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Pharmacist-Based Interventions Analysis to Reduce Drug-Related Problems for Surgery Patients

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ABSTRACT

The misuse of drugs is detrimental and prevalent among hospitalized patients. Patients admitted to general surgery wards typically face a significant risk of Drug-Related Problems (DRPs). This Randomized Controlling Trails (RCT) sought to evaluate the efficacy of a healthcare program on surgical wards for identifying and mitigating DRPs compared to regular healthcare. This research was performed in standard surgical wards encompassing gastrointestinal, arterial, and orthopedic procedures at a central teaching facility for six months. Enrolled participants were randomized into treatment or controlling categories. Medical pharmacists evaluated participants' DRPs and proposed solutions to address the detected DRPs in the treatment category.

The treatment category (n=75) and the controlling category (n=70) had an average age of 58.5 years, with 53.0% of participants being female. 1100 DRPs were detected, averaging 9.2 per participant (intervention category, 9.1 ± 3.5; control category, 9.5 ± 3.5). The often recognized DRPs comprised concerns about safety (25.4%) and effectiveness (18.5%). The adoption rate of pharmacists' suggestions by doctors was notably high at 95%, accompanied by a DRP corrective rate of 60.5% throughout hospitalization. The efficacy of pharmacological care was demonstrated by attaining medical goals and preventing mortality, achieving 69.3% in the treatment category, in contrast to 20.4% in the controlling category ($p<0.001$). This research demonstrates that DRPs are prevalent amongst surgery recipients, particularly concerning drug effectiveness and safety. Pharmacists' suggestions significantly aided in addressing the majority of reported DRPs and enhanced medication management for general surgical participants.

Keywords: *Pharmacy, drug-related problems, surgery, interventions.*

1. INTRODUCTION

Medication errors can result in complications for those in hospitals. Numerous instances stem from prescription mistakes that result in potentially avoidable morbidity, mortality, and expenses. Most are attributable to analgesics, a mixture of antibacterial agents, cardiovascular medications, and pharmaceuticals eliminated via renal excretion [1]. Individuals on surgical floors are particularly vulnerable due to the necessity for analgesics and antibiotics, regularly changing of antithrombotic therapies, and waste of blood and fluids. In senior surgical recipients, numerous co-morbidities necessitating various medications exacerbate the possibility of drug-related complications. Junior doctors frequently administer care for such individuals [12]. These medical professionals perceive themselves as inadequately qualified for prescribing and are commonly overseen by surgeons lacking specialized knowledge in sophisticated pharmacology.[2].

Guidelines have been established to aid physicians and enhance care; their implementation is problematic, and compliance is restricted, potentially due to the frequent turnover of novice doctors in these units. Various strategies can be employed to reduce errors in prescriptions. The introduction of a complete checklist encompassing medication-related elements has been demonstrated to decrease surgical complications and death.[18]. Computerized Practitioner Order Entry (CPOE), integrated with a clinical decision-making system, can assist the doctor and the hospital pharmacy. Specific prescription errors remain undetected, and concurrently, alert exhaustion develops due to extraneous notifications, heightening the probability that critical alerts are overlooked. The novice doctor lacks sufficient understanding to interpret the signals.[9].

In the majority of hospitals, overruled alarms are reviewed by hospital pharmacists. A thorough assessment of the patient's prescription by the pharmacy necessitates an in-depth understanding of the clinical circumstances. This has resulted in increased engagement of pharmacy technicians in medical wards. Although research indicates the advantages of various clinical pharmacy offerings, there is less evidence of their impact on clinically significant outcomes for those attending regular (Intensive Care Unit (ICU)) hospitals.

The improper utilization of drugs is detrimental and prevalent among hospitalized patients. Numerous studies have discovered a wide array of Drug-Related Problems (DRPs) in hospitalized individuals, primarily concerning the effectiveness or safety of drugs [3]. Patients admitted to surgical rooms are typically at elevated risk for DRPs due to multiple medications associated with comorbidities, the necessity for intraoperative medication modifications, and the utilization of higher-risk drugs, which exacerbate this risk.[10].

