Optimizing the Queuing System at the Grogol Sukoharjo District Health Center Using the Line Balancing Method

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ABSTRACT

The average number of patients served by the Grogol Health Center in the general polyclinic is 40 to 45 patients every day. Based on these data, there is a buildup of 7-10 patients, with an average service time of 10 minutes per patient. From the results of further observations, there is a buildup of patients in the general polyclinic of the Grogol Health Center. This study aims to solve the queue problem with the line balancing method and develop an online registration application at the Grogol Health Center that can increase the efficiency of the patient registration process and reduce waiting time. Line Balancing is a method for solving queue system problems. So that the results of this study are the creation of an integrated application and online registration that can reduce waiting time

KEYWORDS Aplikasi, Line balancing, puskesmas

INTRODUCTION

The Community Health Center is the spearhead of the health sector that has a great opportunity to make direct contact with the community, both sick and not sick (Andriansyah, 2017). In 2020, there were a total of 10,205 Community Health Centers in Indonesia, divided into 6,086 Community Health Centers that do not provide inpatient services, and 4,119 Community Health Centers that provide inpatient services Putri N.R et al (2022). The Grogol Community Health Center is a Public Health Center located at Jalan Raya Grogol No. 47, Dusun II, Madegondo, Kec. Grogol, Sukoharjo Regency, Central Java. The Grogol Community Health Center itself covers an area of 30 square kilometers consisting of 646 RT, 147 RW and spread across 14 villages. According to Yashinta Mayangsari, et al (2016), the queue capacity determines how many people can be served, because the queue system limits the number of people who can be served in real terms, the system has a limited queue length. At Grogol Health Center, there are Dental Polyclinic, Adult/General Polyclinic, Children's Polyclinic, Immunization Polyclinic, Maternity Polyclinic, Elderly Polyclinic, Pregnant Women's Polyclinic, KB & Catin, ER. Grogol Health Center serves 200-350 patients every day, from 200 to 300 patients served are divided into several polyclinics/clusters of Grogol Health Center.

It is known that the average patient served by the puskesmas in the general poly day ranges from 40 to 45 patients, there is a buildup of 7-10 patients, with an average service of 10 minutes per patient. Queuing is a common phenomenon in everyday life, not only experienced by humans but also by goods according to ilham et al (2020). Long waiting times can make patients feel dissatisfied, according to the Decree of the Minister of Health of the Republic of Indonesia Number 129 / Menkes / SK / II / 2008 concerning Minimum Hospital Service Standards for outpatient services stipulates that service waiting times must be less than 60 minutes (Ministry of Health RI, 2008).

Line Balancing, also known as line balance, refers to a group of work stations used to manufacture a product. Each of these groups consists of a number of work areas, called work stations, and is managed by one or more operators. Hutabarat, Y. (2022). Line Balancing is the process of assigning a number of jobs to work stations that are connected in a single track or production line. Each work station is arranged so that its working time does not exceed the specified cycle time Sakiman et al (2022).

From the results of further observations, there is a buildup of patients in the general poly of the Grogol Health Center and there is a Line Balancing concept that is used to solve the Grogol Health Center General Poly queuing system. then the purpose of this study is to Optimize the Queuing System at the Grogol Sukoharjo District Health Center with the Line Balancing Method and make integrated applications.

RESEARCH METHOD

Line Balancing is the arrangement of a group of people or machines on duty in sequence in assembling a product, where each resource is given a balanced task at each stage of production, with the aim of achieving a high level of work efficiency at each work station. The main function of Line Balancing is to create a balanced production trajectory. The main objective is to increase the speed at each work station so as to achieve maximum work efficiency. Bagaskara, D. (2019). (Safi'i Ma'arif, 2018) Line Balancing, also known as line balance, refers to a group of work stations used to manufacture a product. Each of these groups consists of a number of work areas, called work stations, and is managed by one or more operators.

