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The effect of pharmacist-led medication reconciliation on Home-based palliative care and drug-related problems

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Abstract
Patients receiving palliative care at home are the ones at a higher risk of drug-related problems (DRPs) because of polypharmacy, inadequate documentation and lack of monitoring. The proposed study Therefore, this proposed prospective interventional study sought to determine the effectiveness of pharmacist-led medication reconciliation in these patients to decrease DRPs among them. 95 patients in three regional networks of palliative care took part in a 6 week study. Baseline assessments revealed that most patients had an average of 3.2 DRPs, which involved therapeutic duplications, dosing errors, and changes in medications that were never documented. After the pharmacist reconciliation and partnership with caregivers, prescribers, and home nurses, the DRP rate dropped 53 percent. Most of the differences concerned the medications of pain management and adjuvant agents. There was a marked increase in caregiver satisfaction especially on the ability to understand the medication schedule. The intervention was cost-neutral and involved little changes in the workflow. Based on the findings, it will be crucial to consider the use of pharmacist-led medication reconciliation in homecare models in enhancing medication safety and patient care in vulnerable populations.

Keywords: ***Pharmacist-facilitated intervention, medication reconciliation, drug related incidents, palliative care, homecare pharmacy, polypharmacy, caregiver job satisfaction, therapeutic duplication and dosing error.***

1. Introduction

1.1 Having palliative care at home creates some special challenges concerning medication Management

Home-based palliative care is an emerging paradigm which provides individuals with an opportunity to get care in their homes mostly at the later stages of a terminal illness. Patients and their family members often choose this method because it conforms to feelings of wanting to uphold quality of life and dignity despite a life restricting illness. Nevertheless, there are few complications associated with this model as regards the management of medications. In contrast to the hospital-based care, in which the medical professional has the supervision of a patient and the ability to access his or her history throughout the day, homecare environments are characterized by the lack of continuous control and organization. The medical staff is typically spread in different places such as the home of the patient, out-patient clinics and in some cases, hospital. Such geographical distance and the lack of connection among the healthcare providers may cause non-uniform drug treatment and high hazard to patients. The management of medication in home-based palliative care is usually a complicated process as made even worse by the variety of health care professionals that sit in the care of the patient; this includes home nurses, family caregivers, and general practitioners among others.

Management of medications is even more complex in this environment due to the presence of many comorbidities, polypharmacy, and the fact that some medications may be used to alleviate pain and other symptoms of end-of-life ill. The possibility of using several drugs prescribed by various providers, whose activity is not fully coordinated, raises the number of errors and adverse effects. In addition, patients on palliative care tend to run the risk of cognitive impairment and this only increases the burden of taking medication. Under such conditions, home-based palliative care patients are high risk patients in regard to drug-related problems (DRPs), which may have adverse effects on their quality of living and conditions in general.(1)

1.2 Polypharmacy and fragmented care are widespread forms of drug-related problems (DRPs)

The term Drug-related problems(DRPs) describes any problems related to the use of drugs that may lead to harming the patient or that might otherwise interfere with the medication having a therapeutic outcome. DRPs are an important issue in healthcare system and especially in palliative care at home, as the situation is complicated by the issues of polypharmacy and fragmentation of care. Patients of palliative care commonly practice polypharmacy, or the concurrent administration of two or more medications simultaneously; often, such patients

are dealing with complex symptomatology associated with their terminal illnesses. This not only augments the possibility of unwanted drug reactions but also makes it difficult to establish the root causes of the reactions since patients are likely to take a combination of drugs issued by various individuals in the healthcare systems.