This study sought to evaluate the efficacy of a medical service in detecting and addressing DRPs among surgery-related participants, emphasizing the involvement of medical chemists in surgical rooms relative to conventional medical treatment [14]. The goal was to investigate the medical benefits of working together between physicians and clinical pharmacists to improve therapeutic results for individuals undergoing surgical procedures.[4].

1. BACKGROUND

The active involvement of clinical doctors in inpatient treatment can substantially influence the identification and mitigation of DRPs and enhance patient results during hospitalization and beyond. The responsibilities of clinical pharmacies encompass drug evaluation during patient hospitalization, involvement in clinical phases, and discharge counseling. Numerous studies employing various methodologies have shown the role of practicing pharmacists in enhancing therapeutic results, attaining treatment objectives, minimizing adverse effects, and ensuring affordability in countless acute and chronic conditions in internal medicine clients, including cardiovascular disease, hypertension, and obesity mellitus [5].

Few studies globally have examined the significance of pharmacological treatment for individuals undergoing surgical procedures [11]. Numerous research studies have examined specific pharmacist interventions, including suitable antibiotic prophylaxis, optimization of thromboprophylaxis, pre-admission hospitals, and avoiding adverse medication events [13]. Many investigations have been performed on particular participant populations, including those with cardiac, neurosurgical, tertiary bariatric, and visceral surgery conditions. There is limited data on the influence of pharmacies in surgical settings [8].[7]. A comparison investigation of surgical participants is necessary to substantiate the critical findings about the possible substantial role of pharmacists in surgical environments.[16].

2. MATERIALS AND METHOD

3.1 Design and Environment

The Randomized, Controlled Trial (RCT) was performed in the routine surgical wards of a major hospital. This extensive public hospital offers services to a diverse segment of the community. The hospital's 350-bed surgical wards, comprising part of a total of 540 beds, encompass the following areas of expertise: abdomen treatment, heart treatment, endocrinology treatment, and oncological treatment. The research adhered to the Clinical Practice and received approval from the hospital's administrative review committee.[18].

1.1 3.2 Sample dimension

The results from the first 18 participants were utilized for sample dimension determination. The average variation in DRPs at remittance among the treatment and controlling categories was 2, with standard deviations of 2.5 and 4.5, respectively. With an alpha level of 0.15 and an energy of 82%, the lowest sample dimension of 42 subjects per category (intervention vs. controls) was required to achieve a meaningful difference. Considering a potential 25% loss to follow-up, the overall sample dimension was 98 individuals (50 individuals per category).

3.3 Participants in the Study

Patients hospitalized in ordinary surgical rooms with an anticipated length of admission exceeding 2 days were solicited to engage in the investigation. The data gathering and following-up occurred for a six-month duration. Participants received information regarding the study and were allowed to participate in interviews conducted by certified pharmacists in clinical settings. Individuals over 18 identified as having one or more acute or chronic medical illnesses and prescribed two or more drugs upon admittance were suitable for inclusion in the study. Individuals reported in medical records with any of these diseases were eliminated: gestation, schizophrenia, or cognitive decline, and those unable to offer informed authorization. Written permission was acquired from every person in both study categories.[6].

3.4 Categorization of DRPs

The official description of DRPs hinders the patient’s optimum clinical results. DRPs were categorized according to the framework established. DRPs are classified into seven primary types: needless medication, untreated illnesses necessitating

drug treatment, effectiveness issues, safety concerns, inadequate understanding, poor adherence, and the requirement for more regular drug surveillance.

3.5 Data Acquisition

Demographic features, social position, medical histories, and individual prescription lists were extracted from the hospital database. The morbidity among individuals was quantified using the Ranking, a tool designed for predicting death by categorizing or assigning weights to illnesses. Additional data sources included clinical and nursing conditions, interviews with patients, and discussions with primary and secondary healthcare professionals and caregivers. The research employed a systematic approach to guarantee uniformity and precision by synthesizing data from several sources, validating it through cross-referencing, jointly addressing differences, and preserving current documents. Clients' personal information was anonymized and entered into the case report section on the internet-based systems.

