COMPARING SERVICE MODELS: PHARMACIST-ASSISTED TRANSITION OF CARE (TOC) VERSUS STANDARD OF CARE (SOC) TOWARDS EFFECT ON HEALTHCARE RESOURCE UTILIZATION AMONG PATIENTS FROM MEDICAL WARDS

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Abstract

Introduction: Suboptimal care transition post-discharge may potentially increase subsequent healthcare system utilization. Transition of care is a service approach to support continuum of patient care after discharge.

Objectives: This study aimed to compare the effect of pharmacist-assisted transition of care versus standard care models towards healthcare resource utilization among medical ward patients.

Methods: A cluster randomized controlled study was conducted among medical ward patients in a Malaysian secondary hospital from July to December 2019. Intervention group received pharmacist-assisted discharge medication reconciliation, bedside discharge medication delivery with counselling and a timely post-discharge call-back. Control group followed standard discharge process with medication collection at ambulatory pharmacy without post-discharge phone calls. Study endpoints included pharmacy first refill persistency, resolution on unintended discharge medication discrepancies and 30-days all-cause rehospitalization.

Results: A total of 168 patients with 84 patients in each arm were recruited. Intervention resulted a higher pharmacy first refill persistency (70.2% versus 50.0%, $p<0.05$), indicating a lowering in subsequent unscheduled refill rate. Under intervention, consistent rate of resolution from discrepancies (100.0%, IQR 0 versus 100.0%, IQR 67; $p<0.05$) was demonstrated that corresponded to medication cost-savings of RM6.80 per prescription over control. Unplanned rehospitalization was not significantly different between groups ($p>0.05$) but towards a trend of 10% reduction after intervention.

Conclusion: Pharmacist-led transition care model demonstrated promising effect towards a reduction in healthcare resource use compared to standard care. Future studies for its standardization across institutions are warranted to facilitate service expansion.

Keywords: Transition of Care, Healthcare Resource Utilization, Bedside Dispensing, Medication Reconciliation, Readmission

Introduction

A growing body of evidence indicates that patients are at risks to negative outcomes during their pivotal transitions from hospital to home (1). Data from previous studies indicated that 77% of discharge patients received inadequate medication instructions while 70% of patients may have at least one medication discrepancy upon discharge (2, 3). Suboptimal and ineffective patient management during their transition of care period following discharge may potentially increase subsequent healthcare resource utilization (4). This including uncorrected medication discrepancies leading towards unnecessary post-discharge prescription and wastage (2, 5), unscheduled pharmacy refill visits secondary to medication non-adherence (6, 7) which eventually posing a threat towards higher risks of avoidable readmissions or unplanned emergency department (ED) visits (3, 6).

Issues affecting patient care across transitions need to be addressed. Pharmacist-assisted transition of care (TOC) is an innovative and transformational pharmacy service

approach to facilitate the delivery of optimum patient discharge care during the period when they transit from hospital to home (4, 8). Pharmacist-assisted TOC incorporated service activities such as medication history taking and reconciliation to minimize discharge medication discrepancies, pharmacy-led bedside discharge medication delivery with counseling as well as post-discharge follow up reinforcement on medication understandings (5, 8, 9). Pharmacist-assisted TOC service model has been shown to empower patients with medication knowledge to improve subsequent healthcare system reutilization such as to avoid pharmacy fill non-persistency and unplanned rehospitalization (2, 8).

In Malaysia, some elements of the pharmacist-led TOC activities such as medication reconciliation upon discharge, bedside dispensing with discharge medication counselling have been incorporated as the ward pharmacy services in order to ensure the provision of continuity of care when patient transit from hospital to home (10). The main aim of this approach is to speed up patient's discharge so that can reduce patient's waiting time at ambulatory pharmacy as well as enhance patient's satisfaction (10). However, in most of the healthcare institutions in Malaysia, this service only limited in office hour and not implemented fully to all discharge patients in view of manpower constraints. Hence, there is a number of discharge patients still follow the standard of care (SOC) (11) whereby the discharge prescriptions will be processed by the respective ward and they will proceed to ambulatory pharmacy for medication collection and counselling.