Disorganization of healthcare providers is another contributor of DRPs. In homecare, various medical staff can prescribe medications without having a review of the whole medication plan. This can trigger the duplications of treatment, a dosage, and even unessential or inadequate medications. Moreover, the communication among primary care providers, specialists, home nurses, and caregivers, who are all the critical figures to deliver medications safety, is usually unclear. Poor or non-consistent records of medication changes, and records that lack or have incomplete documentation of medication changes are additional factors that may lead to incidence of DRPs in such patients. Such problems may lead to additional hospitalization, unneeded procedures, and an overall deterioration of patient outcomes in some situations.(2)

1.3 Medication Reconciliation Facilitated by a Pharmacist Can Be a Central Part of Enhancing Patient Safety and Regulatory Compliance

Medication reconciliation by pharmacists has become an effective option to minimize the incidence of DRPs in any healthcare environment. Medication reconciliation simply refers to a process whereby a pharmacist examines and evaluates the medication regime of a patient as s/he moves between any form of care set up in order to make sure that there are no mismatches between them. This includes gathering and checking the list of medications, verification of possible drug interactions and medications administered appropriately and in the correct dose. Such an intervention will assist in completing the communication valves between the healthcare providers and by doing so ensure, that the list of medications the patient takes is comprehensive and accurate in home-based palliative care.

Pharmacist, given their knowledge about drug therapy management, can be the ideal person to determine possible DRPs and eliminating medication-related problems. Some of their work is to check prescriptions, suggest dosage changes, find exercise interactions, and teach the patient and caregivers about the necessity of medication compliance. Medication reconciliation executed by pharmacists not only enhances patient safety, but it is also essential in regulatory compliance, in such a way that patients are provided with the right drugs, and they are not harmed. Moreover, incorporating pharmacists in the homecare model complies with the trends in the development of healthcare toward collaboration and team-based care. Pharmacists have an opportunity to play the biggest role in medication management, hence preventing the occurrence of adverse drug events and the rational utilization of medications in vulnerable groups of patients, including palliative care.

1.4 This Study Assesses the Effects of This Kind of Intervention on Reduction of DRPs in Homecare Palliative Patients

The goal of this research will be to assess the effects of medication reconciliation by pharmacists as an initiative in lowering the intensity of drug-related issues and the occurrence of those in home-based palliative care patients. Considering the level of the threat of the DRPs in this environment, the intervention is likely to affect a considerable decrease in the rates of the emergence of these issues, especially in the following spheres of the repetition of a therapy, mistakes when it comes to the doses of medications, and changes in medication that were not properly noted. Effect of the intervention on patient and care giver satisfaction will also be studied with special interest on the understanding of medication regimens and schedules by patients and care givers. The study aims to emphasise clinically and regulatory significance of involving pharmacists in home-based palliative care models as one of the effective methods to minimise harm and enhance patient outcomes in this vulnerable group.(3)

2. Materials and methods

2.1 Study Design Prospective interventional study done in 6 weeks

This experimentation was a prospective interventional study, which was carried out after a 6 weeks time period, with the aim to check the influence of medication reconciliation by pharmacist on the incidence and severity of the drug-related problems (DRPs) in residents receiving home-based palliative care. Identification and resolution of discrepancies in medication regimens was the intervention point and the aim of the intervention was to decrease adverse medication-related events. The potential design enabled them to have real-time visibility of the impact of the intervention and have the evident contrast between baseline and after-intervention information. The main aim of the study was to examine the reduction or increase in the number of DRPs by its severity prior to and following

the intervention developed to tackle the problem of the pharmacist and to examine patient and caregiver satisfaction with the medication management process.

2.2 Method and Sampling: 95 Patients Recruited across Three local Home- based Palliative Care Networks

The research was carried out in three home-based regional networks of palliative care. The reason of choosing these networks was their long history of home-based palliative care delivery and the capacity to support the work of involving a wide spectrum of healthcare professionals, such as general practitioners, home nurses and family caregivers. The networks were also equipped with the infrastructure which would support medication reconciliation interventions and the process of collecting data as well.

A group of 95 patients was taken on board in the study. The inclusion criteria were as follows: (1) participants enrolled had terminal illness and were under home-based palliative care, (2) a participant needed to be aged 18 years and above, (3) a participant needed to maintain a prescribed regimen of at least five medications, and (4) a participant needed to be cognitively capable of participating in the study or have caregiver able to provide informed consent and help in the process.