Balance delay

Balance delay describes the proportion of idle time on a production line, with higher values signifying greater levels of inefficiency. The higher the line balance efficiency, the higher the line performance as the line becomes more balanced.

$$BD = \frac{(K.CT) - \sum {}^{k}_{i}{=}_{1}{}^{STi}}{(K.CT)} X100\%$$

Line Efficiency

Line Efficiency is the ratio of total workstation time to cycle time multiplied by the number of workstations.

$$LB = \frac{\sum {}^{k}_{i}{=}_{1}{}^{STi}}{(K)(CT)} X100\%$$

RESULT AND DISCUSSION

Calculation of track efficiency for each work station
K = 5 (but the calculation is 1, because it calculates each workstation one by one) K = 1
Cycle time / Cycle Time 400 Seconds
Obtained from 1999 : 5 = 399.8 rounded to 400

Table 1. Time For Each Work Station

Work station	Process time of each work station	
1	118	*Seconds*
2	254	*Seconds*
3	623	*Seconds*
4	128	*Seconds*
5	876	*Seconds*
Jumlah Total	1999	*Seconds*

Trajectory efficiency Number captureClick to apply

$$EL = \frac{\sum_{i=1}^{k} STi}{K.C} X100\% = \frac{118}{1.400} X100\% = \frac{118}{400} X100\% = 29{,}5\%$$

Balens Dilay on Falidation and number printing

$$BD = 1\frac{(K.C) - \sum_{i=1}^{k} STi}{K.C} X100\% = \frac{(1X333) - 254}{(1X333)} X100\%$$

$$= \frac{333 - 254}{333} X100\ \% = 24\%$$

Tabel 3. Calculation Result Table Trajectory Efficiency And Balens Dilay

No	Calcutalion Information	Work Station	Percentage
1	Cycle time	333 *Seconds*	
2	*Balens Dilay*	Falidadi dan cetak nomor	24%
		Poli	1%
		Kasir	62%
		Farmaasi	9%
3	Efisiensi lintasan	Falidadi dan cetak nomor	76
		Poli	99
		Kasir	38
		Farmaasi	91

The following is a comparison of the calculation of initial linebalancing and linbalancing den online registration. Comparison table of initial line balancing calculations and line balancing den online registration

Tabel 4. Comparison Table Of Trajectory Efficiency Calculation And Balens Dilay

No	Calcutalion Information	Work Station	Percentage	Work Station	Percentage
1	Sycel Time	400 *Seconds*		333 *Seconds*	
2	Balens Dilay	Number retrieval	70,5%	Falidadi and number printing	24%
		Registration	36,5%	Poly	1%
		Poly	55,8%	Cashier	62%
		Cashier	68%	Pharmacy	9%
		Pharmacy	119%		
3	Trajectory Efficiency Sycel Time Balens Dilay	Number retrieval	29%	Falidadi and print the number	76%
		Registration	63%	Poly	99%
		Poly	115%	Cashier	38%
		Cashier	32%	Pharmacy	91%
		Pharmacy	219%	333 *Seconds*	

From the above results, a comparison of the efficiency value of each workstation is obtained.

1. In taking numbers, which were originally 29% and registering 63% with the existence of online registration, patients fill out registration from home via the available web and after online registration, taking numbers and registration are combined into one, increasing to 76%. With the calculation of the initial balens delay in taking numbers 70.5% and in registration 36.5% with the registration app combined into Falidadi and printing numbers 24%.
2. In the poly that was originally Oferlod with an efficiency value of 115% with the application can be 99%.
3. Cashier with an initial 32% increased to 38%.
4. Pharmacy experienced oferlod with a value of 2019% experienced a normal decrease of 91%. the beginning in pharmacy119% dropped dramatically to 9%.

Proposal/output

Here is a view of the application for patients

Figure 1. registration menu

The picture above is a display of the online registration menu that patients can access from home via smatpone and lapotop provided there is an internet network.

Figure 2. Display after the patient fills in the online data
Display after the patient fills in the online data through the available web

Figure 2. After filling the web will get a WA message
After filling the web will get a WA message

Figure 3. wa message embedded ling
In the wa message embedded ling, when opened the display as above.

Login menu display of integrated health center application

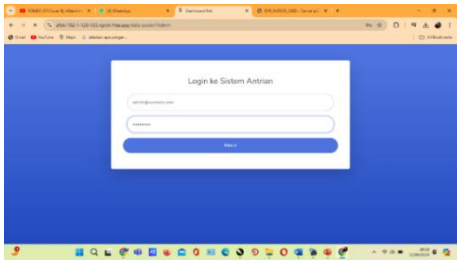


Figure 4. Login menu display

Admin menu display

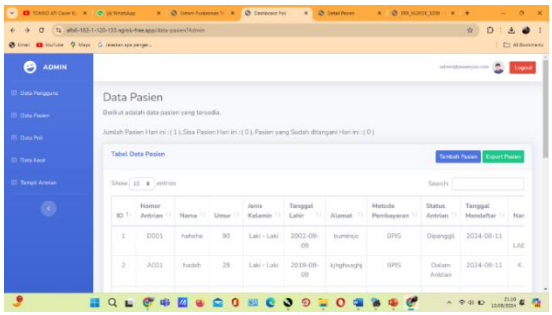


Figure 5. Admin menu display

in the admin menu there is an overall menu of integrated applications, can see patient data details, print patient data, completed transaction details and existing poly desails.

