MEASURING THE PROPORTION OF TIME SPENT ON WORK ACTIVITIES OF CLINICAL PHARMACISTS AT A PUBLIC HOSPITAL AND THE PUBLIC PERCEPTION AND SATISFACTION TOWARDS HOSPITAL PHARMACISTS' SERVICES IN MALAYSIA

KONG KIAN KEONG

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by

KONG KIAN KEONG

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LIST OF ABBREVIATIONS

IQR	Intequartile range
SD	Standard deviation
CI	Confidence interval
FRP	Fully registered pharmacist
PRP	Provisionally registered pharmacist
OTC	Over-the-counter
PhIS	Pharmacy information system
DOSM	Department of Statistics Malaysia
SP	Study period

LIST OF APPENDICES

MENGUKUR KADAR MASA YANG DIGUNAKAN OLEH AHLI FARMASI KLINIKAL UNTUK AKTIVITI KERJA DI HOSPITAL AWAM DAN TAHAP PERSEPSI DAN KEPUASAN ORANG AWAM TERHADAP PERKHIDMATAN AHLI FARMASI HOSPITAL DI MALAYSIA

ABSTRAK

Peranan ahli farmasi adalah berdasarkan jangkaan dan pengaruh orang awam sama ada mereka memperoleh perkhidmatan farmasi ataupun tidak. Pemahaman mengenai peranan ahli farmasi daripada perspektif orang awam masih terhad di Malaysia. Kini, bukti saintifik mengenai skop kerja dan sumbangan ahli farmasi di hospital awam yang membuahkan hasil berkaitan kesihatan masih terhad. Kajian ini bertujuan unutk mengenalpasti peranan dan jenis kerja yang dijalankan oleh ahli farmasi yang bertugas di hospital awam daripada perspektif pemerhati dan perspektif orang awam. Kajian ini dijalankan menggunakan dua fasa. Kajian fasa pertama dijalankan dengan menggunakan teknik persampelan kerja yang melibatkan 1455 kali pemerhatian secara rawak oleh dua pemerhati terhadap aktiviti-aktiviti lima orang ahli farmasi klinikal yang bekerja di hospital awam untuk jangka masa 30 hari dan telah mencatatkan sebanyak 3493 peristiwa. Secara keseluruhan, ahli farmasi menggunakan 78.8% (n=2751) daripada masa bekerja untuk melaksanakan perkhidmatan farmasi klinikal manakala 12.3% daripada masa bekerja untuk menjalankan aktiviti yang tidak berkaitan dengan farmasi klinikal. Kajian ini juga mencatatkan sebanyak 8.9% masa tidak digunakan untuk apa-apa kerja. Ahli farmasi klinikal didapati mempunyai purata unit kerja kumulatif yang lebih tinggi apabila diperhatikan oleh permerhati (Mean =9.8, SD = 4.3) berbanding dengan purata unit kerja kumulatif yang lebih rendah

(Mean =6.5, SD = 4.6) tanpa kehadiran pemerhati (p=0.005). Secara keseluruhannya, sebahagian masa ahli farmasi klinikal telah dihabiskan untuk menjalankan aktiviti bukan bidang farmasi klinikal di hospital awam. Pelbagai usaha yang dilakukan oleh ahli farmasi klinikal tidak ditangkap oleh sistem maklumat pelaporan kerja. Tanggungjawab ahli farmasi klinikal dengan kerja bukan klinikal harus dikurangkan supaya mereka boleh meluangkan lebih banyak masa dalam penjagaan pesakit. Kajian fasa kedua dijalankan terhadap golongan orang awam dengan menggunapakai satu borang soal selidik yang telah diterjemah dan divalidasi yang merangkumi empat bahagian: 1. data demografik, 2. tahap persepsi dan 3. tahap kepuasan pelanggan. Terdapat 479 borang kajian yang lengkap diperoleh di mana kadar pembalasan menghampiri 91.6%. Kajian ini menunjukkan skor median persepsi orang awam ialah 83 (IQR 15) manakala skor median kepuasan pelanggan pula mencatatkan 38 (IQR 33). Skor persepsi orang awam telah menunjukkan perbezaan yang signifikan (p < 0.05) berdasarkan umur, kumpulan lokaliti, dan kumpulan peringkat pendidikan. Manakala, skor kepuasan pelanggan pula menunjukan perbezaan signifikan (p < 0.05) dalam kategori lokaliti dan tahap peringkat pendidikan. Kesimpulanya, orang awam mempunyai persepsi positif terhadap peranan ahli farmasi dan berpuas hati dengan perkhidmatan farmasi yang diberikan oleh ahli farmasi. Walaubagaimanapun, masih terdapat sedikit kesalahfahaman mengenai persepsi tugas ahli farmasi dalam kalangan masyarakat.