Three qualified pharmacy technicians conducted Medication Reconciliation, which was succeeded by a Medication Review at hospital admissions and discharges. Pharmacological therapies were recommended to physicians. All remarks containing an idea from the pharmacy technician were documented in the individual's medical file and conveyed to the doctor. Patient education was conducted at the time of leaving the hospital. The research meets the Strategies for Improved Reporting Excellent criteria. The entire technique is depicted in Figure 1. The research was conducted outside investment and received approval from the Ethics Council of the National Institutes of Illnesses.

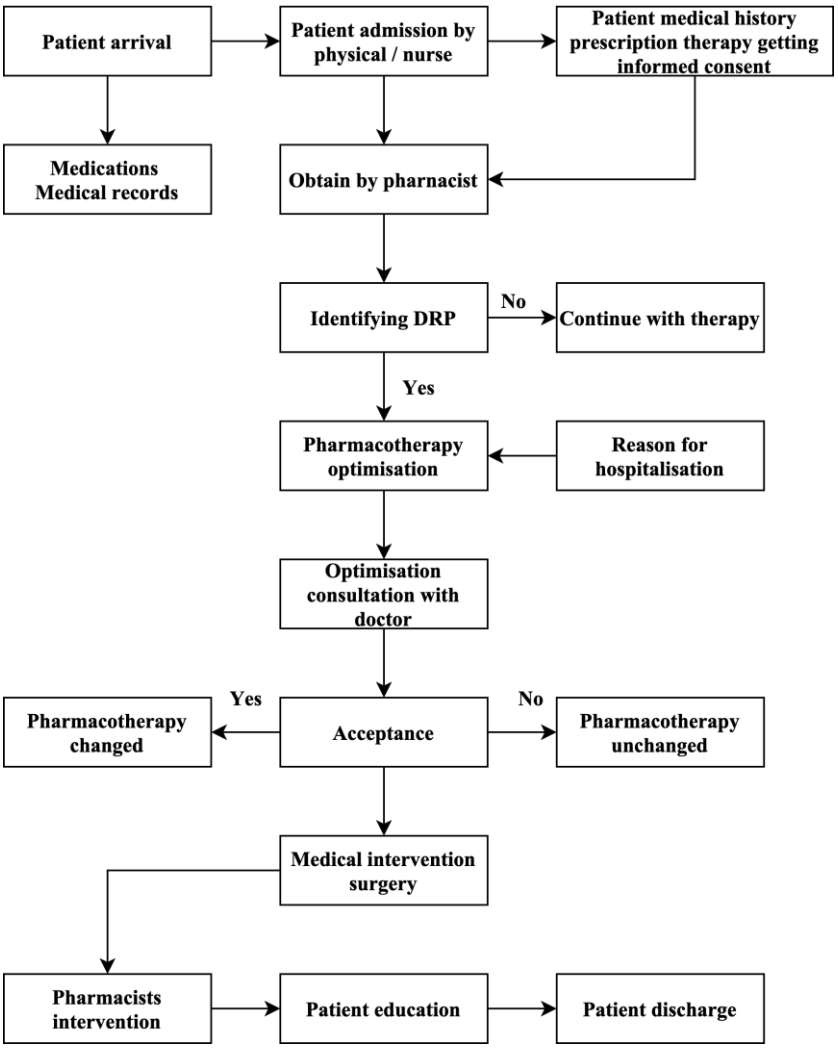

Figure 1: Workflow of the DRP

3.6 Comparison of the intervention and standard care

The research pharmacists conducted initial interviews with individuals in the two categories of study to gather data on their medicines, illnesses, and lifestyles and to evaluate and identify DRPs. The individuals in the treatment category received standard care from their doctors and nurses and medications administered by clinical pharmacy technicians. Physicians

conducted daily follow-ups with patients, evaluating the effectiveness and safety of medicines, recommending optimal therapeutic regimens for various medical conditions, offering medication counseling, addressing inquiries from patients and healthcare professionals, assessing and promoting adherence to prescribed therapies, and advising on laboratory results tracking.

