ISSN: 2573-9565

Research Article

Journal of Clinical Review & Case Reports

A Retrospective Cohort Study of Pediatric Unplanned Readmission with Medication Related Problems in Tertiary Hospital

Khawla Khamis Al Quaitaei[1], Laila Khalifa Al Saadi[1], Jehan Al Fannah[2] and Alka Ahuja[1]*

[1]*Oman Medical College, Muscat, Oman*

[2]*Royal Hospital, Muscat, Oman*

***Corresponding author**
Alka Ahuja, Professor of Pharmaceutics and Head of Research Oman Medical College Muscat. Sultanate of Oman, E-mail: alka@omc.edu.om

Submitted: 01 July 2018; **Accepted**: 06 July 2018; **Published**: 17 July 2018

Introduction

Hospital readmission is defined as "patient readmission into the hospital within 30 days (or 4 weeks) of discharge". Readmission rates are used as an indicator of the quality of care that patients receive during a hospital admission and after discharge.

Readmission is a worldwide problem. It is an unacceptable outcome from the perspective of patient centered care. Readmission is considered as a good indicator for quality of care but is not perfect (should be interpreted with caution) because of the other factors such as patient's age and the disease complexity. Some countries started to deal with this issue effectively. For example, USA hospitals are accountable for their readmission rate to reduce the cost and volume of treatment. In UK and Australia they monitor hospital readmissions as well. Studies indicate that 5 -10 % of hospital admissions are as a result of adverse drug event and 50 % of them are preventable.

A drug related problem (DRP) is defined as an event or circumstance that involves a patient's drug treatment that actually, or potentially, interferes with the achievement of an optimal outcome [1,2].

Problems associated with the drug use have a wide set of factors that can be considered as DRP viz. adverse drug reactions, drug interactions, untreated indication, inappropriate drug selection, sub-therapeutic dosage, supra-therapeutic dosage, non-compliance and drug use without indication.

There was a study about Pediatric Readmissions which showed that the rate of readmission was 7.6% with age group between 13-18 years and 6.1% in age group between 1-12 years. Pediatric disease state and child age are more related with Medication Related Problems (MRP) which can cause morbidity, mortality and significant burden on healthcare resources. MRPs are caused by adverse drug reactions, drug interaction, untreated complication, incomplete treatment, inappropriate drug selection, and sub-therapeutic dosage, supra-therapeutic dosage, non compliance and medication use without indication.

Planned readmissions were identified with procedure codes from the International Classification of Diseases, Ninth Revision, and Clinical Modification. A large amount of empirical research has been sought to explain the variation in hospital readmission rates observed in many high-income countries [3-5]. Identifying the reasons for readmissions can be crucial to securing a reduction in readmissions that are potentially avoidable, thereby reducing healthcare costs and improving health outcomes. Hospital mortality and readmission rates are important indicators of hospital outcomes that are frequently used to assess and publicise hospital and physician performance. They are also often used in health services research to assess issues such as the impact of service organisation, the relationship between hospital inputs and outcomes, the effect of introducing new policies and the impact of new technologies [6-13].

The idea behind outcome-based quality indicators such as hospital mortality or readmission rates is that, if appropriate adjustment is made for patient case-mix and external environmental factors, then variations in reported levels of such outcome-based quality indicators are likely to be driven by differences in the (unobservable) quality of hospital services, as reflected in the processes of hospital care and service organization. For example, the provision of appropriate rehabilitation services for fall and fracture patients is known to have an impact on the risk of readmission. Similarly an efficient management of the surgical theatre and staff shifts can reduce the delay before the patients are treated and thus their mortality risk [14,15]. The intrinsic quality attributes are often unobservable by the researcher, because collection of the necessary data is either impossible or highly costly. However, it is expected that hospitals with better quality should have on average better outcomes (as defined above) than their lower quality peers, after controlling for their differences in patient characteristics and environmental factors. Many empirical applications therefore examine unplanned readmissions occurring within 30 days from previous discharge of patients admitted with a similar primary diagnosis, such as hearth failures, AMI, strokes, pneumonia or hip fracture.

The advantage of outcome-based quality indicators is that they can be constructed by using routine administrative data on patient discharges without the need for costly additional information on the process of care. Outcome-based quality indicators can make it feasible for large population of patients and hospitals to be included in a study and followed for several years. However, these indicators can be inaccurate and have been criticized in the medical literature for their lack of clinical relevance [16,17]. Moreover, some outcome indicators have low correlation with more accurate measures of

quality based on the process of care [18,19].