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ABSTRACT

The role and work activities of hospital pharmacists have recently changed under the impact of the public services revamp in Malaysia, with a scarcity of updated evidence available today. Furthermore, the evidence on the public's perception of hospital pharmacists was still lacking in Malaysia. This study aimed to identify the role and work activities of public hospital-based clinical pharmacists from the observer's and the general public perspective. The study was conducted in two phases. In the first phase, a work sampling study was conducted by making 1455 random observations using two observers over 30 days on the work activity of 5 clinical pharmacists working in the public hospital. A total of 3493 events were recorded. Overall, clinical pharmacists spent 78.8% (n=2751) of their time providing clinical services whereas 12.3% (n=433) of their time was spent on non-clinical activities. They were found to be idle from work for 8.9% of the time. Clinical pharmacists were found to report a higher average daily cumulative work unit of 9.8 (SD = 4.3) when under observation compared to an average daily cumulative work unit of 6.5 (SD = 4.6) when no observer was present (p=0.005). In general, a significant amount of time of the clinical pharmacist in the public hospital was spent on non-clinical work. Many efforts spent by the clinical pharmacists were not captured by the work reporting information system. Their burden with non-clinical work should be reduced so they

can allocate more time to providing patient care. In the second phase study, a self-developed, validated questionnaire consisted of: part 1 of demographic data, part 2 of the level of perception, and part 3 of the level of satisfaction were used. 479 sets of completed questionnaires were collected which yielded a 91.6% response rate. The median total public perception score was 83 (IQR 15) whereas the median total public satisfaction score was 38 (IQR 33). The public perception score was significantly different ($p < 0.05$) among the age group, respondents' locality group, and education level group. However, the public satisfaction score was significantly different ($p < 0.05$) among the respondents' locality group and education level group. Overall, the general public had a favorable perception level of the role of pharmacists and they were generally satisfied with the community pharmacy service despite the services being underutilized. However, a minor misconception among the public on the perception of the role of pharmacists still existed.

CHAPTER 1

INTRODUCTION

1.1 Background

The development of the Malaysian pharmacy services can be explained in part by the history of the independence of Malaysia. The public pharmacy services were started in Malaysia in 1951 during the British colonization period. The core pharmacy services were confined fundamentally to procurement, storage, and distribution of drugs at that time (Hassali et al., 2016; Fathelrahman, Ibrahim and Wertheimer, 2016). Since then, the focus of pharmaceutical services has gradually shifted towards enhancing patient safety, drug therapy optimization, and medication error prevention (Sing, 2001). In the 1990s, the further expansion of pharmacy service was hindered by the emergence of a pharmacist shortage (Pharmaceutical Service Programme, 2013; Hassali et al., 2016). This dynamic shortage was due to the rapid increase in the demand for pharmacists, coupled with a constrained ability of the Malaysian academic institutions to increase the supply of the pharmacist workforce.

The factors causing the pharmacist shortage are of a nature not likely to abate shortly without fundamental changes in education and the pharmacy practice. The Malaysian government has taken a few measures to increase the number of pharmacists in the country. One of the key measures taken by the Malaysian government was to increase the number of academic institutions offering undergraduate pharmacy courses (Sing, 2001). Additionally, the Pharmacy Board Malaysia had mandated a 3-year compulsory service program in the public sector for all pharmacy graduates in Malaysia as a remedial measure to control the serious

shortage of pharmacists in the public services since 2005 (Hassali et al., 2016; Pharmaceutical Service Programme, 2013; Sing, 2001). As a result of this intervention, the number of pharmacists retained in the public sector increased significantly and this made the establishment and expansion of clinical pharmacy services within the Ministry of Health possible. The duration of compulsory service was then subsequently reduced to one year in 2011 given the gradual blooming number of pharmacy graduates leaving the university and looking for training positions in the public sector.

Over the years, the pharmacy services in the hospitals operated by the Malaysia Ministry of Health have been expanded to various services which included inpatient pharmacy, clinical pharmacy service, medication therapy adherence clinic (MTAC), home medication review, non-sterile pharmacy, clinical pharmacokinetic services, oncology pharmacy service, parenteral nutrition service, methadone replacement therapy, drug information service, nuclear pharmacy service, and procurement and supply services (Hassali et al., 2016; Pharmaceutical Service Programme, 2022). The specialty in the field of pharmacy has not been established and defined. It is common to acknowledge the pharmacists by the service they provided in the hospital. For instance, the pharmacists who worked in the therapeutic drug monitoring (TDM) unit were acknowledged as TDM pharmacists while those who worked in the parenteral nutrition (PN) preparation unit was acknowledged as PN pharmacists.

