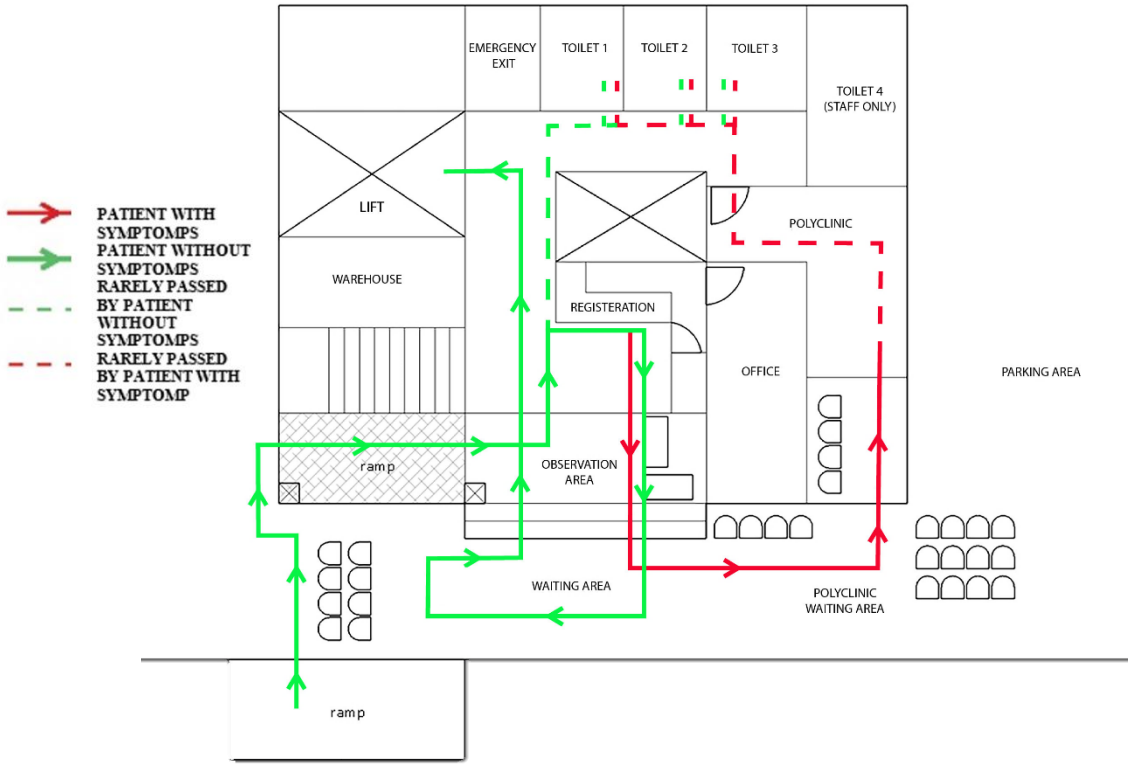

Figure 1. Circulation plan on the 1st
Source: Author (2023)

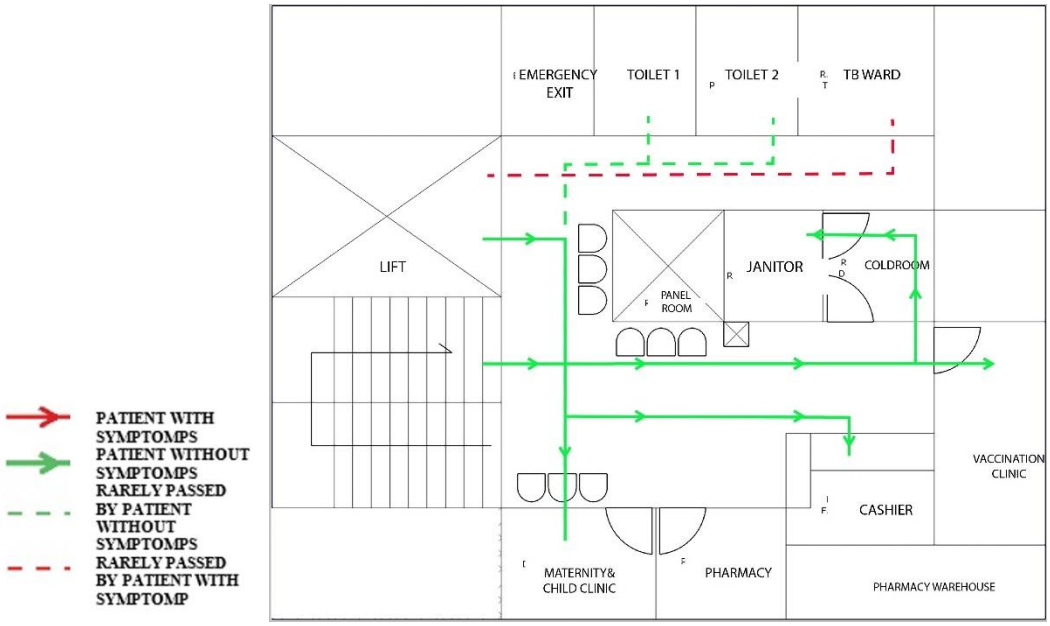

Figure 2. Circulation plan on the 2nd
Source: Author (2023)