Although considerable amount of literature supports the implementation of pharmacist-assisted TOC service model (4, 8) and even showed high level of patients' satisfaction towards the provision of these services (12), Malaysian data on its effect towards the perspective of healthcare resource utilization is yet to be explored. To the best of our knowledge, no Malaysian published study has evaluated the effect of pharmacist-assisted TOC from the perspective of resource utilization in healthcare setting. Moreover, in view of Coronavirus Disease 2019 (COVID-19) pandemic expands globally, strategy to prevent unnecessary hospital resource utilization and to ease the burden of overwhelmed healthcare system is of particularly importance (12). Hence, this study aimed to compare pharmacist-assisted TOC (reengineered with post-discharge telephone call-backs) versus SOC model towards the effect on healthcare resource utilization among patients discharged from medical wards in a secondary care hospital.

Materials and Methods

Study design and subject selection

An open-labelled, cluster randomized controlled study was conducted in a district hospital in the state of Johor, Malaysia from July 2019 until December 2019. Eligible patients for study inclusion were those aged 18 years old and above, scheduled to discharge from medical wards within 8 am to 5 pm, those with discharge prescriptions contained more than 3 regular medications and those with more than 1 scheduled pharmacy medication fill visit. Patients who hospitalized less than 24 hours, with planned readmissions, transferred out to other healthcare facilities for continuation of care, without telephone access, mentally incapable to communicate without presence of caregivers and those who died prior to discharge were excluded from this study.

Sample size

According to previous studies (8, 13, 14), patients under intervention group had 22.3% lower rate of healthcare resource utilization compared to those received usual care. Considering the power of 80%, margin of error of 0.05 and by taking into account of inter-cluster correlation coefficient of 0.02 (15) and 20% potential dropout rate, a sample size of 84 patients each for both control and intervention group was obtained using Power and Sample Size (PS) Calculation Version 3.0 (16).

Sampling method and randomisation

A list of eligible patients who fulfilled the inclusion criteria was generated from the medical wards on every data collection day. They were randomly selected to be approached via simple random sampling utilizing random number generator. For patients with repeated admissions throughout the study period, only index hospitalization was considered for recruitment into the study. Eligible patients were approached by a team of trained data collecting pharmacists with a study explanation session with all pertinent aspects of the study as outlined in study information sheet, confidentiality assurance and consent to participation prior to their hospital discharge. They were allowed for ample time to inquire about the study details and to consider their participation in the study. All questions about the study were answered to the satisfaction of the potential participants. Patients who refused to participate would be provided with conventional SOC service model.

Those who consented for participation were instructed to sign the patient's consent form. The expected duration for each potential subject to get participated into this study was 1 month. In order to minimize the potential contamination between intervention and control group, those who were willing to participate in this study were stratified into 2 clusters according to patients' discharge time period. Patients with a discharge time that fell within Monday to Wednesday were stratified into 1 cluster while patients with a discharge time of Thursday to Saturday were assigned into another cluster with a grace period of Sunday per week from study participants' recruitment. Patients in each cluster were randomised into control or intervention group using block randomisation in blocks of 4 with allocation concealment by sequentially numbered opaque sealed envelope method. A total number of 8 patients were recruited in each week of the study. Randomisation

code was assigned and kept by investigator other than the study data collecting pharmacists. In view of the unblinded nature of the study, emergency code breaking was not necessary. Standardized training sessions on study procedures and data collection were provided to data collecting pharmacists prior to the study. Besides, a pilot study was conducted prior to the actual data collection to evaluate the feasibility of the study design.

Data collection

Intervention (TOC)

Baseline demographic data (age, gender, race), information on index admission (primary diagnosis, discharge date, number and types of discharge medicines) of eligible patients allocated to the intervention group was collected using tabulated data collection sheet. They were then enrolled into pharmacist-assisted TOC which consisted of three key service components as depicted in Figure 1. The TOC pharmacy services provided were pharmacist-led medication reconciliation upon discharge, bedside discharge medications delivery with counselling and a timely post-discharge call-back.