The definition of 'clinical pharmacy' has been widely discussed worldwide with no consensus on the definition nor its job description. Rest assured, the clinical pharmacy service was described under the inpatient pharmacy service in the Malaysia

Pharmaceutical Services, Ministry of Health Malaysia. The job description of the clinical pharmacists (or ward/ inpatient pharmacists which were used interchangeably in the guidelines) was detailed in the guidelines for inpatient pharmacy practice (Abida Haq et al., 2010), which included drug distribution activities, ward pharmacy activities and other clinical activities. The role of clinical pharmacists is more challenging compared to other fields of pharmacy as they have to be versatile and be adapted to many different pharmacy functions or activities in the hospital(Hassali et al., 2016). In addition, it had been reported that the pharmacists working in the major hospital also provided drug information to the healthcare professional and the general public, hence, further extending their role to the community.

The possible oversupply of pharmacists in the pharmacy industry has become a mounting concern among healthcare professionals and policymakers in 2010 as the number of pharmacists registered in Malaysia had been increasing over the years. In 2016, the pharmacy resident position in the public sector was saturated by the high number of pharmacy graduates and it was reported anecdotally that they had to wait for up to 9 months to get a hospital placement (Liew, 2021). In response to this critical situation in which the demand for resident positions exceeded the number of available training positions among pharmacy graduates in the public sector, a new contract-based employment system was implemented by the public services office to make more resident positions available in the public health sector. The fresh pharmacy graduates were hired on contract to work and complete their placement training in the public hospitals.

Table 1.1 Job scope of the clinical pharmacists as described in the Guideline of Inpatient Pharmacy Practice

Job activity	Responsibility and involvement	Description and Objectives
Drug distribution activities		
1. Unit dose system	Minor	i. To dispense prescribed drugs to patients in wards in a timely and efficient manner. ii. To avoid the occurrence of medication error iii. To minimize drug wastage iv. To minimize opportunities for drug diversion v. To maintain information on drug utilization and rational drug use vi. To identify unusual patterns of drug usage
2. Floor stock/ emergency trolley medications	Minor	
3. After hour office hours supply	Minor	
4. Supply of psychotropic medicines	Minor	
5. Supplies for discharged patients	Major	
6. Handling of referral letter and supply of medications for patients being referred to health facilities	Major	
7. Ward medication inspection	Major	
Ward pharmacy activities		
1. Medication history taking	Major	i. To gauge the patient's understanding of their medications ii. To ensure continuity of medication treatment iii. To elucidate information on non-compliance toward drug treatment iv. To ascertain if patients are taking other forms of medications such as supplements, over-the-counter (OTC) medicines, and herbal preparations v. To ensure that the most accurate patient medication list is available to all care providers, especially at the point of transition of care (admission, transfer and discharge). vi. To ensure timely and accurate documentation of a comprehensive list of patient's medications. vii. To ensure communication of this information across the continuum of care. viii. To reduce medication-related errors at each transfer of care. ix. To improve patient safety and optimize health outcomes x. To reduce medication discrepancies after the patient is discharged from the ward xi. To save cost through the use of patients' own drugs xii. To ensure better drug knowledge and to enhance compliance to medicines prescribed xiii. To make provision for continuity of care.
2. Case Clerking		
3. Pharmacotherapy rounds		
4. Medication review		
5. Medication reconciliation		
6. Medication counselling		
7. Discharge planning		

Other activities		
1. Clinical pharmacokinetic service	Major	Clinical Pharmacokinetic Service ensures safe and efficacious dosage regimens through the application of pharmacokinetic / pharmacodynamic principles and the determination of drug serum concentrations. At the same time this service provides invaluable information regarding the toxicity level of drugs with narrow therapeutic window.
2, Drug information service		i. Serve as effective providers of drug information. ii. All drug information requests from healthcare professionals / consumer / patients should be responded to immediately. iii. Prevent and reduce the occurrence of medication errors through the proper dissemination of drug information. iv. Improve awareness and knowledge on health among the public in the quality use of medicine and pharmaceutical products. v. Promote patient care through rational use of drugs
3. Adverse dryg reaction monitoring and reporting		
4. Medication error reporting		
5. Product complaint reporting		
6. Processing request for non-formulary medications		
Documentation	Major	i. Data collection through systematic documentation can be used for future planning and expansion of pharmacy services in the country. ii. Drug information enquiries during the ward rounds should also be recorded in the Clinical Pharmacy Report Form. iii. Areas of national importance such as cost savings and medication error reduction can be utilised to enhance a particular service.

(Abida Haq et al., 2010)

This contingency plan from the government has temporarily relieved the employment issue at that time while at the same time bringing impact to the pharmacy practice. The impact has led to a high staff turnover rate and an increased number of pharmacists leaving the public services to pursue alternative career progression in the private sector, particularly those who were employed on a contract basis (Atun et al., 2016). Pharmacists that remained in the public sector were required to share the work burden of those who had left on top of their usual job activities. As a result, the daily tasks of pharmacists particularly those who were involved primarily in clinical work were reassigned to take up non-clinical tasks that were out of their clinical specialties, such as managerial works and logistics arrangements. However, there has been limited up-to-date local research done on reporting the clinical pharmacist's work pattern in the hospital.