Vol. 9, No. 2, Oktober, 2024, pISSN 2527-2853, eISSN 2549-2985
DOI : 10.12962/j12345678.v9i2.20367

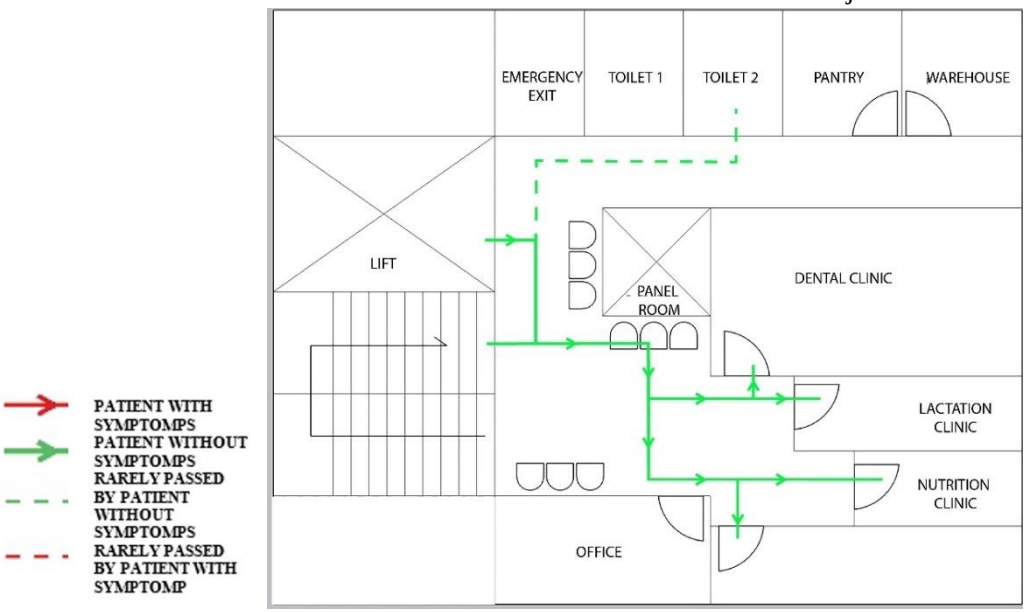

Figure 3. Circulation plan on the 3rd
Source: Author (2023)

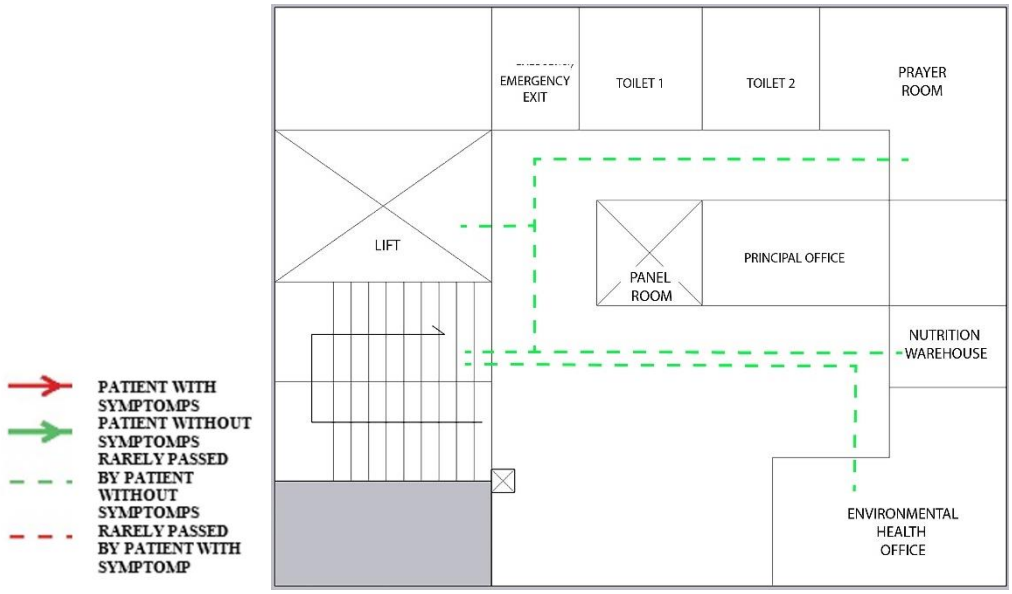

Figure 4. Circulation plan on the 4th
Source: Author (2023)

Shown Shown in Fig.1 the circulation path tends to still be mixed at the entrance. There is a separation of the group of visitors with symptoms (indicated by a red direction line) and the group of visitors without symptoms (indicated by a green direction line).

