ISSN 2673-0200 (print) ISSN 2673-0251 (online)

Original article

Received: July 19, 2024
Revised: Oct. 5, 2024
Accepted: Oct. 15, 2024
Published: Oct. 15, 2024

Improving Waiting Time in an Oncology Outpatient Clinic at a Tertiary Hospital

Chirawadee Sathitruangsak, Apinya Prisutkul, Tippawan Arundorn, Maliwan Songserm, Anongnart Ruangdam
Holistic Center for Cancer Study and Care (HOCC-PSU) and Medical Oncology Unit, Division of Internal Medicine, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla, Thailand

Abstract

Background: Long waiting times are a common problem in public referral centers. Thus, this study examines the effectiveness of a decision-making scheduling system that was implemented to reduce the waiting time in an oncology outpatient department (OPD) at a tertiary hospital in southern Thailand. **Methods:** We propose a new scheduling approach based on the Lean management system to reduce OPD waiting time without increasing healthcare resource use. In addition to the scheduled appointment slot, we applied a new scheduling system based on the following three key points: (1) review the necessity of laboratory tests for each patient before the visit date, (2) inform the patient regarding blood draws at arrival and obtain blood results before the doctor's consultation, and (3) reschedule new patients with their planned treatment start date. Using an in-house electronic hospital information system, we retrospectively reviewed patients who visited oncology OPD between January 2015 and December 2017, then compared the waiting time and number of patient visits before and after implementing the new scheduling system. The waiting time were determined and analyzed by Wilcoxon rank-sum test. **Results:** The total OPD waiting time of new patients significantly decreased from 361 minutes (interquartile range [IQR] 218.2–454) to 293 minutes (IQR 217–375; $p < 0.001$). The rate of new patients who received anticancer treatment within two visits was increased from 75.4% to 97% ($p < 0.001$). Correspondingly, the total OPD waiting time of follow-up patients was also significantly reduced from 213 minutes (IQR 113–332) to 122 minutes (IQR 53–217; $p < 0.001$). In addition, the new scheduling system reduced the average OPD time by 11.4% ($p < 0.001$). **Conclusion:** A decision-making scheduling system based on the use of existing capacity can effectively reduce waiting time in an oncology outpatient clinic.

Key Words: Outpatient clinics, Waiting time, Oncology, Appointments and Schedules, Real-world data

Corresponding author: Chirawadee Sathitruangsak
E-mail: sjirawadee@gmail.com

ISSN 2673-0200 (print) ISSN 2673-0251 (online)

Introduction

Cancer has been identified as one of the leading causes of morbidity and mortality worldwide, with approximately 19.3 million new cases and 10 million cancer-related deaths reported in 2020 (Sung et al., 2021). In Thailand, the age-standardized cancer incidence rate per 100,000 people was 173.1 in men and 159.0 in women. Moreover, the age-standardized cancer mortality rate per 100,000 was 122 in men and 83.6 in women (International Agency for Research on Cancer, 2021).

Songklanagarind Hospital is one of the largest referral centers in southern Thailand. At our academic tertiary hospital, we provide multidisciplinary care for cancer patients in the southern part of Thailand. In 2019, the oncology outpatient clinic of our institute had 12,092 outpatient visits, which then increased to 13,220 outpatient visits in 2020. Based on our data, the number of outpatient visits has increased every year. However, the outpatient clinic has become more complicated and difficult to manage due to increasing patient numbers, higher patient expectations, multiple subspecialty medical care teams, teaching activities, and ongoing research. Most patients must spend long periods of time waiting. Some patients even have to go the hospital a couple of times before receiving any specific treatment for their diseases. This has resulted in a huge negative impact on both patients and their families (Naaz & Mohammed, 2019). It also affects doctors, nurses, and other medical providers (Luther et al., 2017; Rosenberg & Mechatie, 2018). The oncology outpatient clinic is usually run until late and often overtime.