While it is important to review and update the role of hospital pharmacists, understanding the role of pharmacists from the general public's perspective is also vital in the delivery of health services and the health outcome. In the 21st century, the role of the pharmacist is expanding beyond the traditional product-oriented functions of distributing and dispensing medicines and other health supplies. Nowadays, pharmacists are in a position of greater impact in the shifting landscape of health care and public health, in which their roles include providing more patient-oriented service, carrying out administrative duties, and performing public health functions. Additionally, pharmacists have demonstrated to be an easily accessible resource for health supplies and information to the general public, regardless of their setting of practice. Hence, pharmacists are in the important position of educating the public and

improving the health literacy of the general public. According to the definition from the World Health Organization, health literacy is defined as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health"(Organization, 2022). Additionally, a study has demonstrated that pharmacists had an important role in improving patient health literacy and in preventing and reducing medical errors through continuous health education and counseling (Youmans and Schillinger, 2003).

Unlike the private healthcare sector, the Malaysian government health sector is the only place in which the dispensing separation is practiced comprehensively in Malaysia. Patients have to come to the pharmacy to obtain their medication supplies after seeing the doctor (Sing, 2001; Abdul Ghani, Kamaruddin and Mokhtar, 2021; FocusM, 2020). On top of that, hospital pharmacists were also delegated to prescribe medications under a doctor's supervision while managing certain medical conditions for patients. For instance, under the supervision of a doctor, hospital pharmacists were delegated to prescribe and adjust the dose of warfarin for patients with atrial fibrillation or mitral valve regurgitation (MTAC service); insulin for diabetic patients (MTAC service); inhaled corticosteroid and beta-2 agonist for asthmatic patients (MTAC service); adjusting the content of parenteral nutrition for patients with contraindications to enteral nutrition (PN service) (Pharmaceutical Service Programme, 2022). These were the expanded pharmacy services added along with the development of pharmacy services in Malaysia. As a result, patients need to have a good perception and satisfaction with the role played by hospital pharmacists in order

to have them engaged more with the healthcare services to achieve good health outcomes (Kember, Hodson and James, 2018).

The fact that pharmacists offer accessibility to the general population has made them a unique and rare healthcare entity among healthcare professionals. Pharmacists often offer health knowledge and promotion to the general public, in some cases 24 hours per day without a prior appointment required. They work in many different public settings such as hospitals, retail pharmacies, groceries store, and even some nursing care centers. By understanding the general public perspective of the role of pharmacists and maximizing their role, opportunities exist to better utilize their knowledge and skills to improve the public health outcome in Malaysia.

1.2 Theoretical Framework Of The Study

The theoretical framework of using the work sampling technique to measure the work activities of the clinical pharmacists in the hospital and the public perception level and the satisfaction level with the role of pharmacists is based on several key theories and concepts. One of the most important of these is the concept of work sampling, which is a statistical technique used to analyze the distribution of time spent by workers (which were referring to the clinical pharmacists in the present study) on various tasks. By using work sampling to observe hospital clinical pharmacists, researchers can gain valuable insights into how these professionals spend their time and how their work is perceived by the public.

Another key theoretical framework for this study is the concept of public perception level and the public satisfaction level, which were the way in which members of the public view a particular profession or occupation and whether they were satisfied with the services being provided. In the case of pharmacists, there are often misconceptions and misunderstandings about their role in healthcare. By surveying public perception and satisfaction, researchers can gain insights into the level of awareness and understanding of the role of clinical pharmacists in hospital settings. This can help inform future efforts to educate the public about the important work that these professionals do.

While exploring the perception and satisfaction of the role of hospital pharmacists from the general public's perspective, cross-studying the actual role performed by the pharmacists from the researcher's perspective could be beneficial in understanding what might be the gap between how the public's thought on hospital pharmacists could be doing and what the hospital pharmacists were actually doing. This information can be used to improve the way that hospital pharmacists are perceived and to provide more accurate information to the public about their roles and responsibilities. In the present study, a specific group of the subject of clinical pharmacists was chosen as the study target because their scope of work was the widest and hence able to represent the general hospital pharmacist compared to the pharmacists working in outpatient dispensary settings in which their core activities might be limited to a few such as counseling and dispensing.

Overall, the theoretical framework of this study is designed to provide a comprehensive understanding of the work of hospital clinical pharmacists and the

public perception of their role as pharmacists. By using work sampling and public perception and satisfaction surveys, researchers can gain valuable insights into the challenges and opportunities facing these professionals and develop strategies to improve their effectiveness and impact in healthcare settings. The findings of this study can be used to inform policy decisions, guide future research, and enhance the overall quality of healthcare services for patients.