Separation of visitors can be seen as illustrated by the layout of waiting areas. From the layout we can see visitors with symptoms will be waiting and served at polyclinic areas, while visitors without symptoms will be waiting around the entrance. This separation occurs after visitors have registered on the 1st floor. The path of sick patients is also available on the 2nd floor to Tuberculosis (TB) service room. But this space is almost never used. TB services are routinely carried out separately on the 1st floor. Meanwhile, areas on the 3rd and 4th floor are only intended for the staff and patients in healthy conditions.

A. Spacce Programming and Wayfinding Type list

The flow analysis of visitor circulation at the Kemanggisan Health Care (*Puskesmas Kemanggisan*) showed that the space programming has a structured pattern. On each floor, there is a different pattern, indicated by areas of purple, orange, yellow, and green.

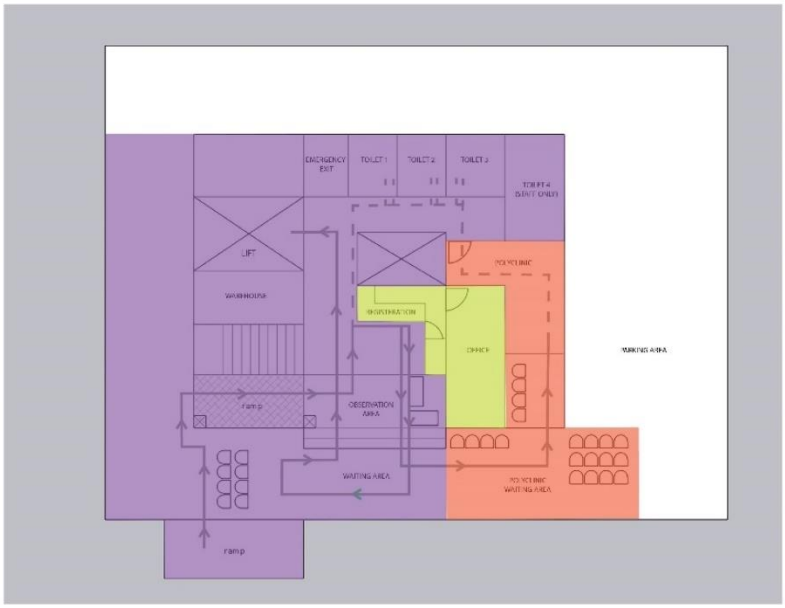

Figure 5. Space Programming on the 1st Floor
Source: Author (2023)

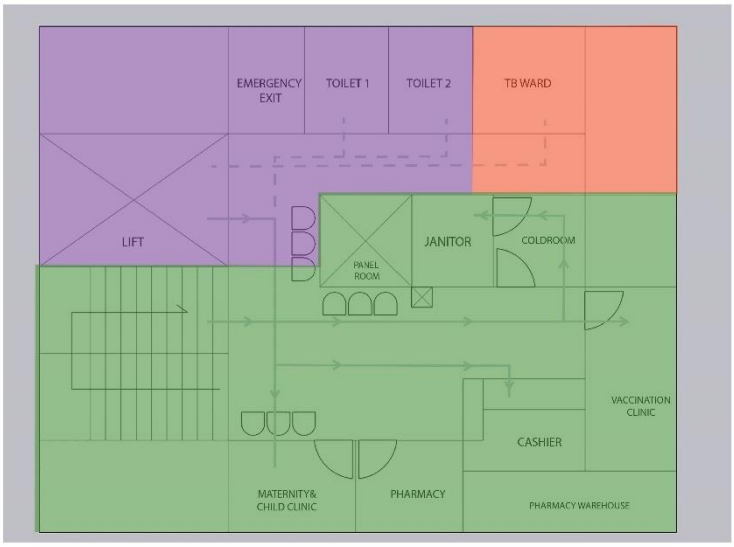

Figure 6. Space Programming on the 2nd Floor
Source: Author (2023)

Vol. 9, No. 2, Oktober, 2024, pISSN 2527-2853, eISSN 2549-2985
DOI : 10.12962/j12345678.v9i2.20367