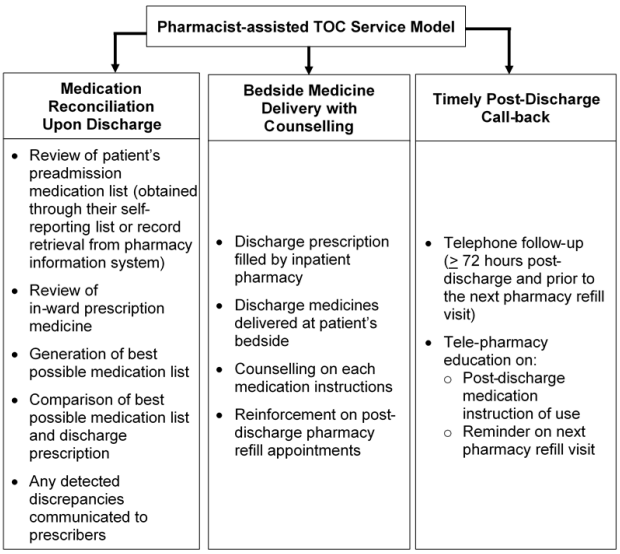

Figure 1: Structure of pharmacist-assisted TOC service model

Under pharmacist-assisted TOC, trained data collecting pharmacists reviewed the discharge prescriptions of patients allocated in intervention group. By using standardized tracking sheet, comparison and reconciliation of patients' pre-admission medication lists (obtained through patients' self-reporting list or via the retrieval of records from pharmacy information system), in-ward medication lists as well as discharge medications were conducted. The discrepancies detected were communicated and discussed with the prescribers who treated the patients in medical wards to determine whether the identified discrepancies were intended or unintended. The number and types of unintended medication discrepancies detected upon discharge were recorded. Intervention on the correction of unintended medication discrepancies was made by the trained data collecting pharmacists to the respective prescribers from the medical wards and the prescribers held the final decision regarding their patient's discharge medication management. The unintended medication discrepancies were considered resolved if prescribers enacted the changes towards the discrepancies prior to patients' discharge. Any unintended discrepancies corrected upon data collecting pharmacists' interventions were documented. The discharge prescriptions were then collected by data collecting pharmacists. The prescriptions were tagged as 'intervention group' and sent down to inpatient pharmacy for medication preparation and counter-checking by inpatient pharmacists. Trained data collecting pharmacists then delivered the discharge medications at bedside and provided with appropriate medication counselling. The counselling offered were education on each discharge medication instructions and reinforcement on subsequent post-discharge pharmacy refill appointments. Intervention arm were then contacted 1 time at least 72 hours after discharge and prior to their next pharmacy refill visit (2). Data collecting pharmacists would stop calling if they were unable to be reached after 3 attempts (2) or if they were found to readmit to hospital or revisit ED. The phone conversation included reminder on the next scheduled pharmacy refill visit and reinforcement on each post-discharge medications instruction of use. Any drug related problems raised during post-discharge phone assessment, if any, was brought to the attention of prescribers for their further action.

In view of the standard pharmacy first refill visit in our institution was scheduled at 1 month for all discharge prescriptions consisting regular medications, patients in this study were followed up for 1 month and they resumed to usual hospital discharge care after 1 month of study intervention and follow up. Data on pharmacy first refill adherence measures (continuous single-interval medication availability [CSA] scores) (17) as well as 30-days all-cause hospital readmission or ED visits was obtained using pharmacy computerized database as well as electronic patients record system. The study data was collected according to the procedure as outlined in Figure 2.

Control (SOC)

Eligible patients allocated to the control group followed routine hospital discharge process (11). Their discharge medications were managed by the respective medical wards. The discharge prescriptions were tagged by the trained data collecting pharmacists as 'control group' and the prescriptions were processed by the respective wards. Patients under the control group collected their post-discharge medications at ambulatory pharmacy and they did not receive follow-up call from data collecting pharmacists after discharge. Similar with intervention group, their baseline demographic, information on index

admission, CSA and 30-days all-cause hospital readmission or ED visit were collected. Data on the number and types of unintended medication discrepancies detected and resolved during respective routine ward pharmacist round or at ambulatory pharmacy prior to discharge was collected in the same manner as the intervention group except it was conducted as retrospective basis via patients' medical records and post-discharge prescriptions review (Figure 2).