Participants in the untreated category received standard treatment administered by nurses and doctors. The pharmacy technician failed to provide suggestions or give educational advice or counseling. In control individuals, drugs were evaluated for DRPs at departure and prospectively among their medical to assess results for DRPs and contrast them with the category receiving intervention. Daily assessments of DRPs were not conducted in the control category to facilitate a proper comparison with the treatment category and to more effectively evaluate the influence of clinical pharmacy on individuals. Detecting DRPs in the controlling category without treatment presents moral dilemmas and influences the research results if addressed or eliminated. Every detected DRPs, suggestions, and categories of outcomes were proposed by the research's physicians and examined by the two researchers for conversation and agreement.

3.7 Performance indicators

This research examined the following results:

3.7.1 Process outputs encompassing:

- Prevalence
- Categories of detected DRPs
- Level of doctors' approval of suggestions.

3.7.2 Medical results: a comparison was made between the treatment and control categories concerning:

- Therapeutic results of DRPs during hospitalization: Participants were monitored to assess the results for every DRP during their hospitalization. This encompassed the evaluation of health indicators, physical exam findings, testing results, diagnostic test outcomes, symptoms of patients, and health record annotations. The interventional and control groupings were compared concerning the number of DRPs settled, enhanced, averted, unchanged, or aggravated.[15].
- To evaluate the effect of pharmacists' treatments during hospitalization, the research examined and contrasted the incidence of DRPs at discharging medications among the treatment and controlling categories.

3.8 Characterization of Medical Results

The medical results were categorized as follows:

- Resolved/enhanced: A therapeutic result was attained or enhanced. This term was employed to denote results necessitating the addition of a medication to enhance the medical result. Addressing genuine negative drug responses or authentic Drugs-to-Drugs Interactions (DDI) was deemed 'resolved/enhanced.'
- Avoided: Potential morbidity was averted by mitigating adverse drug reactions or DDIs, providing education to rectify improper knowledge or compliance, and discontinuing superfluous or possibly hazardous pharmacological therapies.
- Unchanged: The term applies when the addition of the suggested drug fails to enhance the clinical results. This term was used when failing to implement suggestions concerning various issues or omitting a medication that influences long-term therapeutic results.

3. RESULTS

During the standard care phase of the trial, there were 6800 procedures (6000 individuals), while the treatment phase had 6500 discharges (5800 individuals). Table 1 delineates the attributes of these applications. A markedly reduced percentage of admittance with one or more clinically pertinent, potentially avoidable DRPs transpired during the treatment phase [2.3%] in contrast to the standard care duration of the trial [2.3%]. The relative risk was 0.78 (92% Confidence Interval (CI)l: 0.61-0.89). Following adjustment for relevant variables (age, race, division, anticipated hospitalization), the corrected Relative Risk (RR) was 0.81 (92% confidence interval: 0.62).

Table 1: Features of admissions

	Usual care time	Intervention time
No. of admissions	6800	6500
No. of participants	6000	5800
Average age of participants (yrs)	64.5	63.5
Department of admission	3200	3100

Common	3850	3750
Orthopaedic	1500	1450
Urology	1150	1350
Planned admission	2350	2150

Upon categorizing the included participants into established risk classifications, the primary outcome shifted from 4.2% to 1.9% in higher-risk individuals, 0.82, and 0.38% to 0.25% in lower-risk individuals, 0.69. The average quantity of higher-risk individuals requiring evaluation to avert one significant clinical drug-related issue was 120.