1.3 Problem Statement

Adequate time allocation by clinical pharmacists in providing clinical care to the patient is the key to ultimate success in health outcome improvement. On the other hand, when time management is managed poorly due to inadequate delegation of work to others can end up exacerbating stress for the individual pharmacist, and lead to sub-optimal clinical care for patients. Based on the available literature, there is limited to-date research done on identifying the work pattern of the clinical pharmacists working in the hospital under the impact of the job employment change in the government system in Malaysia. It is unsure if the time spent by clinical pharmacists on clinical activities remained the same before the change.

The previous finding has shown that the extent to which the public perceived and accept the role of pharmacists would affect the extent the general public engages with the range of pharmacy services and hence the final health outcome. While the study is available on the perception and satisfaction of the public on the role of the community pharmacist, it is not sure if the public would demonstrate similar results when the scenario involves hospital pharmacists as there are not much local Malaysian

data available. Nevertheless, it is anticipated that there would be a different perception and satisfaction demonstrated by the public as both the hospital and community pharmacy are two different entities in the context of the Malaysian healthcare sectors, with the latter one being product-oriented service.

1.4 Rationale and Significance of The Research Project

The updated evidence on the changes in the role and work activities in the pharmacy services over the years is very limited in Malaysia. Additionally, the literature available on the role and the work activities of the clinical pharmacy in Malaysia was commonly referenced using studies from other countries. Moreover, the available studies have demonstrated that the work and contribution of clinical pharmacists are often underrepresented. Thus, there is a growing interest in research that evaluates and assesses the role of clinical pharmacists in the services delivering efficiency in the field of pharmacy.

On the other hand, the pharmacist's role may arise from the public's expectations, and hence influence whether the general public seeks advice and pharmacy services as desired. Previous studies have demonstrated that the important role of pharmacists is well recognized among other healthcare professionals in the hospital setting. However, the patient perspective on this matter was not widely explored in Malaysia. The results of the available studies conducted worldwide that assess the public's or patient's perception and satisfaction of the roles and responsibilities of pharmacies are common among community pharmacists but not among hospital pharmacists, with some demonstrating a good level of perception and

satisfaction while others indicating a lot of areas for improvement. In Malaysia, the available study conducted to investigate this aspect is still limited.

The findings of this study might serve as the baseline evidence for the Ministry of Health policymakers to have an insight into the role and work activities of the clinical pharmacists in the hospital under the impact of the high staff turnover rate as well as the extent of the general public's understanding on the role and services provided by the hospital pharmacists in Malaysia. Additionally, course correcting the perception or the awareness of hospital pharmacists among the general public might be beneficial in improving the service delivery mechanism from pharmacist to patients through a better mutual understanding of the role of the pharmacist in public hospitals in Malaysia.

1.5 Research Objectives

The general objectives of the present research were as follows:

(i) To determine the proportion of time spent by the clinical pharmacists on clinical activities, the range and the type of activities performed by the clinical pharmacists in the hospital;

(ii) To determine the general public's level of perception of the role of hospital pharmacists in Malaysia;

(iii) To determine the general public's level of satisfaction with the service provided by the hospital pharmacist in Malaysia

1.6 Thesis Overview

The thesis consists of five main chapters. Chapter 1 described the research project rationale, significance, aims, and objectives. Chapter 2 described the role of clinical pharmacists and different types of work activities and measurement methods, and provided a review of literature on the use of work sampling technique on measuring the work activity of clinical pharmacists working in the hospital setting, as well as how the public perception on the role of the hospital pharmacist, their satisfaction with the service provided could lead to pharmacy service utilization and eventually affecting the health outcome. Chapter 3 addressed the first objective with two specific objectives and one secondary objective by using the work sampling method approach in a selected public hospital. It assessed the range and types of work activities performed by the clinical pharmacists. In addition, it also estimated the proportion of time spent by them on different types of work activities. In chapter 4, the second and third study objectives were addressed with four specific objectives by using a questionnaire survey in all the states over the whole of Malaysia. It measured the level of the public perception of the role of hospital pharmacists, as well as their level of satisfaction with the pharmacy service provided. Comparison of perception level and satisfaction level between different groups of demographic factors were conducted. Chapter 5 drew the research overall conclusions and proposed recommendations for policymakers, healthcare professionals, and the possible future research direction.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

There have been changes in the role and work activities in the pharmacy services over the years whilst there is very limited and updated information on this area. There is an increasing interest among pharmacists in administration and in research that evaluates services and the productivity of the pharmacy department (Rascati, Kimberlin and McCormick, 1986). The work measurement in pharmacy services has become increasingly important and invaluable when it comes to policy change and implementation in Malaysia.