Withdrawal criteria

Patients would be considered as study withdrawal if they opted to withdraw from the initial consent and refused to participate at follow up. Patients who withdrew from the study would receive complete discharge medications as per usual discharge care.

Outcome measures

Pharmacy first refill persistency

Pharmacy first refill persistency was assessed using CSA score. CSA is one of the primary adherence measures that utilizing objective markers to explore pharmacy refill persistency (17). CSA was calculated by dividing the days' supply obtained at a pharmacy fill by the number of days before the next pharmacy fill for that same medication (17). A cut point of less than 0.8 was defined as pharmacy refill non-persistency and vice versa (17). Data on pharmacy first refill persistency was obtained from pharmacy hospital information system as well as patients' manual prescriptions.

Resolution rate of unintended medication discrepancies detected upon discharge

In this study, unintended medication discrepancies defined as the variances through comparison between the best possible medication list (generated from the process of medication reconciliation upon discharge) with the actual discharge prescriptions that was not intended by the prescribers (18). The number of unintended medication discrepancies detected upon discharge was recorded. Intervention to correct the unintended medication discrepancies was proposed to the prescribing discipline and they were the final decision maker on the modification of discharge prescriptions. Any unintended discrepancies corrected upon discharge was documented. The resolution rate towards unintended medication discrepancies detected prior to discharge was calculated and compared between intervention and control group. The associated medication cost-savings from the correction of medication discrepancies in both study arms were explored.

30-days all-cause hospital readmission or ED visit

In this study, 30-days all-cause hospital readmission or ED visit was defined as readmission or ED visit for any reason within 30-days following hospital discharge (6). Data on 30-days all-cause readmission and ED visit was obtained using electronic patients record system.

Data analysis

The study data was analysed as descriptive and analytical statistics. Deviations from normal distribution were explored using Kolmogorov-Smirnov test. Information on the baseline demographic and index admission between SOC versus TOC group was compared using Chi-square, Mann-Whitney U test or Independent Sample t-test where appropriate. In addition, the association of CSA scores, pharmacy first refill persistency and resolution rate of unintended medication discrepancies detected upon discharge was assessed between two groups with the use of Chi-square, Mann-Whitney U test or Independent Sample t-test where applicable. Comparison of 30-days all-cause hospital readmission or ED visit was explored by using Kaplan-Maier Curve. The level of significance in this study was expressed by p-value of less than 0.05. In order to maintain prognostic balance generated from the original random treatment allocation and to provide unbiased estimate of treatment effect, intention-to-treat (ITT) analysis was applied from any deviation from random assignment.

Ethical considerations

This study was conducted in compliance with ethical principles outlined in the Declaration of Helsinki and Malaysian Good Clinical Practice Guideline. The study protocol was registered on National Medical Research Registry (NMRR-19-2287-50121) and approval was sought from Medical Research & Ethical Committee, Ministry of Health Malaysia [KKM/NIHSEC/P19-1896(11)].

Results

A total of 168 patients were enrolled in the study with 84 patients were randomized into each arm. The response rate for initial study enrolment was 97.1%. In view of the Kolmogorov-Smirnov test did not show a normal distribution, median and interquartile range (IQR) were used for the dataset. Median age of the overall study cohort was 62 (IQR 17) years old. The most common reason for hospital admission was cardiovascular related conditions (87, 51.8%). No patient withdrew from the initial consent and refused to participate at follow up. All baseline characteristics for each arm were comparable ($p>0.05$) as shown in Table 1.