Table 2: Features of interventions

	Usual care time	Intervention time
Average no. of medications	5.8	6.7
Medication after first entry	854	703
Hypoglycaemics	590	520
Antagonists	4350	3850
Heparins	1250	1150
Aggregative inhibitions	1500	1300
Diuretics	1650	1450
Beta inhibitions	2450	2300
Opioids	2750	2350
Department of entry	3200	3100
Common	3850	3750
Orthopaedic	1500	1450
Urology	1150	1350

Table 2 presents a comparison of variables related to the treatment. No variation was observed in the number of drugs on the first day post-admission. There was a minor reduction in the percentage of hospitalized patients utilizing particular pharmaceutical categories. In specific categories (heparin, diuretics, beta inhibitors, opiates), the decrease was of statistical significance. The duration of hospital stays and the incidence of individuals with kidney failure diminished following the operation.

Table 3: Features of participants with action

	Usual care time	Intervention time
Average no. of participants	76.5	72.5
Women	50.5	35.0
Department of entry	75	44
Common	32	21
Orthopaedic	5	9
Urology	12.7	13.2
Average no. of drugs	12.3	14.2
Average size	13.2	15.1
Average time	6.8	7.1

Table 3 delineates the attributes of individuals who experienced an event. The individuals who experienced an event were older and utilized more medications on the first day following discharge. The average length of hospitalization for these individuals was somewhat reduced post-intervention compared to the usual care duration; it was considerably longer relative to the overall patient cohort. The average duration until the incident occurred exhibited no disparity between the two intervals. It delineates the categories of occurrences associated with individuals experiencing a DRP. Various types of incidents occurred with reduced frequency during the treatment time frame, particularly thrombosis and neurological events (mostly delirium).

Table 4: Average expenses of treatment

	Usual care time	Intervention time
Pharmacal help	5.24	3.24
Clinical doctor	2.32	2.13
Prescribers	0.98	0.24
Training prescribers	7.45	7.24

Table 4 presents the expenses associated with research-related operations throughout the normal care phase and the treatment

period of the trial. During the program, hospital pharmacies' expenses per admittance were elevated due to their execution of medication safety checks and ward inspections. The costs associated with pharmacy technicians were reduced. The expenses related to learning of pharmacists and doctors were evaluated and quantified as additional expenditures per admission. The average total costs amounted to €5.5 (92.5%) per hospitalization over the standard care period. The differences were not economically different compared to €7.2 (92.5%) per hospitalization during the treatment phase.

The treatment category (n=75) and the controlling category (n=70) had an average age of 58.5 years, with 53.0% of participants identifying as female. There were 1100 identified DRPs, with an average of 9.2 per participant (intervention category: 9.1 ± 3.5; controlling category: 9.5 ± 3.5). The often acknowledged DRPs included issues related to safety (25.4%) and effectiveness (18.5%). The adoption rate of pharmacists' recommendations by physicians was significantly high at 95%, alongside a DRP correction rate of 60.5% throughout patients' hospitalization. The effectiveness of the pharmaceutical intervention was evidenced considerably by the achievement of medical objectives and the reduction of mortality, reaching 69.3% in the treatment category, compared to 20.4% in the control category ($p<0.001$).

4. LIMITATIONS, FUTURE DIRECTIONS, AND SUGGESTIONS

5.1 Prospective Directions

Incorporating modern technology and Artificial Intelligence (AI) has demonstrated potential for enhancing healthcare services. Studies emphasized the significant influence of these advances on the routine activities of medical pharmacists. Physicians have superior expertise relative to AI in pharmaceutical education, prescription review, identification of negative drug reactions, and assessment of their causes. This highlights their essential function in direct interaction with participants and enhancing medical results.

5.2 Obstacles and Approaches

5.2.1 Opposition to transformation

Medical personnel oppose pharmacist-based actions, perceiving them as an additional encumbrance. Execute focused learning that emphasizes the advantages and cost-efficiency of pharmacist-based treatments and provides evidence of enhanced patient results.

5.2.2 Challenges of integration

Integrating pharmacist-based treatments into current systems might be challenging due to process limitations and the absence of established standards. Establishing explicit standards for physician participation and incorporating them into Electronic Medical Records (EMR) can illustrate their practicality and advantages.