Thus, to improve waiting times while maintaining the quality of care, we have applied the Lean management system (Lean) to focus on improving the value of healthcare services and minimizing waste. Lean is a principle-based management system for continuous quality improvement, originally derived from the Toyota Production System, which has been applied to healthcare to enhance the quality and cost-effectiveness of services. Important performance indicators of a Lean organization in a healthcare system include the waiting time and repeat visits (Young et al., 2004).

Using our in-house electronic medical records (EMR), Songklanagarind Hospital utilizes scheduled appointment slots to avoid overbooking patients per clinic session. However, the problem of overcrowding in the oncology clinic due to a large number of patients with cancer and a suboptimal number of attending oncologists remains unresolved. Thus, to improve the ordinary appointment system, we introduced a new appointment scheduling system in September 2015. In this system, a dedicated staff reviews the medical history of new patients, the necessity for preliminary blood tests, and their appointments with other clinics. Staff members inform the patient regarding blood draws upon arrival at the clinic that day and obtain their blood test results, which are then processed before the doctor consultation (Figure 1). In addition, staff then reschedules appointments for the same date with other clinic or for the treatment start date. In some cases, staff contacts patients to obtain the preliminary investigations from other hospitals, in order to reduce the number of visits and free up appointment slots for other patients.

The most important expected benefit of the proposed appointment scheduling system is expected to be significantly beneficial as it will reduce patient waiting time in the oncology clinic and minimize repeated visits of new patients. Thus, this study aims to evaluate the efficacy of the different appointment scheduling systems as a means of reducing patient waiting time, which might lead to an increase in capacity and efficiency of the oncology outpatient clinic at a tertiary hospital.

Methodology

Study Design

This study was a retrospective cross-sectional study conducted among patients attending the oncology outpatient clinic at Songklanagarind Hospital, Hat Yai,

ISSN 2673-0200 (print) ISSN 2673-0251 (online)

Songkhla, Thailand, between January 2015 and December 2017. The data were extracted from the EMR by the Division of Digital Innovation and Data Analytics (DIDA), Faculty of Medicine, Prince of Songkla University. We included all patients aged ≥18 years old who visited the oncology outpatient clinic during the data collection period. The electronic medical record was reviewed retrospectively. The data were collected and entered in Microsoft Excel version 2019.

Outcomes

In this study, the outcome measured was the waiting time before and after the initiation of an appointment scheduling system in the oncology outpatient clinic. Waiting time was defined as "the time that the patient waits for services in the oncology clinic per visit" and was measured from the time the patient registered at the oncology clinic to the time the patient left the clinic. Captured data included the following time points: T0, time of registration at the oncology clinic; T1, time of blood obtained; T2, time of blood results reported; T3, time of attendance by an oncologist; and T4, time of discharge from the clinic. The waiting times for each process were collected for individual patients as follows: waiting time before blood obtained (T1–T0), waiting time before receiving blood test results (T2–T0), waiting time before consulting doctor (T3–T0), and total waiting time in the oncology clinic (T4–T0). We have also recorded the number of visits that occurred before the patient received anticancer treatment (Figure 1).