Pharmacy first refill persistency

Throughout the study period, 125 patients had their prescriptions refilled post-discharge (58 patients under SOC versus 67 patients under TOC). On the other hand, 43 patients were readmitted to wards or returned to ED visits following 30 days of hospital discharge. Among patients with their prescriptions refilled post-discharge, statistically significant higher median CSA score was observed in TOC group (1.0, IQR 1.0) compared to SOC group (0.7, IQR 1.0) with $p<0.05$. Patients participated in pharmacist-assisted TOC service model resulted significant improvement in

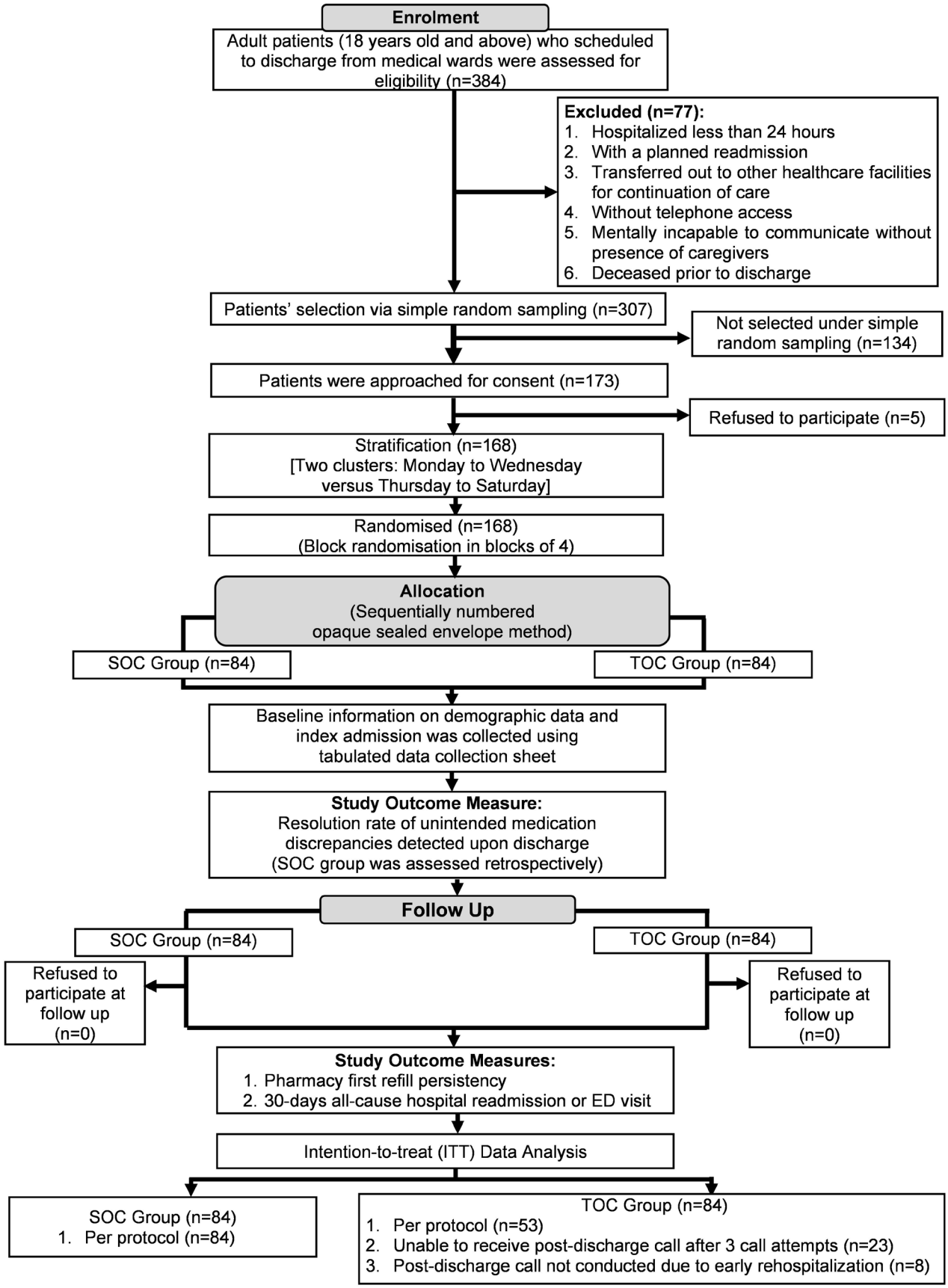

Figure 2: Data collection process

Table 1: Baseline study characteristics comparison between TOC versus SOC

Study Characteristics	SOC	TOC	p-value#
	N_1=84	N_2=84	
Age, years (Median, IQR)	60 (16)	63 (17)	0.297
Gender (n, %)			
Male	42 (50.0)	50 (59.5)	0.215
Female	42 (50.0)	34 (40.5)	
Race (n, %)			
Malay	60 (71.4)	55 (65.5)	
Chinese	12 (14.3)	22 (26.2)	0.107
Indian	12 (14.3)	7 (8.3)	
Primary Admitting Diagnosis Category (n, %)			
Cardiovascular	45 (53.6)	42 (50.0)	
Infectious Disease	8 (9.5)	15 (17.9)	
Renal/ Endocrine	15 (17.9)	9 (10.7)	
Central Nervous System/ Musculoskeletal	9 (10.7)	7 (8.3)	0.301
Others (Respiratory/ Hematology/ Hepatology)	7 (8.3)	11 (13.1)	
Number of Discharge Medications (Median, IQR)	8 (4)	7 (4)	0.583

Data given as number (percentage) unless otherwise indicated
Chi-square test or Mann-Whitney U test where applicable
p-value <0.05 considered statistically significant
IQR, interquartile range

their primary adherence with higher number of patients showed to have pharmacy first refill persistency post-discharge compared to SOC groups (70.2% versus 50.0%, p<0.05). A summary of the findings was contained in Table 2.

Table 2: Comparing SOC versus TOC on pharmacy first refill persistency