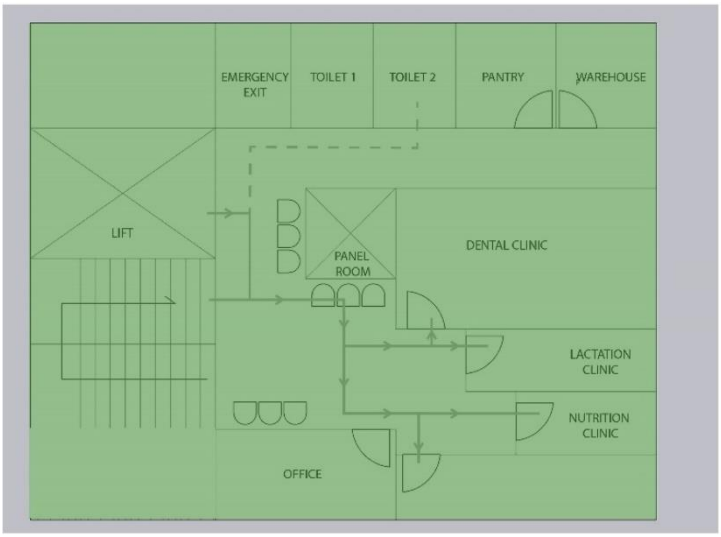

Figure 7. Space Programming on the 3rd Floor
Source: Author (2023)

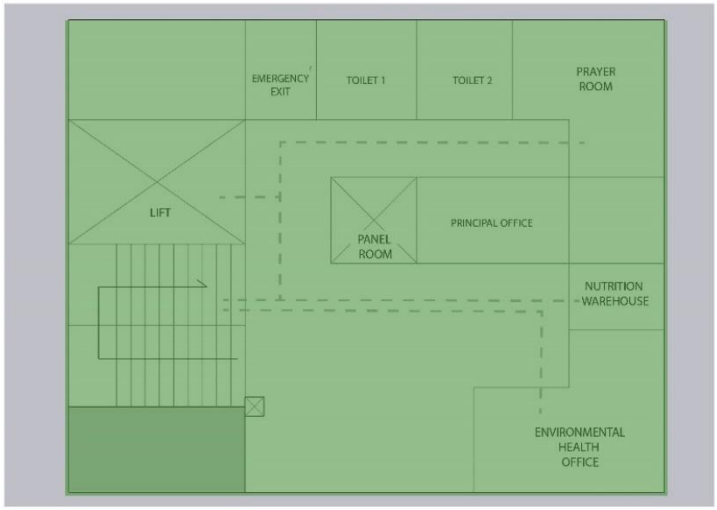

Figure 8. Space Programming on the 4th Floor
Source: Author (2023)

The purple color indicates the area that can be reached together by patients with healthy conditions as well as patients with symptoms of illness. The orange color indicates an area reserved for visitors with symptoms of illness. Meanwhile, yellow indicates the staff's working area, and green color can be accessed by healthy visitors.

Based on the space program and circulation paths, the signage types that can be used in Kemanggisan Health Care (*Puskesmas Kemanggisan*). Referring to Gibson (2009), the types of sign which suitable for indoor use, as follows; 1) Identification (included any sign, image, or symbols refers to area/ level, service and maintenance, office, elevator, etc.), 2) Directional (shows sign of ways and location for certain room/ areas), 3) Orientation (shows isometrical view of the building), and 4) Regulatory (signs/symbols/ image containing advisories such as fire safety).

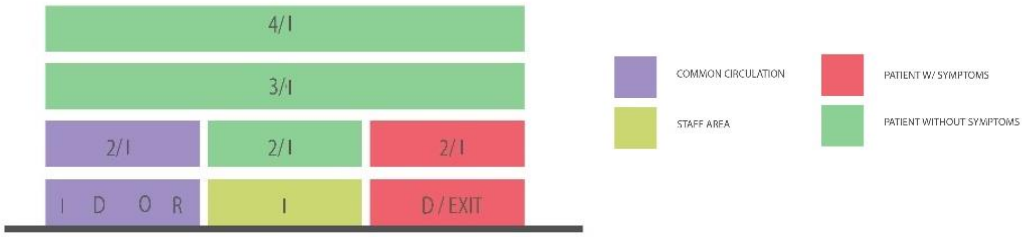

Figure 9. Allocation of Signs
Sumber : Author (2023)

The diagram above shows that the area is becoming greener. It described the function of areas on the higher floor as dedicated for the healthy visitor and staff. Meanwhile, the red zone for sick patients is only on the lower floor. Therefore, providing information regarding the separation of the red and green zones is prioritized on the bottom floor. Applying this way of separation could make visitors with symptoms of illness do not need to go upstairs to just find information.

B. Planning Sign Location

The next stage is to design sign location in the areas that require direction. The location of this sign placement is prioritized at the visitor crowd points such as entrance, waiting rooms, points that are expected to separate visitor groups, and emergency areas. The simulation of sign placement on Health Care (*Puskesmas*) layout is shown in the picture below.