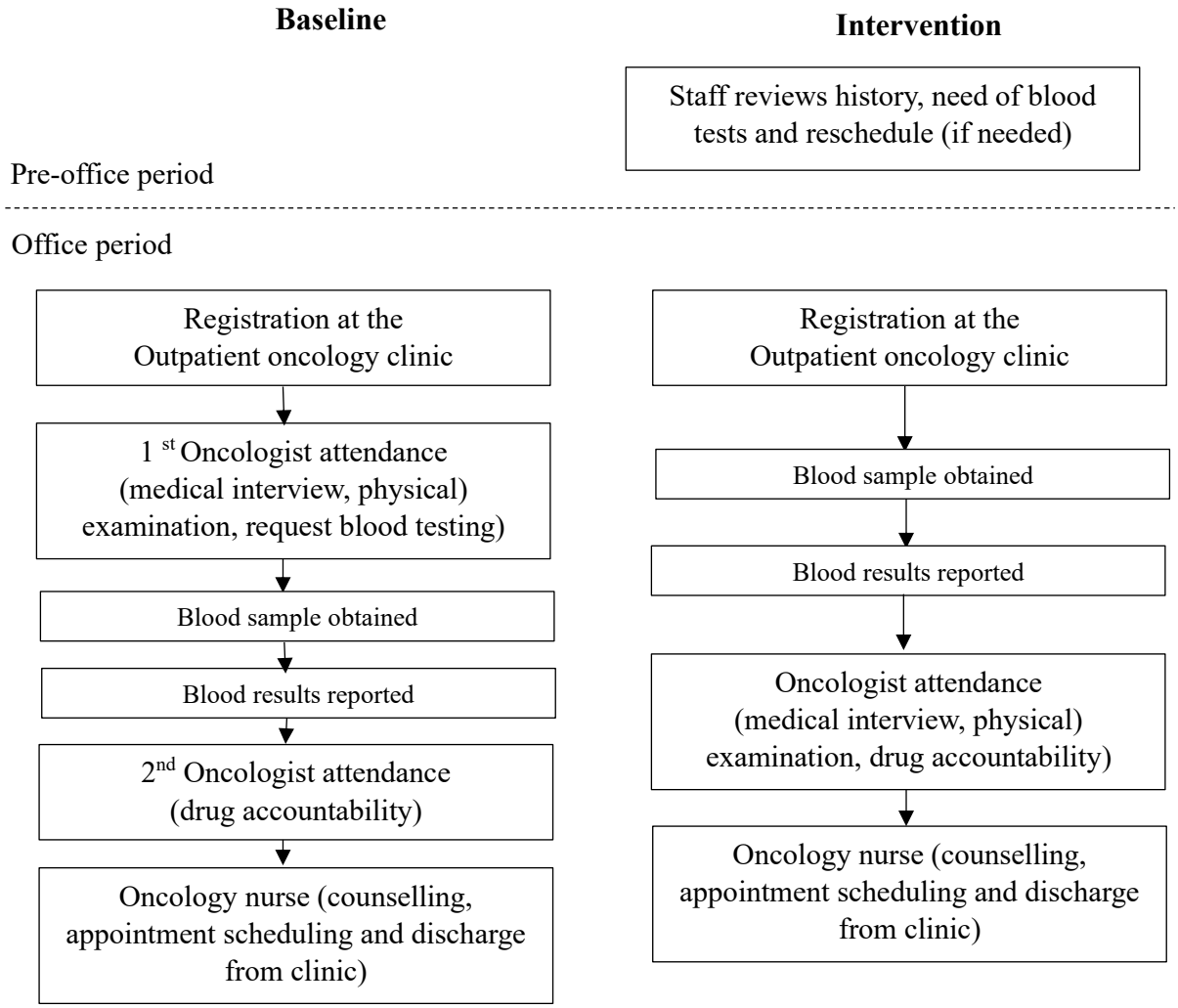


Figure 1. Schema of the oncology outpatient clinic flow in the new patient group.

ISSN 2673-0200 (print) ISSN 2673-0251 (online)

Data Collection and Measurements

The measurement process of our in-house EMR captured the occurrences of events as discrete time points within each patient's visit. These data were automatically recorded when the patients were contacted at each service point. The captured data were validated and maintained in a computerized database for analysis.

Statistical Analysis

We performed statistical analyses using R program version 4.1.1 (R Core Team (2021), n.d.). Descriptive statistics were used in this study. Continuous data were presented as medians and interquartile ranges (IQR). The Wilcoxon rank-sum test was used to test the differences in waiting time between groups. Chi-square was used to test the difference in categorical variables between groups. The level of statistical significance was set at $p < 0.05$.

Ethical Considerations

This study was approved by the Ethic Committee on Human Research (Ref No. REC 60-165-14-1) of the Faculty of Medicine, Prince of Songkla University, in accordance with the principle of the Declaration of Helsinki and the International Conference on Harmonization in Good Clinical Practice. No personal data were collected in this study. All information with regard to the patients' personal identification was concealed. The analyses were performed on aggregated data.

Results

In total, 4,124 patient visits were included in this study. Most were follow-up visits (3,127 visits), and the remainder were new patients (997 visits) who attended the oncology clinic for the first time. Among these new patients, 464 patients were in the preintervention period (baseline), whereas 533 patients were in the postintervention period.