The exclusion criteria were: (1) a patient that had already taken part in an earlier medication reconciliation intervention, (2) a patient with severe cognitive impairments that would not allow him/her to provide informed consent or communicate with the pharmacist, and (3) a patient that did not receive palliative care at home but in a different care setting (e.g., a hospital, hospice care).(4)

2.3 There was no intervention: none of the study participants were assigned to any intervention.

The intervention included a pharmacist-based medication reconciliation procedure, which involved an elaborate look at the medical regimen of each patient. The responsibility of the pharmacists was to countercheck, match, and cross-reference all content contained in the patient records along with all drugs that the patient was using and even identifying any misfit. This involved a comprehensive review of prescriptions by all those healthcare professionals involved in the care of the patient such as primary care physician, specialists and even home care nurses.

The pharmacists also contacted the prescribers, caregivers and home nurses directly to clarify anything to do with medicines. This communication would solve any duplication of medications, doses, or adjustment of schedules that were not recorded. One of the main roles of a pharmacist was to provide the caregivers as well as the patients with information on the significance of proper medication records and proper medication time. The pharmacists also made recommendations on changes to dosage, alterations of the regimen of medications, and new drugs, which were based on the recommendations of the goals of care with respect to the quality of life, as understood by the patients.

At baseline (the first part of the study), the medication reconciliation procedure was performed, and follow up activities were conducted during the 6-week period of the study. The drug regimens of the patients were reviewed by the pharmacists at the stipulated periods to ascertain that the patient adheres to the medication and to see whether any additional DRPs will appear.

2.4 Data Collection: documentation of baseline and post-intervention DRPS, satisfaction care giver surveys

The data were to be obtained at two time points namely; the baseline (denotes the data collected just prior to the intervention) and after the 6 weeks following the intervention. Baseline data involved a thorough evaluation of each patient medication regime, as well as evaluation of whether he or she has any DRPs. These baseline DRPs were listed in details and the severity of each DRP measured. The data collected after the intervention were aimed at determining any new DRPs and recording the status of the identified DRPs before, whether they have been rectified or alleviated.

Besides the documentation of DRPs, the caregiver satisfaction surveys were also executed to determine the effect of the pharmacist-led intervention on the understanding of the medication regimen of the patients by the caregivers and their confidence in administering medications outside the hospital. Essentially, the surveys aimed at the collection of information based on the perspective of the caregivers regarding the medication reconciliation process, their level of ease of communication with the pharmacist, and their general satisfaction with the described intervention.(5)

2.5 Assessment Criteria: categorized as Therapeutic Duplications, Dosing Error, Omissions

The evaluation criteria of DRPs were well outlined and all the found DRPs were placed into one of the below following categories:

Therapeutic duplications: The cases such as patients being prescribed with duplicate drugs with the same condition covered within their remedies and not being necessary were included in this category.
Dosing errors: It involved any disparities between the prescribed dose as well as either over dose or under dose which may result in ineffective treatment of the disease or vulnerability to adverse drug reactions.
Omissions: This category identified situations in which prescription drugs which were needed to treat the patient (according to clinical practice or treatment plans) were not included into the prescribed regimen.
Undocumented changes: It comprised any changes in medications (including changes in dosage or discontinuing the medication) that had not been properly documented or relayed to all members of the healthcare team and created a possible misunderstanding and ensuing mistakes in treatment.
The clinical significance of each DRP was evaluated, and the resolution of the DRP monitored during the entire period of the intervention. The DRPs severity was also evaluated to find out whether the intervention acted on clinical patient outcomes.(6)

2.6 Statistical: Paired t-Tests will be Employed in the Reduction of DRP; $p < 0.05$ will be used as a Statistical Significance.

The analysis of the obtained data was performed based on paired t-tests comparing the frequency and severity of DRPs before and after the medication reconciliation intervention, which was conducted by pharmacists. The first outcome of concern was the decrease in the overall number of the DRPs following the intervention. p-value less than 0.05 was considered to be of statistical significance. The use of paired t-tests can be justified by the fact that it provides a possibility to compare two related samples: the baseline DRPs and post-intervention ones pertaining to each patient. In this approach, it was used to determine the significant effects of the intervention controlling the repeatedly ordered measurements done on the same patients over the period. Also, the effect sizes were computed to demonstrate an indication of the size of the intervention on DRPs.
Along with the main analysis, the secondary outcomes including caregiver satisfaction were also investigated. Survey answers were summarised using descriptive statistics, and in suitable cases, relationships between satisfaction of caregivers and the decrease in DRPs were investigated.