Drug related admissions have significantly increased over the past few decades. According to various studies on drug related hospital admissions, it was estimated that around 5–10% of hospital admissions were due to drug related problems (DRP), in which 50% of them are avoidable [20,21]. DRP admissions need high attention as DRP related admissions on an average accounted for 8.36% [22-28]. Increased use of medicines, existences of multiple inter current disease states and polypharmacy are some of the risk factors for DRPs. Geriatric population showed a high incidence of DRP admissions. Pharmacological and pathological changes leading to alteration in pharmacodynamics and pharmacokinetic parameters of drug absorption, distribution, metabolism and excretion in elderly patients are believed to be the reasons why geriatric population is the most affected group among DRPs. Antiplatelet, anticoagulants, antineoplastic, immunosuppressive agents, diuretics, antidiabetics and antibiotics showed a high profile of drug related problems. Majority of DRP admitted patients presented with chief complaints of weakness due to dehydration, electrolyte imbalance; bleeding, GI disturbances, anemia, hypoglycemia, secondary infections etc. It has been noticed that drug related problems associated with medications' use have contributed to a major portion of the health expenses in most of the countries [29-32].

Most of DRP studies were retrospective, multicenter studies conducted in general population in Europe. The main objectives of the studies were to estimate DRP frequency, incidence, risk factors and trends of DRP hospital admissions. Anti-neoplastic agents, CVS drugs and CNS drugs were related to most of the drug related problems. These studies concluded polypharmacy and older age were the major risk factors for developing drug related problems. It was found that the cost for the management of DRP was directly proportional to severity.

Among patients admitted to acute care pediatric hospitals, the rate of unplanned readmissions at 30 days was 6.5%. There was significant variability in readmission rates across conditions and hospitals. These data may be useful for hospitals' quality improvement efforts. In this study, sample selection bias in the identification of hospitals' performance on unplanned readmissions occurring within 28 days of discharge of patients with a primary diagnosis of fractured hip was reported.

This intervention was especially relevant for the phenomenon that the scientists wanted to explore given the high risk of both mortality and readmission, and great deal of heterogeneity amongst patients. The bias was quantified at the patient level in terms of the unexplained correlation between the residuals of two separate probit models for survival and readmissions, similar to the models used in many applied studies. Second, having identified a bias, a solution was proposed to the sample selection problem relaxing the assumption of independence between the data generating process of patient survival and readmission implicitly adopted in most previous empirical applications. They used a bivariate sample selection model that allowed for the correlation between survival and readmissions and for the non-linear nature of the data generating process process shedding some light on the inconsistency between outcome-based and process-based measures of quality [33]. Using patients admitted with pneumonia in South California hospitals from 1989 to 1994, they showed that hospital risk adjusted mortality rates are affected by selection bias that invalidates inferences on the quality of care provided. Specifically, if patients' health conditions are not perfectly observable and patients are able to choose the hospital of treatment, then (unmeasurably) sicker patients are more likely to select high quality hospitals. Therefore, the differences in mortality rates across hospitals may be determined in part by difference in the quality of care they provide and in part by differences in unobservable patient health conditions. The latter effect systematically disadvantages high quality hospitals, and measures of the processes and outcome of care might show low correlation [34] providing an elegant econometric solution to correct for this bias by using a structural model that takes into account the patient choice of hospital and the two determinants of the mortality variable.

In general, observational studies based on hospital administrative data have only limited information on the heterogeneity in patient and treatment characteristics, which are therefore only partially observable. In contrast, other study designs in the medical and epidemiology literature, such as retrospective studies or prospective cohort studies, often have access to data describing such heterogeneity and thus are able to provide a better direct control for the latter. Therefore, observational studies need to pay careful attention to the characteristics of the data generating process before any meaningful inference can be made on variations in hospital quality of care, and on the determinants of such variations.

Hypothesis

The medication related problems cause hospital readmissions.

Objectives of the study

The study was planned with the following objectives in our mind:

- To determine if medication related problems in children contribute to unplanned hospital readmission.
- To study the records of readmission at Royal Hospital for paediatric readmission over a period of one year.
- To analyse the data and arrive at a conclusion of the study.