After the new appointment scheduling system was introduced, the average waiting time of the new patient group was noted to decrease significantly [time to blood drawn (59.5 vs 152 minutes, $p < 0.001$), time to blood test reported (134 vs 228 minutes, $p < 0.001$)], except for the time to doctor consultation (162 vs 135 minutes, $p = 0.33$), because patients in the intervention group had their blood tests processed before the doctor consultation. However, this difference was not statistically significant (Table 1).

Table 1 Average waiting time baseline and after the intervention period

Waiting time	Average waiting time (minutes)					
	New patients			Follow-up patients		
	Baseline (n = 464) Median (IQR)	Intervention (n = 533) Median (IQR)	*P*-value [a]	Baseline (n = 1,456) Median (IQR)	Intervention (n = 1,671) Median (IQR)	*P*-value [a]
Before blood drawn	152 (102.5–222)	59.5 (32–118)	<0.001*	97.5 (57.5–202)	59 (25–85.5)	<0.001*
Before blood test reported	228 (183–287.5)	134 (39.2–192.8)	<0.001*	67 (44–108)	62 (39.5–90)	<0.001*
Before doctor consultation	135 (58.2–271)	162 (66–264.5)	0.33	144 (50–252.5)	81 (26–161)	<0.001*
Total waiting time	361 (218.2–454)	293 (217–375)	<0.001*	213 (113–332)	122 (53–217)	<0.001*

[a] Wilcoxon Rank sum test. * Statistical significance (*P*-value < 0.05)

During the preintervention period, the average total time spent of the new patient group in the oncology clinic was 361 minutes (approximately 6 hours; IQR 218.2–454) from the time the patient arrived until discharge from the clinic. However, the average total time was significantly reduced to 293 minutes (approximately 5 hours; IQR 217–375) during the postintervention period ($p < 0.001$; Table 1 and Figure 2).

ISSN 2673-0200 (print) ISSN 2673-0251 (online)