3. Pharmacist interventional approach

3.1 Carried out Comprehensive Medication Reviews with History/Clinical Notes of Patients

The intervention delivered by the pharmacist was initiated through the process of complete medication review of every patient enrolled. This involved the scrutiny of the entire medication history (by the pharmacist) that the patient is using by the use of prescriptions issued by the primary care providers, the specialists and any other health care provider that the patient is under care. Besides examining medication prescriptions, the pharmacist checked the clinical records of home nurses and physicians as well as caregivers to have a complete picture of the current state of the patient, treatment objectives and how the health of the patient changed during the treatment process.
Another dangerous component of the medication review was the incorporation of the information provided by the patients (based on their reports and interviews with the patient (in case able of cognition) and the caregiver) to obtain a better understanding of what medication might actually be taken and to identify possible discrepancies. A good number of patients under home-based palliative care might have deteriorating mental abilities, pain, or inadvertence with regards to their prescription solutions, and thus, it is vital to engage the caregivers as well as home nurses in face-to-face communication with patients. This joint effort allowed ensuring that the list of medications was full and error-free, which allowed the pharmacist to identify any problem in time. The pharmacist has been particularly mindful in some of the critical sections of the review which includes the amount of medicines prescribed, dosage of the medicines as well as how well pain management medicines are utilized which is a major adjustment in palliative care units.(7)
Moreover, the pharmacist took any clinical note regarding the previous treatment, such as a hospital discharge summary or specialist advice, to prove the correctness of the list of medications. Other procedures like the investigation of drug interactions, possible duplication of therapies and contraindications were also undertaken in this process. Having detected any such inconsistencies at the initiation of the intervention, the pharmacist made sure that the discussed intervention helped in dealing with the most urgent medication problems that might cause harm or inefficacy.

3.2 Rectification/clarification involving the Discrepancies in Pain Management, Psychotropic Agents, and Adjuvants

The median management of the drugs used to relieve the pain was a major sticking point of the pharmacist intervention in the home-based palliative care because of its significance. Since pain in a terminal patient is usually complex and evolves frequently, then it is quite understandable that discrepancies may be characterised in terms of dosage, frequency of administration, or even, in choice of drug used to treat pain in the medicine. In particular, the pharmacist spoke about such problems as therapeutic duplications (e.g., when a patient is prescribed to take several medications due to one common reason of pain management) and inadequate dosing (e.g., when an insufficient dose of opioids or analgesics is definitely prescribed). Such differences may result in inefficient pain control or side effects vulnerability, in particular among poorly functioning organs patients.

In a comparable way the pharmacist was looking into the psychotropic agents that are generally issued to the palliative society patients that are helpful to manage the symptoms of anxiety, depression, or agitation. The drugs are extremely complicated to monitor considering there might be a drug interaction, and that the patient has a changing health condition. The pharmacist was involved in making sure that patients were taking the best psychotropic agents and the decisions made were both effective and safe. When polypharmacy was evident, the pharmacist was able to identify a chance of prescribing fewer medications and alleviating the burden on pills that were not required, which increases medication adherence.

Also, adjuvants, including drugs to control such symptoms as nausea, constipation, or sleeplessness, were considered very thoroughly regarding the appropriateness. The pharmacist has detected the cases when patients were either exposed to unnecessary or ineffective adjuvants, and was suggesting the appropriate changes to minimize risks of adverse reaction or complications. Reviewing and closely studying the entire regimen of dealing with the pain and the symptoms, the pharmacist contributed to the better usage of medication and elimination of risky interactions, which resulted in the general increase of patient comfort and safety.(8)

3.3 Offered Counseling to Caregivers and worked with Physicians to alter Therapy in the cases where it was necessary

One of the key components of the intervention was counseling of care givers. Given that caregivers are a key component in providing medications and checking the status of the patient in home-based palliative care, it was of essence that they were well equipped with required knowledge and unfazed by the medication regimen. The caregivers were educated by the pharmacist on the right medication administration methods such as the dosages, right time and side effects to look out on. This type of counseling allowed not only avoiding administration mistakes, but also made caregivers feel they are an important part of the care process, which, also, led to improved compliance with medication adherence.