Study Characteristics	SOC	TOC	p-value#
	N_1=58	N_2=67	
Continuous Single Interval Medication Availability, CSA Score (Median, IQR)	0.7 (1.0)	1.0 (1.0)	0.002*
Pharmacy First Refill Persistency			
Persistence [CSA score ≥ 0.8] (n, %)	29 (50.0)	47 (70.2)	0.021*
Non-Persistence [CSA score <0.8] (n, %)	29 (50.0)	20 (29.8)	

Data given as number (percentage) unless otherwise indicated
Chi-square test or Mann-Whitney U test where applicable
*p-value <0.05 considered statistically significant
IQR, interquartile range

Resolution rate of unintended medication discrepancies detected upon discharge

Overall, 29 patients (17.3%) had their prescriptions with unintended medication discrepancies upon discharge. From the total number of 39 unintended medication discrepancies detected, the most common type of discrepancies was discrepant in duration (16, 41.0%), followed by medication (10, 25.6%), dose (6, 15.4%), frequency (6, 15.4%) and a combination of the aforementioned (1, 2.6%). No significant difference (p>0.05) was observed on the total number of patients between pharmacist-assisted TOC versus SOC service model with their discharge prescriptions consisted unintended medication discrepancies (Table 3). Although both pharmacist-assisted TOC (100.0%, IQR 0.0) and SOC (100.0%, IQR 67.0) arms showed to have similar median rate of resolution from unintended medication discrepancies, detection and intervention made under SOC model significantly showed to have a larger variable of response which contributed to a wider IQR that was evident under Mann-Whitney U test (p<0.05). On the other hand, intervention made to resolve medication discrepancies under pharmacist-led TOC model also translated to a total medication saving of RM 571.14 with the average cost-savings per prescription of RM 6.80 over SOC model.