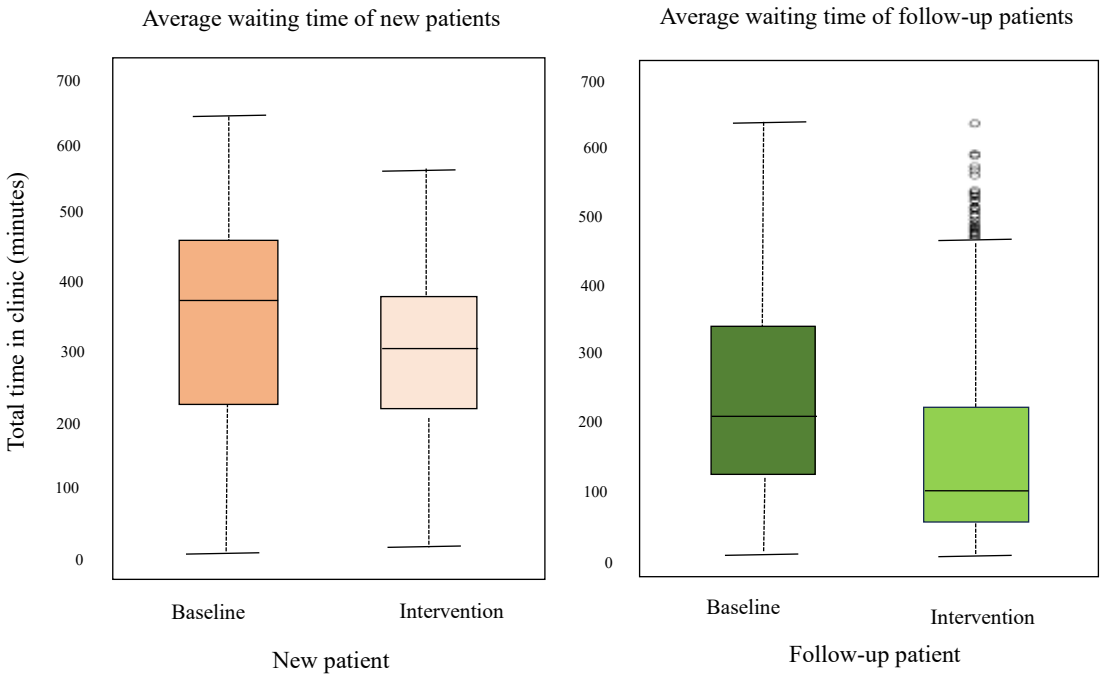


Figure 2. Average total time of each patient group spent in the oncology clinic at baseline and after the intervention period

After the introduction of the new appointment scheduling system, the average waiting time was significantly reduced at all time points in the follow-up patient group (Table 1). After the intervention, patients went to their doctor consultation at 81 minutes after registration (IQR 26–161), as compared with 144 minutes (IQR 50–252.5) in the preintervention period ($p < 0.001$). Likewise, after the intervention was introduced, the average total time spent in the clinic was 122 minutes (approximately 2 hours; IQR 53–217) as compared with 213 minutes (approximately 3.5 hours; IQR 113–332) before the intervention ($p < 0.001$; Figure 2).

Among the follow-up patient group, 58.7% of patients spent more than 3 hours in the oncology clinic before the new appointment scheduling system was introduced, as compared with 33.4% of patients after its implementation (Table 2). However, no significant difference was observed in the new patient group ($p = 0.93$).

Table 2 Overall waiting time in the oncology clinic

	New patients		*P*-value [a]	Follow-up patients		*P*-value [a]
	Baseline, n (%)	Intervention, n (%)		Baseline, n (%)	Intervention, n (%)	
<3 hours	89 (19.2)	100 (18.8)	0.93	600 (41.3)	1,112 (66.6)	<0.001*
>3 hours	375 (80.8)	433 (81.2)		853 (58.7)	557 (33.4)	

[a] Chi-square. * Statistical significance (*P*-value < 0.05)

In the new patient group, the median number of visits before starting anticancer therapy was two visits before implementation of the new appointment scheduling system (IQR 1–2) compared with one visit after its implementation (IQR 1–2; $p < 0.001$). In the preintervention period, 75.4% of new patients received anticancer treatment within two visits, which increased to 97% in the postintervention period ($p < 0.001$; Table 3).

ISSN 2673-0200 (print) ISSN 2673-0251 (online)

Table 3 Number of visits before receiving anticancer treatment among the new patient group at baseline and after the intervention period

Number of visits	Baseline, n (%)	Intervention, n (%)	*P*-value [a]
1–2	350 (75.4)	517 (97)	<0.001
≥3	114 (24.6)	16 (3)	

[a] Chi-square. * Statistical significance (*P*-value < 0.05)

The interventional appointment scheduling system was also noted to significantly reduce the average total OPD time by 11.4% as compared with conventional patient scheduling (Table 4). The average total OPD time during the preintervention period was 587 minutes (9 hours 47 minutes; IQR 550.8–627), and it was significantly reduced to 520 minutes (8 hours 40 minutes; IQR 483–555.5) in the postintervention period ($p < 0.001$).

Table 4 Average clinic time at baseline and after the intervention period

Average clinic time (minutes)		*P*-value [a]	Percent decrease
Baseline Median (IQR)	Intervention Median (IQR)		
587 (550.8–627)	520 (483–555.5)	<0.001	11.4

[a] Chi-square. * Statistical significance (*P*-value < 0.05)

Discussion

The waiting time in an outpatient clinic has been identified to be an important indicator of the efficiency of the health facility and is also related to patient satisfaction (Al-Harajin et al., 2019). A long waiting time can have a huge negative impact on both patients and families, for example, in terms of stress, frustration, traveling costs, reduction in adherence, and so forth (Hamel et al., 2014). In addition, it also affects doctors, nurses, and other medical providers. Extended work shifts are associated with increased physical fatigue, exhaustion, and lower quality of care (Luther et al., 2017). Thus, reducing waiting time can lead to an enhancement in outpatient clinic circulation, improvement in patient satisfaction, and better performance of medical personnel. Therefore, projects that aim to improve waiting time are justified primarily by the reduction in waiting time and number of visits required before starting treatment.