Moreover, the pharmacist engaged physicians and other healthcare providers in close cooperation pointing out and modifying therapy when it was required in addition to educating the caregivers. Having found any inconsistencies or improvement gaps in medication regimen the pharmacist reported this data and related suggestions to the physician who prescribed the medication. This form of collaboration guaranteed that the changes that came about in the medication regimen were both clinically acceptable and conformed to the overall goals of the patient in terms of care. As an example, in case the drugstore suggested that the patient was given a low dosage of analgesic or there is a dangerous drug combination, the drugstore would recommend the doctor to use other medicines or adjust the dose so that the patient could feel better and be safe.

Another type of teamwork referred to, in the context of this field, was the combination of work with home nurses and other medical workers, e.g., a physical therapist or a social worker, to make sure that the patient took medicines in accordance with her or his overall care plan. The role played by the pharmacist to close communication gaps among all the members of the healthcare team played a critical role in making the intervention not only effective but also aligned with the overall needs of the patient in terms of care.

Engaging the caregiver in the medication reconciliation process as well as the continuous support offered to the caregiver and the collaboration with the healthcare team, the pharmacist made sure that the medication reconciliation process was comprehensive, practical, and the considerations made therein were based on the individual needs of a particular patient. It was also aimed to solve the discrepancies and not only to identify them but also to make the patients and caregivers feel secure about the possibility to handle the medications properly and safely at home.

4. Regulation Compliance Factors

4.1 Made Sure that Medication Documentation Keeps to National Homecare Pharmacy Standards

An important point of the intervention that was led by the pharmacists was that all the documentation about the medication was up to the standards of the national homecare pharmacies. These standards ensure the precise and uniform record of medications in the homecare environment, which aims to maximize patient security, enhance talks, and stay in compliance with all legislations. Owing to the fact that home-based palliative care usually has multidisciplinary practitioners, it is imperative to have a set of records in which medications are properly documented in order to eliminate any possibilities of committing medication errors and disrupting continuity of care.(9)

The pharmacist also examined the records of all the patients to make sure that they were complete, accurate and in accordance to the national regulation. This included checking that all the medications that were prescribed were all written properly indicating drug name, dose, drug route and frequency. Any omission or gaps in information were noted and amended. The pharmacist also made sure that the alterations in the use of the medication, which could include dose variations or addition of new medicines to the set, would be noted in the medical history of the patient and shared with all the interested parties, such as caregivers, physicians, and home nurses.

The pharmacist was also keen to ensure that schedules related to the administration of medication were properly documented as well as easy to follow that reduces chances of errors to occur during the administration of drugs. Specifically, they paid attention to the fact that the medication regime of the patient should be well-defined so that it should be rendered clear to the home caregivers who might be critically involved in drug administration. The objective of this documentation process was to comply with the regulations and minimize the risk of harm as a result of ambiguous or inadequate records of medications.

4.2 Marked and Revised Off-Label Uses that have no Recorded Information

The other notable part in the regulatory compliance initiative by the pharmacist was to detect and rectify the off label use of drugs that were not documented properly. It is not unusual in the palliative context that when medications are prescribed, they are assigned off-label use: that is, they are prescribed outside the approval process conducted by regulatory authorities (such as the FDA or EMA). Although off-label prescriptions may be medically correct in some situations, particularly in situations of palliative care where patients might need individualized treatment plans, great care must be taken that their applications are well documented and in the appropriate manner. The pharmacist scrupulously reviewed the drug regimens to identify those cases when medications were taken out of label or used to treat pain, sedated, or managed symptoms and make sure that such usage is appropriately documented in the medical records of the patient. In the instance that an off-label drug was identified to have been prescribed without proper documentation, the pharmacist identified this problem and liaised with the prescribing MD to clearly indicate the justification of the off-label usage in the patient records. Such documentation is critical to the transparency and justify clinical decisions as well as compliance with regulations.