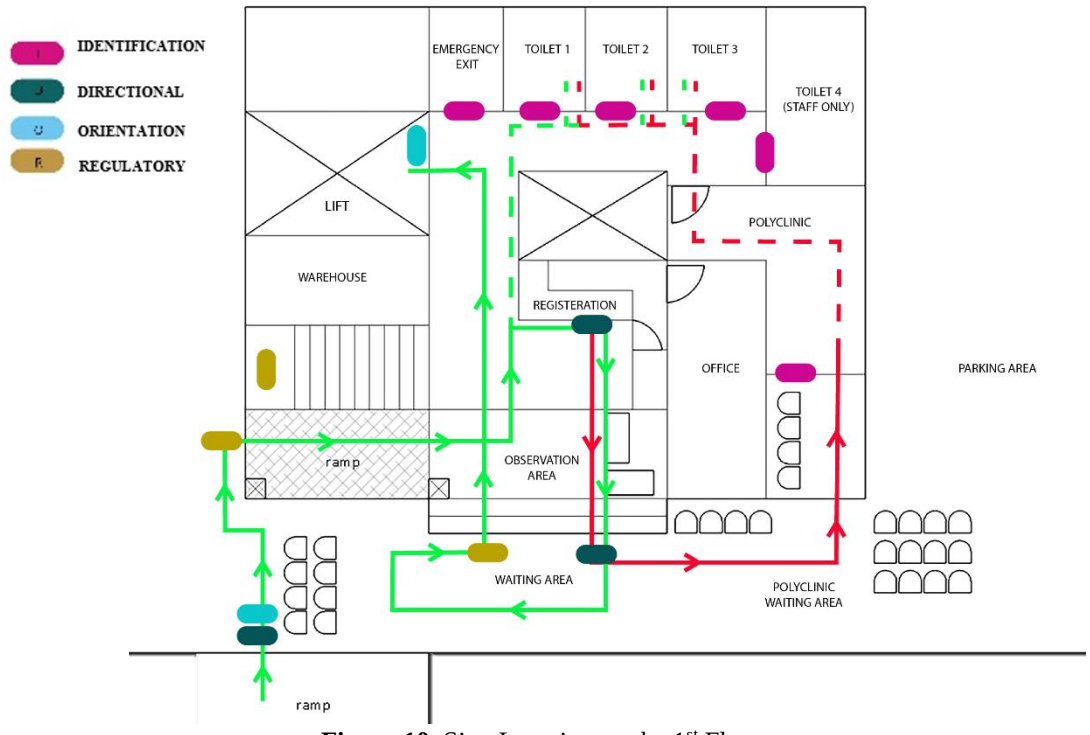

Figure 10. Sign Location on the 1st Floor
Source: Author (2023)

Vol. 9, No. 2, Oktober, 2024, pISSN 2527-2853, eISSN 2549-2985
DOI : 10.12962/j12345678.v9i2.20367

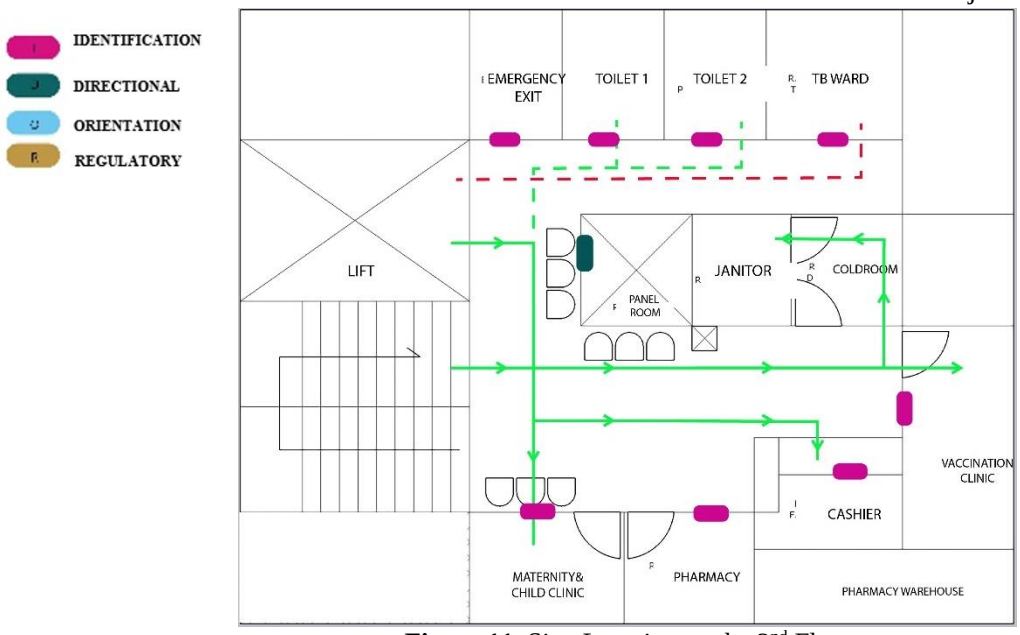

Figure 11. Sign Location on the 2nd Floor
Source: Author (2023)