Measuring patient wait time allows for determining and monitoring the effectiveness of the clinic's performance. The Patient's Charter of the United Kingdom (UK) Government recommends that all patients must be seen within 30 minutes of their appointment time (Lee et al., 2022). In this study, although a statistically significant reduction in waiting time was accomplished using the new scheduling system, we have not yet met the 30-minute recommendation. Long patient waiting times are common in health facilities in developing countries. Several studies have shown that patients often spend 2 to 4 hours in the outpatient clinic before a consultation with their physician (Biya et al., 2022).

In the tertiary clinic setting, common reasons for the long waiting time include a large number of patients, the complexity of disease, and an insufficient number of attending physicians. Highly specialized clinics can have various challenges that require different interventions to overcome these contributing factors. Previous studies have shown that an appropriate scheduling system improved the patient waiting time, for example, a staggered appointment system that is based on expected consultation time (Barlow, 2002; Hong et al., 2013; Su & Shih, 2003). However, there is no standard guideline on the most optimal consultation time. Therefore, to achieve the standard of

ISSN 2673-0200 (print) ISSN 2673-0251 (online)

care with an appropriate waiting time, the scheduling system should be adjusted to the requirements of health facilities and the type of patients attending the clinic.

We have designed a new scheduling system to overcome these challenges. In this study, we demonstrated that the new appointment scheduling system can improve the quality of outpatient care by reducing waste in the form of waiting time and unnecessary repeated visits. An insufficient number of attending staff is a known factor for lengthy waiting times in outpatient clinics (Oche & Adamu, 2013). To minimize this confounding factor, we retrospectively collected patient data between January 2015 and December 2017, on account of the same two oncologists attending the outpatient clinics during this period. Although the number of patient visits was higher in the postintervention period, the total waiting time was decreased significantly among both new patients and follow-up patients. In addition, the average total clinic time was also significantly reduced after implementing the new scheduling system. These results thus reflect the effectiveness of the new scheduling system in terms of reducing waiting time in an oncology outpatient clinic at our institute.

From our results, appropriately scheduling new patients can have an influence on the waiting time of follow-up patients as well. After implementing the new scheduling system, the waiting time of the follow-up patients was significantly reduced at all service time points. In addition, a significantly greater number of follow-up patients spent less than 3 hours in the clinic compared with the preintervention period. As a result of reducing patient waiting time, the total clinic time was shortened, despite the higher number of patients in the postintervention period. This was probably due to the better sequence of patients in a clinic session and an improvement in service flow within the clinic. In addition, the application of the new scheduling system has also significantly reduced the number of visits required before initiating anticancer therapy.

This study also reflected the overcrowding oncology outpatient clinic in the referral hospital and the insufficient number of specialists in a real-world situation. An ordinary solution usually depends primarily on adding additional human workers. By improving the scheduling system, a more effective flow can reduce patients' waiting time without adding any human resources in the clinic. A key strength of this study was the accurate time recorded by the computerized EMR. However, the limitations of this study are as follows: First, there were no data on patient and medical personnel satisfaction. The doctor consultation time was also not included in the study. In addition, we did not report the nonattendance rates of new cases. Finally, this study did not include the time required for bill payment, medication pickup at the pharmacy, or chemotherapy administration. Thus, further studies are needed to assess patient satisfaction with clinic services and the duration of waiting time as well as the satisfaction of medical personnel regarding improving their services to patients.

Overall, the findings of this study suggest that the new appointment scheduling system in our oncology outpatient clinic based on using existing capacity (structure and personnel) more effectively and improving schedule planning resulted in a reduction in OPD waiting time. This finding has several implications for both OPD practice and hospital operations.

Conclusions

An appointment system with adaptive decision-making is able to decrease OPD waiting time and clinic overtime. Hence, we propose the implementation of this appointment scheduling system in oncology outpatient clinics.