In addition, the pharmacist kept all the off- label uses of the drugs clinically acceptable and associated with the best practice principles of palliative care. This involved clinical guideline reviews and up to date research to determine that the off-label use was based on evidence and could support the goals of care of the patient. When a request was raised to prescribe off-label medication without investing enough in a clinical evidence and regulatory papers, the pharmacist simply recommended alternative medicines or changes to the dosage regimen so as to not only keep a patient safe but also in line with medical rules and regulations.(10)

4.3 Renewed Prescription Labeling Concordance and Transfer Reporting of Home Nursing

The pharmacist had an important role in enhancing the uniformity of prescription labeling as well as home nursing handover documentation, which constitute two very crucial fronts, directly influencing patient safety, as well as regulatory compliance in the homecare setting.

Prescription labeling is also sometimes uneven in the palliative care setting at home; especially when the virtual unlimited number of drug prescriptions occurs among different healthcare providers with different patients. Incomplete or inappropriate labeling or inconsistency in labeling may create confusion in medication administration that has potentials to cause adverse drug events. To tackle this, the pharmacist ensured the standardization of all prescriptions so that all drugs were well labeled with their appropriate details and labels such as the drug, dosage, route of administration and required frequency. The pharmacist also urged that giving specific directions to any as-needed (PRN) medicine is crucial since most of them are poorly handled in lack of labeling.

The other problematic place was home nursing handover documentation. Good handover documentation is vital in handling information regarding medication regimes because the home nurses should be fully equipped with sufficient information about changes in medication regimes and introduction of medications. This, in home-based

palliative care, may include, shift-to-shift handover, where the new information about medication should be relayed on a clear and accurate manner. The pharmacist updated the quality of this handover writing, and this consistency is evident by ensuring that every relevant information about the patient and his/her medications is well communicated to all the participating nurses in this handover. This contained an elaborate description of any medication that has been changed, reason behind the change, as well as any special considerations in administration of medication(11)

The fact that the health outcomes were achieved through the following improvements reflects the key points of the medication documentation the pharmacist facilitated communication process between various members of the healthcare team, and decreased preventing the occurrence of medication errors. The maintained and proper labeling of medications, as well as thorough documents about the handover, is critical in the safe usage of medications at the homecare level and by achieving compliance with regulations.

4.4 Presence of Regulation Control and Compliance Till Forever

During the intervention, the pharmacist also acted to make sure that all the medication practices were in line with the statutory government agencies including Food and Drug Administration (FDA) and National Institute for Health and Care Excellence (NICE). These organizations set relevant rules and regulations that ought to be observed to guarantee patient security and superior care. The pharmacist made continuous observation in compliance with these standards and every stakeholder in the homecare team was made to know and follow these standards. Such proactive attitude contributed to assuming that not only was the intervention effective clinically but it was also in full compliance with national regulations.

5. Results

5.1 As the mean of DRPs was 3.2 before and 1.5 after the period of intervention.

The major finding of this experiment entailed the reduction of the mean total number of drug-related problems (DRPs) per patient. This was measured at baseline, when the average was 3.2 DRPs per patient, explaining the average challenges encountered by medications in situations of home-based palliative care. After the intervention, the number of DRPs per patient went down to 1.5. Such a substantial decrease indicates the potential benefit of pharmacist-led medication reconciliation in recognizing medication errors and correcting them in the case of the homecare palliative patients.