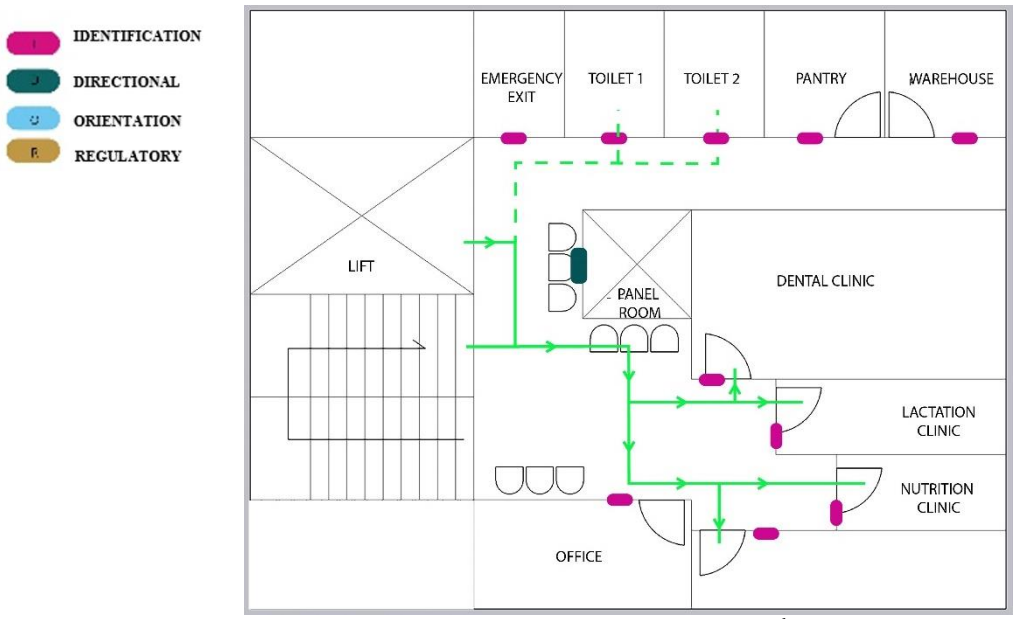

Figure 12. Sign Location on the 3rd Floor
Source: Author (2023)

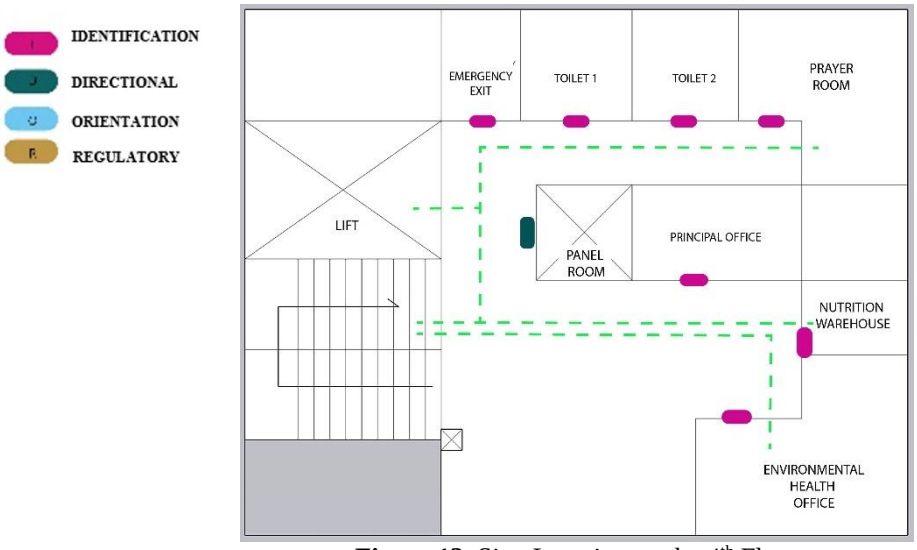

Figure 13. Sign Location on the 4th Floor
Source: Author (2023)

1. **Directional Sign**
   Directional signs are preferred to be located on the 1st floor, especially at the entrance area. Because of the complexity of areas in the building, this type of sign is highly recommended to help visitors understand the destination area.
2. **Orientational Sign**
   Similarly, orientational signs are suggested to be placed in the entrance area and in front of the lift to give an overview of the service area within the *Puskesmas* building. Therefore, orientational signs are preferably placed at the forefront areas such as entrance and in front of the lift.
3. **Regulatory Sign**
   Regulatory signs and identification signs are placed on each floor to provide general guidance regarding the destination space and appeals/recommendations/prohibition signs
4. **Identification Sign**
   Identification signs functioned to re-confirm the place or area that are destined by the visitors. It is placed on each area/room in each floor.