Table 3: Comparing SOC versus TOC on medication discrepancies

Study Characteristics	SOC	TOC	p-value#
	N_1=84	N_2=84	
Number of Patients with Prescriptions consisted Unintended Medication Discrepancies Detected Upon Discharge (n, %)	11 (13.1)	18 (21.4)	0.153
Resolution Rate of Unintended Medication Discrepancies Detected Upon Discharge, % (Median, IQR)	100.0 (67)	100.0 (0)	0.002*

Data given as number (percentage) unless otherwise indicated
Chi-square test or Mann-Whitney U test where applicable
*p-value <0.05 considered statistically significant
IQR, interquartile range

30-days all-cause hospital readmission or ED visit

Figure 3 showed the Kaplan-Maier curve comparing the probability of free from 30-days all-cause readmission or ED visit between TOC and SOC service models. Despite a greater reduction rate in the risk of hospital reutilization within 30-days post-discharge was seen in pharmacist-facilitated TOC group (20.2%) when compared to patients randomized under SOC model (31.0%), no statistically significant difference was noted (p>0.05).

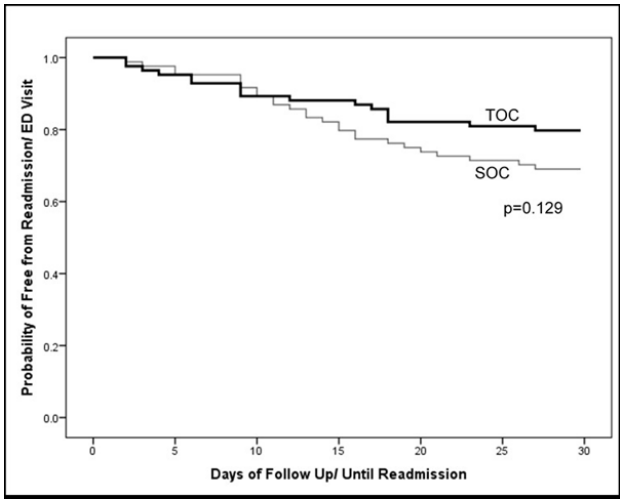

Figure 3: Probability of free from 30-days all-cause readmission or ED visit between SOC versus TOC

Discussion

Overall, the findings from our study revealed that pharmacist-assisted TOC model was able to provide promising effect towards a reduction in healthcare resource use. Implementation of TOC pharmacy services in our study improved pharmacy first refill persistency and provided a consistent resolution towards unintended medication discrepancies. This could prevent unnecessary prescription and its associated medication wastage. A marginal reduction in 30-days hospital reutilization rate was also observed compared to the conventional SOC service model. To our knowledge, pharmacist-led TOC model implemented in our study was the first prospective trial in our local setting of Malaysia. Lowering of preventable utilization of healthcare resources may enhance preparedness of hospital-based services especially during the era of COVID-19 pandemic.

In our study cohort, medication discrepancies were common, occurring at 17.3% from the entire study population, a rate which was found consistent with previous studies (2, 18). Upon admission, prescribers tend to pay more attention in the treatment of admission diagnosis (14). Routine comparison of patients' in-ward medication list with their preadmission list may often overlooked (14). With the pharmacist routine involvement in patients' discharge medication management under both service models at baseline, the median rate of resolution from unintended discrepancies was found to be equal, indicating pharmacists able to effectively rectify the discrepancies detected. However, under conventional SOC model, although discharge prescription review was conducted at baseline during ward pharmacist round or at ambulatory pharmacy prior to discharge, there were times missed opportunity to detect and resolve discharge medication discrepancies. Barriers to constantly execute the rectification of unintended medication discrepancies upon discharge was evident by a wider IQR on the resolution rate towards the discrepancies detected from our SOC service model. In contrary, enhanced medication reconciliation at the point of patient's discharge provided by TOC pharmacists constantly identified and alleviated effectively all unintended discrepancies prior to discharge. In our study, prescribers accepted 100% of TOC pharmacists' recommendations, indicating active pharmacist face-to-face inputs supported the sustainability in resolving inappropriate discharge prescription. Moreover, the cost-savings associated with discrepancies corrected under TOC was found larger, quantifying its economic effect towards the reduction in unnecessary prescription wastage in comparison with conventional standard practices.