Methodology

A retrospective cohort study identifying the pediatric unplanned readmission with medication related problems in a tertiary care hospital (Royal Hospital) was carried out. Approximately 200 discharged patients were included in the study. The study was initiated by giving a formal request permission letter to access patient data at the hospital. As a second step, data collection at the hospital pharmacy was initiated. Al Shifaa System (the hospital medical system) was used to get the required information.

All participated children in this study were readmitted within 30 or 28 days of discharge. The models included all kind of causes such as pneumonia, surgical conditions, Chemotherapy sessions, Penile swelling, nausea reduced activity, abdominal pain, vomiting and many other diseases.

Results and Discussion

A. Data collection and analysis

The collected data was for approximately 200 patients. The data was divided in to sub groups according to the gender of patient, age of patient and reason of readmission. All the data was expressed as statistics in order to analyze them into Pie Charts and give the results. Table 1 shows the distribution of patients based on gender differences.

Table 1: Readmission of patients based on gender differences

Gender	Frequency	Percent	Percent valid	Cumulative Percent
Males	29	58	58	58
Females	21	42	42	100
Total	50	100	100	

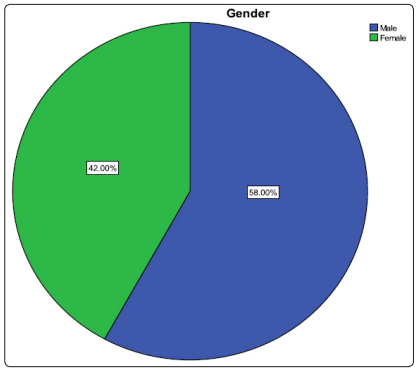

Figure 1: Readmission of patients based on gender differences

The division on age basis is shown in Table 2 and Fig 2

Table 2: Distribution of pediatric patients according to age (years)

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
1	4	8	8	8
3	2	4	4	12
	8	16	16	28
	15	30	30	58
	6	12	12	70
	3	6	6	76
	1	2	2	78
	1	2	2	80
	4	6	8	88
	1	2	2	90
	3	6	6	96
	1	2	2	90
	3	6	6	96
	1	2	2	98
	1	2	2	100
Total	50	100	100	

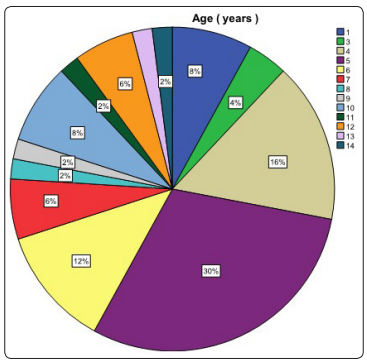

Figure 2: Distribution of pediatric patients according to age (years)

The readmission period with number of patients is shown in Table 3 and Figure 3

Table 3: Number of patients admitted for a specific period (days)

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
0-7	44	88	89.8	89.8
8-14	3	6	6.1	95.9
15-21	2	4	4.1	100
Total	49	98	100	
Missing system	1	2		
Total	50	100		

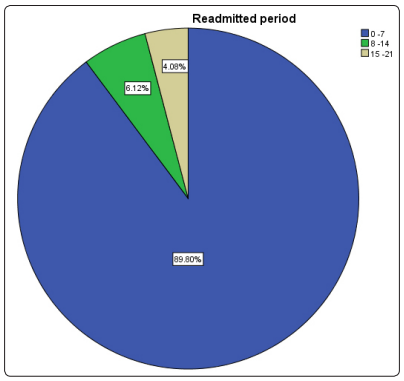

Figure 3: Number of patients admitted for a specific period (days)

The readmission from drug related problems is shown in Table 4 and Figure 4

Table 4: Readmissions from drug related problems

Drug related problems	Frequency	Percent	Valid Percent	Cumulative Percent
No	27	54	54	54
Yes	23	46	46	100
Total	50	100	100	