5.2.3 Labor scarcity

The deficiency of doctors and nurses intensifies the difficulty, resulting in overextended staff and restricted treatment of patients time. Employ doctors for responsibilities like medication administrators and patient education to alleviate the workload of nurses and doctors.

5.3 Constraints

The principal weakness of the research is the lack of a control population, which resulted from ethical reasons. This constraint creates possible biases, including selection prejudice and confounding factors, which compromise the reliability of the results. Without a comparison group, it isn't easy to ascribe the results seen only to the treatment conclusively. The research project was structured as a prospective investigation undertaken at a single center, thus constraining the application of the outcomes to wider demographics and diverse healthcare environments. The research initially intended to incorporate a post-discharging follow-up appointment 4-10 weeks after the participants' release. The research had challenges accomplishing this objective due to organizational constraints, as specified in the protocol change sanctioned by the Ethics Board. The research could not evaluate the adoption rate of suggestions provided to outpatient doctors at the time of hospital release nor ascertain the impact of pharmacist-based training. Finally, due to legislative barriers to access to general digital health records, the research could assess the adoption rate of the treatments administered upon hospital release. This shortcoming hindered the ability to ascertain the degree of implementation of the suggestions in hospitals, potentially affecting the comprehensive evaluation of the intervention's efficacy.

Notwithstanding these constraints, the analysis offers significant insights and underscores critical topics for future investigation. Employing an RCT methodology in subsequent research would mitigate these drawbacks by reducing biases and yielding more applicable proof of the intervention's efficacy.

1.2 5.4 Recommendations

The study involved a pilot trial to assess the role of chemists in optimizing medication for individuals undergoing vascular surgery. The present pilot study represents the inaugural prospective assessment of drugs in this group of patients to quantify

the beneficial effects of pharmacist participation on the clinical results. Initial findings suggest substantial enhancements in healthcare when doctors are integrated into the medication regimen. An RCT evaluated the efficacy of pharmacist-based treatments at an academic medical center, revealing a decrease in DRPs and enhanced adherence in an inpatient environment. To validate these encouraging findings, the forthcoming research must ascertain the beneficial effects of pharmacological therapy through a prospective RCT design to mitigate possible biases. Future research should incorporate control groups, more significant sample dimensions, and subsequent follow-up after discharge to yield more substantial evidence regarding the advantages of pharmacist-based treatments. In developing such a research, the research should weigh both moral and technical aims and achieve a balance between them. These initiatives will ultimately facilitate establishing optimal procedures for incorporating chemists into healthcare groups and enhancing patient results.

5. CONCLUSION

This research indicates that DRPs are prevalent among surgical individuals. The most pervasive DRPs pertained to safety, including high dosages and interactions with medicines, alongside those relating to patient tracking and medication efficacy. Doctors' advice significantly aided in addressing the majority of identified DRPs and markedly enhanced the safety and effectiveness of drugs utilized in general surgery clients. The treatment category (n=75) and the controlling category (n=70) had an average age of 58.5 years, with 53.0% of participants identifying as female. 1100 DRPs were identified, averaging 9.2 per participant (intervention group: 9.1 ± 3.5; control group: 9.5 ± 3.5; p = 0.48). The often acknowledged DRPs included issues related to safety (25.4%) and efficacy (18.5%). The accepting ratio of suggestions by doctors was 95%, with a DRP correcting ratio of 60.5% during patients' hospitalization. The effectiveness of the medical intervention was evidenced considerably by the achievement of medical objectives and the reduction of mortality, reaching 69.3% (25.1% + 43.5%) in the treatment group, compared to 20.4% (13.5% + 5.2%) in the controlling category. The study indicated that surgical patients experience a significant incidence of DRPs during hospital stay and discharge. The provision of pharmaceutical care during hospital stays and departure diminished the prevalence of DRP in the research environment. The execution of pharmacist-based treatments during hospital stay and departure, accompanied by patient education, improves patient safety. The outcomes of this study corroborate prior research and underscore the significance of medical pharmacy collaboration in both regular and specialized surgical units.

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