Acknowledgements

We thank Nannapat Pruphetkaew for statistical analyses.

Funding

This research was supported by the Faculty of Medicine, Prince of Songkla University.

Conflict of Interest

The authors declare no potential conflict of interest.

References

Al-Harajin, R., Al-Subaie, S., & Elzubair, A. (2019). The association between waiting time and patient satisfaction in outpatient clinics: Findings from a tertiary care hospital in Saudi Arabia. *Journal of Family and Community Medicine*, *26*(1), 17. https://doi.org/10.4103/jfcm.JFCM_14_18

Barlow, G. L. (2002). Auditing hospital queuing. *Managerial Auditing Journal*.

Biya, M., Gezahagn, M., Birhanu, B., Yitbarek, K., Getachew, N., & Beyene, W. (2022). Waiting time and its associated factors in patients presenting to outpatient departments at Public Hospitals of Jimma Zone, Southwest Ethiopia. *BMC Health Services Research*, *22*(1), 107. https://doi.org/10.1186/s12913-022-07502-8

Hamel, L. M., Chapman, R., Eggly, S., Penner, L. A., Tkatch, R., Vichich, J., & Albrecht, T. L. (2014). Measuring the Use of Examination Room Time in Oncology Clinics: A Novel Approach to Assessing Clinic Efficiency and Patient Flow. *Journal of Oncology Practice*, *10*(6), e385–e389. https://doi.org/10.1200/JOP.2013.001359

Hong, T. S., Shang, P. P., Arumugam, M., & Yusuff, R. M. (2013). Use of simulation to solve outpatient clinic problems: A review of the literature. *South African Journal of Industrial Engineering*, *24*(3), 27–42.

International Agency for Research on Cancer. (2021, March). *Population Fact Sheet: Thailand*. The Global Cancer Observatory.

Lee, H., Choi, E. K., Min, K. A., Bae, E., Lee, H., & Lee, J. (2022). Physician-Customized Strategies for Reducing Outpatient Waiting Time in South Korea Using Queueing Theory and Probabilistic Metamodels. *International Journal of Environmental Research and Public Health*, *19*(4), 2073. https://doi.org/10.3390/ijerph19042073

Luther, L., Gearhart, T., Fukui, S., Morse, G., Rollins, A. L., & Salyers, M. P. (2017). Working overtime in community mental health: Associations with clinician burnout and perceived quality of care. *Psychiatric Rehabilitation Journal*, *40*(2), 252–259. https://doi.org/10.1037/prj0000234

Naaz, F., & Mohammed, I. (2019). A time motion study to evaluate the average waiting time in OPD with reference to patient satisfaction in the setting of state-level AYUSH Hospital (India). *Medical Journal of Islamic World Academy of Sciences*, *27*(3), 71–76. https://doi.org/10.5505/ias.2019.89410

Oche, M., & Adamu, H. (2013). Determinants of patient waiting time in the general outpatient department of a tertiary health institution in north Western Nigeria. *Annals of Medical and Health Sciences Research*, *3*(4), 588–592. https://doi.org/10.4103/2141-9248.122123

R Core Team (2021). (n.d.). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

Rosenberg, K., & Mechatie, E. (2018). Overtime Negatively Affects Nurses' Collaboration with Coworkers. *AJN, American Journal of Nursing*, *118*(8), 64. https://doi.org/10.1097/01.NAJ.0000544169.61725.9b

Su, S., & Shih, C.-L. (2003). Managing a mixed-registration-type appointment system in outpatient clinics. *International Journal of Medical Informatics*, *70*(1), 31–40. https://doi.org/10.1016/s1386-5056(03)00008-x

Sung, H., Ferlay, J., Siegel, R. L., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2021). Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA: A Cancer Journal for Clinicians*, *71*(3), 209–249. https://doi.org/10.3322/caac.21660

Young, T., Brailsford, S., Connell, C., Davies, R., Harper, P., & Klein, J. H. (2004). Using industrial processes to improve patient care. *BMJ (Clinical Research Ed.)*, *328*(7432), 162–164. https://doi.org/10.1136/bmj.328.7432.162