Physical signs need to consider visual appearance to attract visitors. This aspect includes the readability of the text. It is crucial for providing clear information for the visitors, included font size and style, position of the signage toward the human dimension to ensure readability.

Vol. 9, No. 2, Oktober, 2024, pISSN 2527-2853, eISSN 2549-2985
DOI : 10.12962/j12345678.v9i2.20367

Figure 14. Recommendation of Physical Wayfinding
Source: Author (2023)

C. Planning the Virtual Wayfinding

Along with the need for better access to directional information, the existence of wayfinding in the Health Center (*Puskesmas*) building can also be translated into the virtual wayfinding facilities. Physical facilities will make it easier for visitors to find the location and route to the intended health service onsite, while virtual wayfinding facilities can facilitate the movement of visitors by automatically directing visitors to certain routes. This facility allows visitors to access virtual directions through an application installed on a smartphone/tablet.

Visitation paths are distinguished between visitors with symptoms and healthy visitors using color. Meanwhile, the directional marker code can be found on each sign. To facilitate access to each visitor without relying on officers to serve the explanation of each route, this visit path can be made in virtual wayfinding that can be accessed interactively through visitor's smartphone.

The visualization below depicts directions that can be accessed with the help of Augmented Reality (AR) technology. This technology allows visitors to come by defining roles first on applications installed on their smartphones; 1) as a patient with symptoms of illness or 2) a healthy patient who wants to check up regularly. After determining the role, visitors will be paraded by the application with a certain route according to the selected role. Defining role could possibly make different accessed where the visitors with symptoms will never have accessed the same path as the visitors without symptoms (healthy visitors). On the next stage of the application development, the AR also could be assigned to identify the crowd point within the building. It is aimed to unravel the circulation blockage at the peak hour.

To avoid intersection points for a long time between the two types of visitors, it would be better if in the future a registration machine was provided at the forefront areas. It allows visitors to easily separate themselves starting from the entrance area. In the entrance area, a directional sign can also be given along with instructions to select the role of visitor. Provision of information can also integrate physical and virtual wayfinding. Therefore, to integrate the wayfinding system, there are several things to be considered, as shown in the table below.

Figure 15. Visualization of Recommended Path for Healthy Visitors (left) and Visitors with Symptoms (Right). Source: Author (2023)

Table 1. Supporting elements of virtual wayfinding

Elements on Virtual App	Things to Consider	Determine	Tracking Identification
Visitor roles	Types of patient complaints	Role of the patient	Tracking by Code of Room
Space program	Area division	Suggested Areas to Visit	
Visitor circulation flow	Visit route	Suggested Circulation Route	Tracking by Route Color
Crowd point	Number of visitors	Position / location of signs in layout	

Source: Analysis on User Requirements. Authors (2023)

After this supporting element is obtained, then visitors can choose a route based on the role and space addressed:

1. Tracking by color (following by circulation for group of patients with symptoms or without symptoms).
2. Tracking by code (following by specific room).

CONCLUSION

Based on the analysis, there are several findings to be developed in building a wayfinding system in community health centers (*Puskesmas*), including utilizing space programs that have been formed to develop physical wayfinding systems. Then this physical system can be integrated into the virtual wayfinding system.

To be able to implement this system, socialization techniques are also needed and easily understood by the community who use Health Center (*Puskesmas*) services. This system can be implemented first through flexible applications to interior design at any time it changes. These changes should be directly updated through the application to ensure accuracy in guiding patients and visitors in the Health Center (*Puskesmas*) who come according to their individual needs.

Wayfinding within this limited area has a similar working principle to common applications such as Googlemaps and Waze, through the algorithms of the patient's circulation and route. So that application devices and signage layouts for spaces in the interior of the Health Center (*Puskesmas*) are always connected and accurate. This will be impactful regarding efficiency of patient visitation, through smooth queuing, following directions to visit the destined areas, completing administration, and making services carried out optimally. Its implementation requires clear socialization so it can easily be understood by the new visitors. Below is shown on the table a brief comparison of how the physical and virtual wayfinding could offer alternatives for the visitors to understanding their destined route/ areas.

Vol. 9, No. 2, Oktober, 2024, pISSN 2527-2853, eISSN 2549-2985
DOI : 10.12962/j12345678.v9i2.20367

Table 2. Comparison on physical and virtual wayfinding functionalities

Description	Physical Signs	Virtual Signs
Route identification	Manual identification. Suitable for those who do not own any proper devices for the application.	Real-time identification (automatically finding the route)
Visitation Path	Self-identification to categorize visiting type (with symptoms/ without symptoms).	Separate categories of the visitors (with symptoms or without symptoms) by providing different path color.
Circulation	Self-directed to a certain area so the visitors can find the destined areas without any confusion/ depending on the officer.	Avoid blockage by providing crowd points within the building.