Work measurement can be traced to as early as the 19th century in a western country in which social reformer Robert Owen attempted to introduce an allowance of time for rest during work (Rutter, Brown and Jones, 1998). The further effort by Taylor and Gilbreth formed the foundations for work measurement in modern times based on a firm assertion that a job can be further broken down into many element parts and that each element can be timed repetitively to allow a reliable estimate of its contribution to the whole job.

To date, many different work measurement strategies have been known to be useful in determining the optimal assignment of duties and responsibilities to healthcare professionals of different skill and training levels (Rutter, Brown and Jones, 1998). An accurate assessment of the clinical and administrative work aspect of

healthcare professionals as shown in a study done to explore what the hospital doctors and nurse thought wasted their time in Iran suggested future research need on analyzing the workload of doctors and nurses in order to improve their efficiency at work (Bagheri Lankarani et al., 2019) and the clinical aspect of work in identifying inefficiencies, relocating resource, improving quality of care and evaluating performance as shown, were deemed important especially in the field of clinical pharmacy services (Sittig, 1992; Richard and Parrish, 2018).

2.2 The Work Measurement In The Field Of Pharmacy

2.2.1 Self-Reporting

This method of work measurement on the clinical pharmacists is through the self-reporting of work through the documentation of tasks completed by the pharmacists (Rutter, Brown and Jones, 1998). This documentation is usually derived from the records kept by the clinical pharmacists in the normal course of their work (Al-Jedai and Nurgat, 2012; Stuchbery et al., 2007b). Self-reporting work measurement is inexpensive and relatively easy to carry out. The potential downside of this self-reporting method is the high inaccuracy in the results. The validity of the self-reported workload is also limited to the subject's time availability and very often impeded by a large volume of work (Al-Jedai and Nurgat, 2012; Rutter, Brown and Jones, 1998; Kanmaz, Haupt and Peterson, 1997; Scott, McElnay and Burnett, 1996; Zimmerman, Smolarek and Stevenson, 1995).

In Malaysia, a computerized documentation system in pharmacy services was implemented in 2015 in which electronic documentation has replaced paper-based

documentation in all public hospitals (Pharmaceutical Services Division and Information Management Division). An unpublished Malaysian audit reported that the majority of clinical pharmacists are still required to document the task completed during working hours manually before entering them into the computerized system. A study in the US reported about 61% of the pharmacy respondents were dissatisfied with their electronic intervention documenting systems. Unlike the paper-based documenting system in which all pharmacy interventions were recorded on paper, they believed that the electronic documenting systems had problems (Al-Jedai and Nurgat, 2012), such as data transcription was time-consuming and it was difficult to document all interventions using the systems due to a limited number of computers.

2.2.2 Direct Time-Motion Study

A direct time-motion study provides a direct measurement of the amount of time a specific worker spends on a specific activity (Rutter, Brown and Jones, 1998). Commonly, this method is carried out by using an observer with a watch who continuously observes the conduct of certain works to record the time spent on each task activity. Stop-watch time study has been proven to be useful in measuring repetitive operations. However, this methodology requires a long time interval to capture the complete work activity and its validity is limited by the irregular work cycles (Rascati, Kimberlin and McCormick, 1986). Whilst the work nature of the clinical pharmacists is irregular (Gudlin et al., 2019), hence, the conduct of the direct time-motion study is rather difficult.

2.2.3 Work Sampling Technique

Work sampling estimates the percent of the time of study subject spent on identified activities through random observations to record the activities that the worker performs (Rutter, Brown and Jones, 1998). In the work sampling methodology, observations are often carried out by using an observer, following the subjects under study over a fixed or random time interval, noting down their work activity, and categorizing the observed activity into pre-defined categories in relation to the subjects' work. Literature suggested that the duration of the observation period should be sufficiently long enough so the observed activity has better representability over the subjects' work activity over a period of time (Rutter, Brown and Jones, 1998; Sittig, 1992; Rascati, Kimberlin and McCormick, 1986). The proportion of the number of observations of a given activity to the total number of observations taken will approximate the percentage of time spent on that activity.

Literature suggested that the work sampling technique is particularly useful in the analysis of non-repetitive work and can be used to quantify any kind of work, and is easily achievable (Rutter, Brown and Jones, 1998). The mathematical base of the work sampling is as follows:

$$\mathbf{PT_A = T_A / OT \times 100\%}$$

PT_A = time proportion that participants spend on the particular activity A
T_A = Number of observations in which activity A was recorded
OT = Overall number of observations done

Figure 2.1 The mathematical base of the work sampling technique in estimating the time proportion spent on a given activity

ACTI-VITY	EVENT	FREQUENCY/ COUNT	WORK SAMPLING TECHNIQUE CALCULATION	THE PROPORTION OF TIME SPENT
A	√√√√√ √√	7	7/20 x 100%	35%
B	√√√	3	3/20 x 100%	15%
C	√√√√√ √√√√√	10	10/20 x 100%	50%
TOTAL EVENT		20		

Figure 2.2 An example of the application of the work sampling technique in estimating the time proportion spent on a given activity

2.2.4 The Work Measurement Of The Clinical Pharmacists

In Malaysia, clinical pharmacists working in the public sector visit wards on daily basis to participate in ward rounds and to monitor both the progression of patients' conditions and prescriptions (Abida Haq et al., 2010). The health service activities and workload of the clinical pharmacists are very often measured by using 'work units' (Richard and Parrish, 2018; ASHP, 2013). This completed task has to be documented in the standardized forms as required by the current Guidelines For Inpatient Pharmacy Practice (Abida Haq et al., 2010).