The mixture of these two classes was significant, as is indicated by the table and bar graph below, here the total amount of DRPs per patient was decreased by 1.7 DRPs per patient. This implies that the intervention was effective in mitigating and reducing the rates of medication errors to enhance patient safety and medication use in this risky group.(12)

5.2 53% Aggregate Decline in the Amount of DRPs in the Study Cohort

In the overall 95 patients cohort study, the total reduction in total DRPs, as a result of the intervention, amounted to 53 percent. During baseline, the total number of DRPs experienced by the cohort was 304 (3.2 DRP per patient multiplied by 95 patients). The number of DRPs decreased after the intervention, revealed to be 143 DRPs (1.5 DRPs per patient with 95 patients). Therefore, the effect of pharmacist-led reconciliation intervention was significant and broad in its impact of decreasing medication-related issues. This event shows us that the intervention can be effective in enhancing the safety and patient outcome of medication in home-based palliative care when regarding the total number of DRPs.

The 53 percent decrease is quite encouraging because it highlights the importance of including pharmacists when dealing with the areas of particular concern in polypharmacy, poor documentation on medications, and drug-drug interactions in the homecare area.

5.3 72 percent of DRPs were associated with Pain drugs and CNS adjuvants, mostly related to dosing error and changes were not documented

In-depth examination of the DRPs showed that about 72% of the total number of DRPs concerned pain medications and the use of the central nervous system (CNS) adjuvant drugs, which are widely applicable in clinical practice in palliative care by dealing with pain and various other related symptoms anxiety, insomnia, and agitation. The highest number of cases reported in this sub-set was the dosage errors and change of medication without records.

The most common dosing errors were in giving wrong prescriptions of pain medications, including opioids, where patients were either under-treated or over-medicated according to changing clinical requirements. These mistakes

make it possible to forget the correct dosage of pain relievers and poison the patient with the resulting sedative effect, which will spoil the patient and endanger his safety.

Another source of DRPs was not documented changes. Also in most situations, the changes medication regimen, i.e., the introduction of adjuvants to control symptoms, changes in opioid dosage, were not documented adequately and not informed to all care providers. This is because the absence of documentation might easily create misunderstanding and present medication errors, particularly in a homecare facility where several medical practitioners interact.(13)

Table 1: DRP Reduction Summary

Measure	Average DRPs per Patient	Total DRPs
Baseline DRPs	3.2	304.0
Post-Intervention DRPs	1.5	142.5

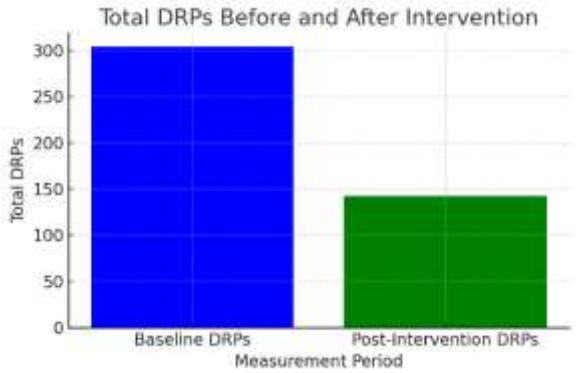

Figure 1: Total DRPs Before And After Intervention

6. Conclusion

6.1 Medication Reconciliation by Pharmacists Rendered DRPs Greatly Minimized at the Home Palliative Care Unit

This paper showed a high level of influence of pharmacist-initiated medication reconciliation in eliminating drug related problems (DRPs) in home-based patient care. This kind of intervention which evaluated and justified medication regimen of patients through comprehensively reviewing and reconciling medication regimen by a pharmacist was successful in finding and addressing the drug discrepancy that would harm the patient and/or cause effect mismanagement. The patients under home palliative care prior to intervention averagely had 3.2DRPs per patient. After the intervention, the results showed a decreasing number of DRPs to one on average per patient; a decrease in 53 percent of the study population.

These results also highlight the essential role that pharmacists can fulfill in reducing medication errors and enhancing patient outcomes in the high-risk groups such as patients of the palliative care at home. Reviewing the lists of medications, recognizing the duplications of therapeutic regimens, modification of dosages, and making sure that the alterations in medication were appropriately reported, pharmacists did not only enhance the safety of drug therapy but also essentially interfered in the quality of care and patient well-being directly. This measure has worked especially well in decreasing frequent DRPs, which included dosing mistakes, undocumented switch, and therapy duplications. The results match those of the past studies that emphasize the advantages of employing pharmacists in medication management, especially in homeber and palliative care, which is characterized by the complications of medication regimens that will continue to change.