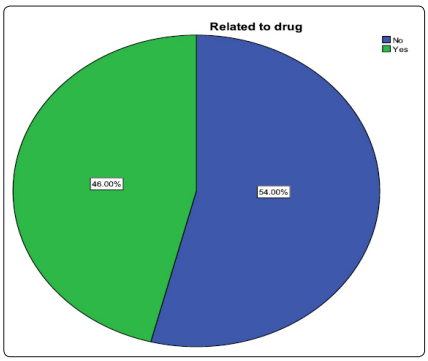

Figure 4: Readmissions from drug related problems

Table 5 and Figure 5 illustrate various medical conditions for readmission

Table 5: Number of patients readmitted for various medical conditions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chemotherapy session	5	10.0	10.0	10.0
	Penile swelling	4	8.0	8.0	18.0
	Cough	3	6.0	6.0	24.0
	Did not pass urine	2	4.0	4.0	28.0
	For surgery	2	4.0	4.0	32.0
	Pain and less intake	2	4.0	4.0	36.0
	Nausea reduced activity	1	2.0	2.0	38.0
	Abdominal pain	1	2.0	2.0	40.0
	Abdominal pain and vomiting	1	2.0	2.0	42.0
	Adjust medication	1	2.0	2.0	44.0
	Antibiotic not continue	1	2.0	2.0	46.0
	Associated with cough	1	2.0	2.0	48.0
	Bisphosphate deficiency with vomiting	1	2.0	2.0	50.0
	Ca resonium use	1	2.0	2.0	52.0
	chemotherapy	1	2.0	2.0	54.0
	Chest pain , productive cough	1	2.0	2.0	56.0
	constipation	1	2.0	2.0	58.0
	Diarrhea	1	2.0	2.0	60.0
	Difficult in pass urine	1	2.0	2.0	62.0
	Difficult in passing urine	1	2.0	2.0	64.0
	Discharge by mistake	1	2.0	2.0	66.0
	Exacebration of asthma	1	2.0	2.0	68.0
	Fever and cough	1	2.0	2.0	70.0
	For urethroplasty	1	2.0	2.0	72.0
	High grade of fever	1	2.0	2.0	74.0
	hypoglycemia	1	2.0	2.0	76.0
	Not pass urine and penile swelling	1	2.0	2.0	78.0
	Osteosarcoma for chemotherapy	1	2.0	2.0	80.0
	Pain unmanaged	1	2.0	2.0	82.0
	pneumonia	1	2.0	2.0	84.0
	Poor oral intake	1	2.0	2.0	86.0
	Poor pain managed	1	2.0	2.0	88.0
	severe pain	1	2.0	2.0	90.0
	Short duration of antibiotic	1	2.0	2.0	92.0
	Short duration of tranexamic acid	1	2.0	2.0	94.0
	Sickle cell anemia	1	2.0	2.0	96.0
	To give 3 unit platelet , to repeat CBC in the morning	1	2.0	2.0	98.0
	Unresolved injective bronchophenomia	1	2.0	2.0	100.0
	Total	50	100.0	100.0	

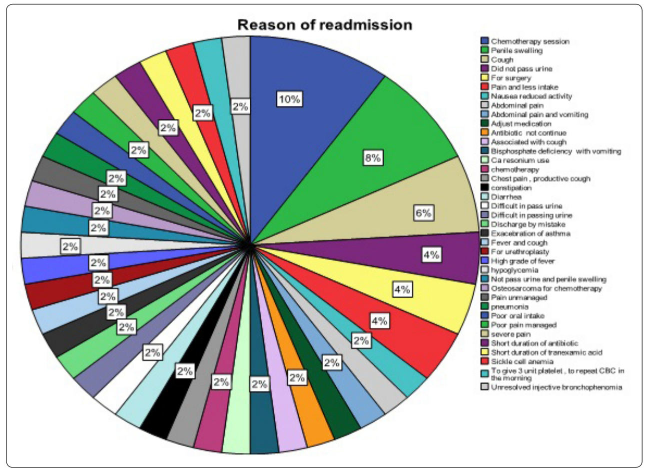

Figure 5: Number of patients readmitted for various medical conditions

The present study was about hospital readmission which meant patient's discharge and coming back to the hospital within 30 days. The results showed that male readmission was higher than females. Figure 1 showed that 58% were males and 42% were females. Figure 2 illustrates that 30% of readmission was for the 5 years old patients which was considered as the highest percentage amongst all ages of the study group, followed by 4 year old patients who were 16 %. The most common period of readmission ranged between 0 and 7 days. There are many reasons for readmission. Some of them are related to medication problem such as adjustment of medication, uncontained antibiotic and drug which is discontinued etc. The study showed that the most common medical conditions for readmission were chemotherapy and penile swelling respectively.