The current Malaysian clinical pharmacy activities practice guidelines have categorized and outlined the objectives of ward pharmacy activities in public service (Abida Haq et al., 2010). All pharmacy-related activities should be documented in 4 standardized documents: CP1-medication history assessment form, CP2-pharmacotherapy review, CP3-clinical pharmacy report form, and CP4-discharge referral note. The data from the documents were then manually summarised and entered into the work productivity report by the pharmacists periodically. However, it is suggested that this method of work reporting might underrepresent the true work

and contribution of the clinical pharmacists (Boardman and Fitzpatrick, 2001; Richard and Parrish, 2018; Millar et al., 2008).

Conversely, the work activity measurement in the field of pharmacy was commonly reported using the work sampling technique, especially in western countries (Rutter, Brown and Jones, 1998; Guarisco, Oddone and Simel, 1994; Rascati, Kimberlin and McCormick, 1986; Sittig, 1992). Relevant examples include a study done by identification of pharmacists' activities by observations in Australia which found a proportion of time spent on clinical activity by clinical pharmacists of 96.2% (Stuchbery et al., 2007a; Stuchbery et al., 2007b; Stuchbery et al., 2008). It was also found in this study that the range of work performed by the clinical pharmacist mainly on clinical work and minimally on non-clinical work such as administration and pharmacy housekeeping, resulting in a high proportion of the time.

A study that was done in the UK employed the work sampling technique to evaluate how the ward pharmacists distribute their time between different activities, had found that about 58% of their time was spent on clinical work (Jenkins, Cairns and Barber, 1992). It was also identified in the same study that the range of works conducted by the ward pharmacists was a mixture of clinical activity and inventory management. In the USA, the work sampling technique was commonly used to evaluate clinical pharmacists' performance and their time spent on each activity. It was reported in a few studies that a time proportion ranging from 60% to 83% was spent by the clinical pharmacists on clinical activities (Guerrero, Nickman and Bair, 1995; Barsness, 1978). It is worth noting that the range of work performed by the pharmacists in the study setting was similar, which consist of clinical and housekeeping work.

The literature on the use of the work sampling techniques in pharmacy research is limited in Asia. Relevant pharmacy research that employs the work sampling techniques includes a study conducted in Japan to measure the work activities of clinical pharmacists. The study results showed that clinical pharmacists spent 78.6% of their time performing clinical activities (Hamai et al., 2001). The range of activities performed by the subjects was a mixture of clinical, administration, and research. Another study that was done in Thailand which measured the time utilization of pharmacy staff at work in the outpatient pharmacy setting reported a proportion time of 82.04% (Panthong and Daosodsai, 2005).

As for the pharmacy service in the private hospital, the emergence of medical tourism and private healthcare insurance has driven its fast development in Malaysia, which at the same time led to the role expansion of pharmacists in the private hospital sector (Abd Mutalib et al., 2017). Having said that, literature reported that pharmacies in private hospitals have offered some or all of the same pharmacy services compared to public hospital pharmacies (Hassali et al., 2016). It was reported by the Malaysian Pharmacy Society that hospital pharmacists in the private sector were required to lead and manage a team independently, to handle administrative work on top of the daily operations of the pharmacy (Liew, 2022). As all private hospitals are not funded by the government and are sustained by the earned profit, balancing between providing high-quality care and ensuring profit to the company has been an ongoing challenge to the pharmacists working in this sector. To date, there is still a minimal number of published studies on the work activity of pharmacists working in the private hospital in Malaysia.

In summary, there is a paucity of data describing the manual documentation of workload by clinical pharmacists who work in the public hospital in Malaysia. Additionally, the available to date Malaysian published data on pharmacy workload and productivity using the work sampling technique is somewhat minimum.

2.3 The Role Of The Pharmacists And The Impact On Public Health

Pharmacists play important roles in many fields, including control and drug management, community pharmacy, hospital pharmacy, pharmaceutical industry, academic activities, training of other health workers, and research (Sing, 2001; Allayla, Nouri and Hassali, 2018). Their role is to ensure optimum drug therapy in all these fields, both by contributing to the preparation, supply, and control of medicines and associated products and by providing information and advice to those who prescribe or use pharmaceutical products. The pharmacist's role may arise from the public's expectations, and hence influence whether the general public seeks advice and pharmacy services as desired. Studies have been done to assess the understanding of the role of the pharmacist from the general public perspective, which reported the pharmacy as the place to have the prescription refilled, to obtain medicines, as the bridge of communication between doctors and patients, and to seek advice (Boardman et al., 2005; Wazaify et al., 2008; Chan and Tran, 2016; Merks et al., 2014; Shrestha et al., 2018; Cheah, 2018).