6.2 Enhanced Communication and Documentation Enhanced Comprehension of Caregivers and Medication Compliance

Besides enhancing patient safety, the pharmacist-led intervention also emanated strong communication as well as documentation among the healthcare team. Communication with caregivers, physicians, and home nurses was active, leading to effective cooperation of all participants of the patient care, namely a clear and accurate understanding of medication regimen of the patient. Among the main findings of the study was the high satisfaction

level in care givers especially in their knowledge of the medication regimes and rightful administration of medications back at home.

Caregivers play an important part in the success of a home palliative care because they usually administer the medication, control the side effects and keep in touch with medical practitioners. But the care givers do not necessarily have the whole idea of the dos and the doses of the drugs that are prescribed, especially in the palliative care field where we often have complex drugs and where adaptations on the drug are commonplace. The participation of the pharmacist in the process of informing caregivers on the correct usage of medication, adverse effects, and the reasoning behind the choice of particular kinds of drugs promoted a more developed awareness on how to improve the treatment of the patient. Consequently, this increased medication compliance, which is a crucial aspect in the process of guaranteeing a patient enjoys the maximum of administered regimens.

Also, the intervention allowed enhancing documentation of medications, which is essential in the medication error prevention. The fact that all medication changes, adjustments and recommendations were registered correctly, with the help of the study, made it easier by cutting down on the possibility of missing a dose or improper administration of medication, as well as simplifying communication within the care team. Universal documentation was also clear and consistent which opened up information on the latest care to caregivers and home nurses and improved the quality of care and helped the regulatory body to be compliant.

6.3 Homecare Teams integration of Pharmacists is both clinically as well as regulatory supportive and does not cause incremental costs in the system

The other major finding of the study is that the inclusion of pharmacists into the homecare teams is clinically effective as well as costless (there is also no change in workflow except minor). The referral did not generate much extra expenses, which means that the intervention is very plausible and sustainable in the context of ensuring medication safety in home-based palliative care. Since there is a rise in the prevalence of palliative care patients who are treated at homes, especially considering the current trends of aging population and the heighted concerns at the individual level, this model may be extensively applied on other healthcare systems without incurring much financial excess.

Regulatory Regarding the regulatory aspect of medication reconciliation, medication reconciliation guided by a pharmacist is a regulation-supportive intervention. This intervention also aids healthcare providers in satisfying the strict requirements of regulatory standards by addressing the issue of medication changes by thoroughly documenting them, predicting any possible future errors before they encounter or even harm patients, and ensuring that the institution serves the patients according to national homecare pharmacy standards. Pharmacist also plays the role of making sure that off-label use of medication is properly documented and justified as well as the care offered is appropriate and legal.

The results of this paper support the importance of the participation of pharmacists in the palliative and homecare services, taking into account the economically efficient and successful results of such participation. The intervention helped in providing safer care to the patients, increased satisfaction levels of the care givers, and minimized the risks of care giving regarding the error caused by the use of medicine without having to allocate significant financial costs.

6.4 Future Work

Although this research proves to be positive, there is more potential to be researched in the effects of pharmacist-led medication reconciliation in home-based palliative care, especially the effect on hospitalizations, morbidity, and quality of life. Moreover, applying this model to various homecare environments and patient groups might give a wider picture of its applicability and performance in the different health care contexts.

To summarize, the research will help to prove that the presence of pharmacist-led interventions can lead to a significant decrease in DRPs, facilitate the improvement of communications between the caregivers and the healthcare providers, and help to provide regulatory compliance in the home-based palliative care setting. Pharmacist integration into homecare teams implies a clinically effective, cost-efficient, and regulatory-compliant way of bettering patient safety and well-being in a vulnerable care environment.

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Conflicts of interest

The authors have no conflicts of interest to declare

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