Recommendation - Management of Readmission

How can we reduce the rate of readmission?

SMART Discharge Protocol

The SMART Discharge Protocol (Signs, Medications, Appointments, Results, and Talk with me) can help to improve care for patients and families and improve the discharge process. The tools include the SMART Discharge Checklist for patients and families, FAQs for health care staff and clinicians about implementing the SMART Discharge Protocol, a presentation, and a self-learning packet.

Readmissions Diagnostic Worksheet

This diagnostic tool can help the hospitals to perform an in-depth review of the last five rehospitalizations to identify opportunities for improvement.

Improving Transitions from the Hospital to Home Health Care to Reduce Avoidable Rehospitalizations

The How-to Guide can support home health care improvement teams and their hospital and community partners in creating an ideal reception into home health care in the first 48 hours after the patient is discharged from the hospital, a post-acute care setting, or a rehabilitation facility, with the related goal of reducing avoidable rehospitalizations.

Role of a Pharmacist

1. A Pharmacist can provide consultative services.
2. He/she can prepare a workflow to identify patients presenting to the pharmacy from a recent ER visit or Hospitalization, train staff, train the Patients, and work with pharmacy software vendors to allow active or inactive medications with the click of a button to assist with reconciling medication lists at the pharmacy.
3. Provide Opportunities for Self-Management Education, Videos, Wi-Fi access, Handouts, and patient counseling from the pharmacist / disease educator.
4. Help in adherence, Refill synchronization with processes to identify transitions of care changes One of the best practices to follow when first enrolling a patient in the medication adherence program is having a clinical pharmacist meet with the patient in evaluation. Each location should have a board-certified ambulatory care pharmacist; these specialists can be trained in integrated care and can strive to build long-term relationships with patients.

Together the pharmacists and patients should review the list of prescribed medications and discuss directions for their use, as well as any side effects the patients may experience. The pharmacists should make it a standard practice to follow up with the physicians as needed to make any necessary changes to patients' medication regimens. If a patient has been hospitalized, the pharmacists can increase the number of one-on-one interviews. Having a team member follow up with patients after discharge and appointments with their primary care physician will ensure that they have the most up-to-date information about the individual's medication therapy. This is especially critical in chronic illness such as diabetes mellitus or heart disease.

Another key to the patients' success is adherence packaging. Using strip-packaging technology called "MedPack," the prescription medications can be packaged for each patient according to day and time of dose. This will make it easy for the patients to comply with medication regimens and simplify adherence for both patients and caregivers.

The pharmacists can call each program participant before they pick up their medications, at which time the patient can check in and share therapy updates or changes so that any necessary adjustments can be made.

These practices can be helpful in ensuring adherence among the patients, especially among those who have been recently discharged from a hospital stay. This can lead to dramatic increase in medication adherence.

Conclusion

DRP studies were retrospective studies conducted in a tertiary care hospital. The primary objective of the studies was to determine if medication related problems in children are contributing to unplanned hospital readmission. Chemotherapy and Circumcision were identified to precipitate the maximum reason of readmission. Poly pharmacy and prescription errors are underlying reasons for developing drug related problem. Few studies classified DRPs based on severity. Hospital could bring down therapy cost incurred to treat DRP admissions to a greater extent. This gives an idea on how much can a clinical pharmacist could play a vital role in preventing the drug related problem.

Early hospital readmission is emerging as an indicator of care quality. Some children with chronic illnesses may be readmitted on a recurrent basis, but there is limited data describing their rehospitalization pattern and impact. Prior studies of readmissions in children focus mainly on an index admission and a subsequent, early readmission experience, often within 30 days. This approach may underestimate the impact of patients experiencing recurrent readmissions during the weeks and months after hospitalization.

Strategies to reduce admissions must distinguish between readmissions that are potentially avoidable and those that may in fact indicate higher quality of care. Children with chronic conditions may require multiple, unavoidable, and necessary hospitalizations (such as chemotherapy for leukemia) to improve their health status. On the other hand, repeat admissions felt to be amenable to high-quality outpatient care (for example Asthma and seizure-related admissions, for example) or related to the same medical problem (such as repeated admissions for sickle cell crisis) may be considered potentially avoidable.

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