The impact of the public perception and satisfaction with the role of pharmacists on the public health outcome had been demonstrated in many studies. It was shown

that the extent to which the public perceived and accept the role of pharmacists would affect the extent the general public engages with the range of pharmacy services (Kember, Hodson and James, 2018). Another study has shown that the public was willing to participate in pharmacy-related health screening provided their concerns were adequately addressed beforehand (Almansour et al., 2020). Understanding how the general public perceives the role of the pharmacist in their health promotion and maximizing their satisfaction with the service provided by the pharmacists, inevitably allows the window of opportunities to better utilize the pharmacists' knowledge and skills to improve the public health outcome in Malaysia.

2.3.1 Definition Of The Public Perception

Perception is defined as a mode of apprehending reality and experience through the senses, thus enabling discernment of figure, form, language, behavior, and action (Given, 2008). It has been demonstrated that individual perception would influences opinion, judgment, understanding of a situation, and the process of decision making. Perception can be studied using qualitative and qualitative methods. In qualitative research, individual perception can be studied by collecting and analyzing non-numerical data to understand the concepts, opinions, or experiences. On the other hand, for quantitative research that involved measuring the level of perception of the subject, Likert scales are the most common method of measurement.

2.3.2 Definition Of The Public Satisfaction

Satisfaction in the field of marketing or customer satisfaction is defined as a measurement that determines how happy the customers are with one's products,

services, and capabilities, which could lead to sustainable purchase behaviors (Biesok and Wyród-Wróbel, 2011). It is an integral component of the quality of primary health care as it has been demonstrated that a good relationship between the pharmacists and the patients gives rise to improved patient health outcomes, overall satisfaction with the healthcare service, and a sustainable continuation of care (Wirth et al., 2010; Biesok and Wyród-Wróbel, 2021).

2.3.3 The Public Perception Of The Role Of Hospital Pharmacists And Their Level Of Satisfaction With The Pharmacy Service

In the US, pharmacists are identified as important contributors to the healthcare team in many new collaborative care models. The impact of pharmacists on public health has been studied in many countries. Available studies have demonstrated that the role of pharmacists was well recognized by the public in smoking cessation (in the USA, Canada, Finland, Turkey, Australia, and Thailand), emergency hormonal contraception (in the USA, the UK, Sweden, Canada Europe, and Australia), health screening and promotion (in the UK, Sweden, Nigeria, Australia, Moldova, Malaysia, and the USA), drug misuse (in the UK, the USA, Vietnam, and Estonia), weight management (in the USA, and the UK), and other chronic diseases management (in the USA, the UK, the UAE, Finland, and Asia) (Eades, Ferguson and O'Carroll, 2011).

The studies done on the level of perception of the role of pharmacists among the general public are available in many overseas countries, with only a few focusing on studying hospital pharmacists. For instance, the study in central Nepal that was done on the perception of patients toward the role of hospital pharmacists demonstrated an

overall positive perception of patients toward the role of pharmacists (Shrestha et al., 2018). Additionally, a study done in Pakistan had demonstrated that patients were having an overall positive perception of 84.1% on the role of hospital pharmacists (Khan et al., 2013).

On the contrary, for the studies that were done on the public perception of pharmacists in a more general way, the study done in the Sultanate of Oman demonstrated a high median perception score of 44 (IQR of 5) out of a maximum score of 55 among the general public (Jose, Al Shukili and Jimmy, 2015). In a study that was done to assess the perception, experience, and expectations of physicians regarding the role of hospital pharmacists in Tehran, it was found that their perception levels were generally positive towards the role of pharmacists and the hospital pharmacists were expected to be involved in more clinical roles (Alipour, Peiravian and Mehralian, 2018). On the other hand, there is only one Malaysian study available in 2015 that found that the general public has an overall positive perception level of the role of community pharmacists but not from the hospital pharmacist's perspective (Cheah, 2018). It is worth noting that none of the studies mentioned above reported the actual role carried out by hospital pharmacists from the researcher's perspective.

It is worth mentioning that there is much literature available particularly on the public perception of the role of community pharmacists and the findings were used as the reference in the present study. A study done in Saudi Arabia has demonstrated that 81.4% of the respondents had an overall positive perception of community pharmacists (Almohammed and Alsanea, 2021). Additionally, the general public was generally in favor of the perception of the community pharmacists' roles as demonstrated by the