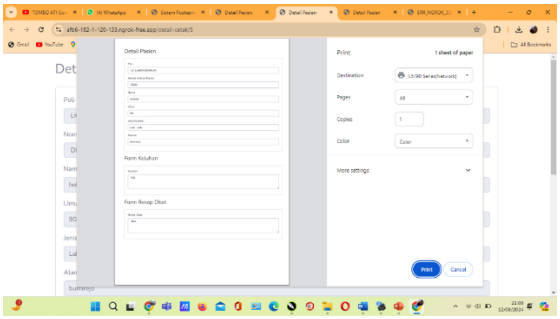
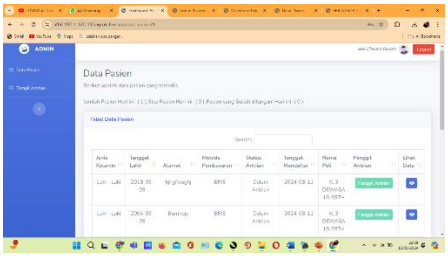


Figure 6. data details and print patient data
The image above is patient data details and print patient data
Poly view



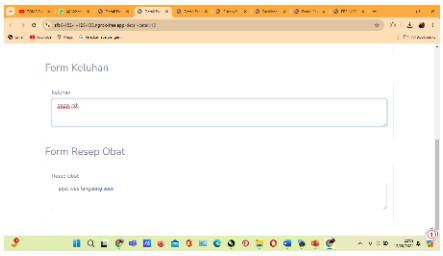


Figure 7. Poly view

Where poly can fill from complaints and from prescription drugs. The patients in the clinic have been divided into patients so they are not mixed like in the admin.

CONCLUSION

This study aims to solve queuing problems with the line balancing method and develop an online registration application at the Grogol Health Center that can improve the efficiency of the patient registration process and reduce waiting time. Based on line balancing calculations, the application succeeded in reducing the proposed waiting time in taking numbers which were originally 29% and 63% registration with the online registration of patients filling out registrations from home via the available web and after online registration taking numbers and registration combined into one increased to 76%. With the calculation of the initial delay balens on taking numbers 70.5% and on registration 36.5% with the registration app combined into validation and printing numbers 24%. Pharmacy experienced oferlod with an initial trajectory efficiency value of 2019% decreased to normal 91%. The initial balens delay in pharmacy119% dropped dramatically to 9%.From the calculation of line balancing, it can be seen that by providing online registration and integrated applications, it can cut the time that initially the patient comes to take the number and queue to input the data, after there is online registration the patient comes for validation and ctak number only and has specified visiting hours. And in the pharmacy there is no need to wait for a doctor's prescription, when the doctor inputs the doctor's prescription it will automatically go to the pharmacy and to the cashier.

REFERENCES

Mayangsari, Y., & Prastiwi, E. H. (2016). Bank mandiri teller queuing system as an effort to improve transaction speed efficiency. Journal of Economics & Business, 1(1), 49-60.

Decree of the Minister of Health of the Republic of Indonesia Number 129 / Menkes / SK / II / 2008

Hutabarat, Y. (2022). Line Balancing Analysis with the Young Moodie Method of Production Process of Krasi Lutvi Tuntungan 2 Chips Factory (Doctoral dissertation, Medan Area University).

Sakiman, S., Arfah, M., & Suliawati, S. (2022). Line Balancing Analysis to Increase Rempeyek Production. Engineering Main Bulletin, 18(1), 16-20.

Andriansyah, A. (2017). The Role of the Head of the Community Health Center in Improving Social Security Agency Services in Palmerah District, West Jakarta. SPEKTRUM: Journal of Social and Political Sciences, 14(2).

Ilham, Husein Hi. Moh Saleh, Asngadi. (2020) “Analysis of Queuing Service System at Bank Bni Syariah Palu City Branch”. Journal of Management Science, Tadulako University Vol. 6, No. 1, January 2020, 020 - 031

Putri, N. R., Guspianto, G., & Hubaybah, H. (2022). The Effect of Perceived Quality of Service on Patient Satisfaction Level at Sungai Tutung Health Center in 2022. Jambi Community Health Journal, 6(2), 7-16.