Source: Analysis on the signs usability. Authors (2024)

ACKNOWLEDGEMENT

The authors gratefully thank to Puskesmas Kelurahan Kemanggisan, West Jakarta for the support on providing data as case study for this research and acknowledge that the present research is dedicated this research for Authors' Affiliation.

REFERENCE

An, S., & Lee, H. (2010). The Sustainable Space Planning of Hospital Design Towards the Healing Environment. *International Conference on Sustainable Building Asia*, (pp. 199-204). Seoul.

Arthur, P., & Passini, R. (1984). *Wayfinding: People, Signs, and Architecture.* New York: McGraw-Hill Book Co.

Arthur, P., & Passini, R. (1992). *Wayfinding: People, Signs, and Architecture* . New York : McGraw-Hill.

Chen, C.-H., Chang, W.-C., & Chang, W.-T. (2009, June). Gender differences in relation to wayfinding strategies, navigational support design, and wayfinding task difficulty. *Journal of Environmental Psychology, 29*(2), 220-226. doi: 10.1016/j.jenvp.2008.07.003

Constantine, M. &. (1961). *Sign language for Buildings and Landscape.* New York: Reinhold Publishing.

Cooper, R. (2015). *Wayfinding for Health Care: Best practices for Today's Facilities.* Chicago: IL: AHA Press/Health Forum.

Gibson, D. (2009). *The Wayfinding Handbook: Information design for public places.* New York : Princeton Architectural Press.

Juliansyah, E. (2012). Efektivitas Pelayanan Kesehatan Di Puskesmas. Jurnal Ilmu Administrasi Negara. *Jurnal Ilmu Administrasi Negara, 12*(1), 40-50. Retrieved from https://jiana.ejournal.unri.ac.id/index.php/JIANA/article/view/902/895

Kalantari, S., Tripathi, V., Kan, J., Rounds, J. D., Mostafavi, A., Snell, R., & Cruz-Garza, J. G. (2022). aluating the impacts of color, graphics, and architectural features on wayfinding in healthcare settings using EEG data and virtual response testing. *Journal of Environmental Psychology, 79*(4), 101744. doi: 10.1016/j.jenvp.2021.101744

Kelly S. Hale, K. M. (2014). *Handbook of virtual environments: Design, implementation, and applications.* Boca Raton: CRC Press.

Larsen, D., & Tatarka, A. (2008). Wayfinding revisited: improved techniques for assessing and solving usability problems in physical spaces. *Proceedings of the 2008 library assessment conference: Building effective, sustainable, practical assessment* (pp. 65-73). Seattle: Association of Research Libraries. Retrieved from https://www.researchgate.net/profile/Karen-Jensen-5/publication/233339707_Beyond_Classroom_Technology_The_Equipment_Circulation_Program_at_Rasmuson_Library_University_of_Alaska_Fairbanks/links/6050e4a5458515e8344e5013/Beyond-Classroom-Technology-The-Equip

Nantabah, Z. K., Roosihermatie, B., & Rukmini, R. (2021). Ketersediaan dan Kelayakan Ruangan Pelayanan Puskesmas Berdasar Topografi, Demografi dan Geografi di Indonesia. *Buletin Penelitian Sistem Kesehatan*, 408-417.

Pati, D., Harvey, T. E., Willis, D. A., & Pati, S. (2015). Identifying Elements of the Health Care Environment That Contribute to Wayfinding. *HERD Health Environments Research and Design Journal*, 44-67. doi: 10.1177/1937586714568864

Rousek, J., & Hallbeck, M. (2011). Improving and analyzing signage within a healthcare setting. *Applied Ergonomics, 42*(6), 771-784. doi:https://doi.org/10.1016/j.apergo.2010.12.004

Ruki, U. A., & Nediari, A. (2014). Penerapan Tipografi dalam Sistem Signage pada Interior Ruang Publik. *Humaniora, 5*(2), 822-832. doi: 10.21512/humaniora.v5i2.3139

Samah, Z. A., Ibrahim, N., & Amir, J. S. (2013). Translating Quality Care Factors to Quality Space: Design Criteria for Outpatient Facility. *Procedia - Social and Behavioral Sciences*, 265-272. doi: 10.1016/j.sbspro.2013.11.028

Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H.-B., Choi, Y.-S., . . . Joseph, A. (2008). A Review of the Research Literature on Evidence-Based Healthcare Design. *HERD Health Environments Research and Design Journal, 1*(3), 61-125. doi: 10.1177/193758670800100306