Lack of understanding on medication refill may result in higher pharmacy no-show rate or unnecessary pharmacy refill visit (9). As a consequence of Covid-19 pandemic, unscheduled pharmacy reutilization might increase unexpected influx of prescription volumes that might put heavier burden for the implementation of social distancing at pharmacy visits (12). Alternative and innovative strategies to preserve healthcare resources under Covid-19 landscape is of particularly importance (12). Under pharmacist-led TOC service model, discharge medications were delivered to patients at bedside. Reinforcements on subsequent pharmacy refill appointments were conducted upon bedside medication delivery and via post-discharge virtual telephonic reminder. Findings from our study showed that pharmacist-assisted TOC model able to foster the compliance and yielded higher rates of primary medication adherence over SOC. Consequently, a higher CSA score and a greater pharmacy first refill persistency was observed compared to usual care. Pharmacist-facilitated TOC model may be one of the key elements that can help patients to gain more insight into their post-discharge medication management (7, 19). Under TOC pharmacy activities, avoidance of unplanned pharmacy refill visit could also help to preserve pharmacy service resource and to limit the unnecessary social interaction in effort to contain Covid-19 transmission in post pandemic era.

Suboptimal coordination or fragmentation of care upon transition from hospital to home has become a raising concern contributing to higher readmission rate (6). The readmission rates reported in this study was found comparable to other published studies (8, 9). In our study, transition support provided via pharmacist-assisted TOC model had reported to lower the readmission rate by about 10% compared to SOC. Implementation of pharmacist-led TOC model allowed immediate identification and resolution of discharge medication discrepancies and provided interactive counselling to strengthen patients' comprehension towards discharge medication instructions. A lowering of likelihood in 30-days all-cause readmission and ED revisit could be a result from the improved quality of discharge prescription and enhanced medication adherence. Although our findings on this endpoint did not reach statistical significance, this may be of clinically important. A published study found that only 13.3% of readmissions were preventable (20), of which only a fraction from these preventable readmissions could be

attributed to medications. Hence, an intervention that focused primarily on transition medication management may be insufficiently power to improve readmission or ED revisit rates significantly. A study conducted in Canada (21) suggested that the significant effect of TOC on short-term 30-days readmission rates may not be evident. A longer time of assessment may be needed to show noticeable improvement from the baseline (21).

Study limitation

Several limitations of this study worth noting. Study outcome measure of 30-days all-cause hospital readmission or ED visit was calculated from the single study institution. According to previous study (22), up to 20% of readmissions were to different facilities from their index admissions. In view of discharge patients could have received care from other facilities, the actual readmission or ED revisit rate captured in this study could have been under-reported. Nevertheless, this factor was offset as it equally affected both SOC and pharmacist-assisted TOC groups. In order to maintain original random treatment allocation, ITT population included 27.4% of patients under pharmacist-led TOC model who could not receive post-discharge pharmacy telephonic reinforcement after 3 call-back attempts. Despite the inclusion of those unreachable patients under pharmacist-assisted TOC model in the analysis, the result conservatively demonstrated significant findings particularly in improvement of pharmacy first refill persistency. It could be postulated that the effect of pharmacist-facilitated TOC might be even larger if the population were excluded from the analysis. This study was designed with the exclusion of patients discharged to other facilities as well as CSA score analysis recruited only patients who refilled medications at single study centre. This could limit the generalizability to other settings. Multicentre studies for normalization and standardization of pharmacist-assisted TOC models across other healthcare institutions warrant further research to evaluate the effectiveness of this model.

Conclusion

Implementing pharmacist-led TOC upon discharge substantially improved pharmacy first refill persistency, provided a sustained rectification on unintended post-discharge medication discrepancies to prevent medication wastage and to a lesser extent, reduced in 30-days all-cause hospital and ED revisit. Our pharmacist-assisted TOC service model showed a positive effect in reducing the healthcare resource use among patients from medical wards. The findings demonstrated a promise to support the role of pharmacist as a key step in transitional care process from hospital to home. Further studies are warranted to validate and refine the model in larger multicentre studies to facilitate subsequent programmatic service expansion, particularly in post COVID-19 pandemic era.

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Competing interests

The authors declared no conflict of interest that may affect the integrity of the study.

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