The Clinical Outcomes of Pharmacist Interventions at Critical Care Services of Private Hospital in Riyadh City, Saudi Arabia

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ABSTRACT

Objective: Dr. Sulaiman Al-Habib Medical Group (HMG) of Hospitals is one of the largest private chains of hospitals in the Kingdom of Saudi Arabia. At HMG, the clinical pharmacy services were started in 2015 which provides services to the acute and chronic cases of neonates, pediatrics and adults. In this study, we aimed to explore the clinical and economic outcomes of providing clinical pharmacy services at critical care units at a private hospital in Riyadh City, Saudi Arabia. **Methods:** This was a 6-month cross-sectional study conducted from January to June 2016 at the critical care unit of HMG involving adult patients. The critical care unit has 30 beds dedicated to the treatment of trauma, medical, surgical and maternity patients. The clinical pharmacist monitors all patients through daily medical rounds and documents any intervention that needs to be provided to the patient. The pharmacist intervention system utilized an international study model, a measure of the level of activity, rational of clinical intervention, recommendation and patient outcome. **Results:** A total number of 1222 pharmacist interventions were provided to 1124 adult patients. The highest number of critical care interventions were found to be potentially significant (610 (49.9%)) followed by potentially serious (360 (29.5%)) and neutral (249 (20.4%)) cases. Anti-infective medications (185 (25.9%)) were the most category of intervention provided followed by cardiovascular medications (96 (13.5%)) and gastro-intestinal medications (73 (10.2%)). The documented rationale of clinical intervention activities was others (203 (28.7%)), inappropriate dose (122 (17.3%)) and therapeutic duplication ((99 (14%)). Most of the patient outcomes were unknown (539 (44.1%)) followed by patient condition improved (408 (33.4%)) and therapeutic endpoint reached (133 (10.9%)). **Conclusion:** The clinical pharmacy services at critical care units of a private hospital is a significant and essential component for patients care. The clinical pharmacist prevents the occurrence of drug-related problems in addition to saving additional economic burden on the healthcare system at HMG in the Kingdom of Saudi Arabia.

Key words: Clinical outcomes, Pharmacist, Interventions, Critical care services, Private hopsital, Riyadh, Saudi Arabia.

INTRODUCTION

The role of clinical pharmacists at critical care services has not been evaluated so far. Patients admitted to a critical care unit are at high risk of prescribing errors and related adverse events. The patients at the critical care unit should be treated by a team of multidisciplinary professionals with great knowledge and skills. The clinical pharmacist has more significant roles and responsibilities toward patient care at the critical care unit.[1] They make beneficial improvements with respect to clinical, economic and patient outcomes. Pharmacist improves the clinical outcomes of critically ill patients by reducing the occurrence of adverse events and medication errors.[2,3] Moreover, economic evaluations of clinical pharmacy services in the critical care unit consistently reveal the potential for considerable cost savings.[2,3] Pharmacist interventions include suggesting alternative therapies, identifying drug interactions, therapeutic drug monitoring, correcting orders and providing drug information.[4] The critical care medicine provides the services or functions with required the critical care pharmacist.[5,6] The board of pharmaceutical specialties issues a certification of critical care pharmacy to the passing candidates. This is to keep up-to-date information regarding critical care pharmacy practice.[7] Several studies have shown the clinical outcomes of pharmacist-provided critical care services. The first randomized clinical trial on the impact of a pharmacist at critical care services showed a significant reduction in medications errors and adverse drug reactions.[8] Other studies also showed encouraging results across the world.[2,3] Few studies conducted in the KSA at governmental institutions to measure the impact of a pharmacist at a critical care setting.[9] However, the base of the best author knowledge there is one study done at private hospitals in Saudi Arabia or Gulf and Middle Eastern countries.[10] In this study, we aimed to measure the clinical outcome of a pharmacist at critical care services through an international system of pharmacist interventions at the most prominent private hospital in Riyadh city, Saudi Arabia.

METHODS

This was a 6-month cross-sectional study conducted from January to June 2016 in the critical care unit at HMG involving adult patients. The critical care unit has 30 beds dedicated to the treatment of trauma, medical, surgical and

maternity patients. HMG is one of largest healthcare institutions in the GCC, which currently operates 14 medical facilities-the majority of which are located in the KSA (Riyadh and Qassim), with an additional medical center in the UAE (Dubai). It is also developing one of the largest private medical cities in Saudi Arabia. In 1995, the core of HMG was built in Olya area in the Saudi capital, Riyadh, with accordance to an advanced vision that applies the highest international healthcare standards, in providing fully integrated premium healthcare services with a capacity of 241 beds.

Furthermore, the complex comprises premium hospitals and clinics of fully integrated maternity hospital; bone, joint and spine surgery hospital, dermatology and plastic surgery center, ophthalmology and laser/vision correction surgical center, specialized infertility treatment and reproduction assistance center. The pharmacies of HMG apply new technological methods at all work phases; starting from storing medicines until transferring them by vehicles equipped with modern cooling systems. HMG Pharmacies have four in-patient pharmacy satellites and three out-patient pharmacies including the main. Pharmacies operate 24 hrs per day and 7 days a week by an integrated team of 97 pharmacists who hold specialized degrees in this field. The pharmacists are trained on a regular basis to develop their scientific and professional skills. The pharmacy also provides more than 40,000 different medical products that cover all types of medicines. The pharmacy's work depends on the patient's medical record system as it helps the pharmacist to provide greater care and protection against chronic diseases. The pharmacist monitors all patients through conducting daily medical rounds and documents any pharmacist intervention. The pharmacist intervention system used an international study model, a measure of the level of activity, rational of clinical intervention, recommendation, patient and outcome impact.[11,12] The data were gathered and analyzed by using the Survey Monkey system.

RESULTS

A total of 1222 pharmacist interventions were provided to 1124 patients. The rate of intervention per patients was 1.1. Among the total patients, 682 (44.19%) were males and 682 (55.81%) were females and the majority of patients were Saudi nationals (956 (78.23%)). Most of the patients were above 65 years of age (459 (37.59%)) followed by those in the age group of 18–40 years (368 (30.14%)) and 40-65 years (263 (21.54%)) (Table 1). Most of the interventions were provided by the consultant prescribers as qualifications (743 (60.8%)) and by the specialists (386 (31.59%)). The highest critical care interventions were found to be potentially significant (610 (49.9%)) followed by potentially serious (360 (29.5%)) and neutral (249 (20.4%)) cases (Table 2). Most of the interventions belonged to the class of anti-infective drugs (363 (29.71%)) and other medications (289 (23.65%)) followed by cardiovascular medications (169 (13.83%)) and nutrition and blood medications (137 (11.21%)) (Table 3). The rationale behind intervention clinical activities was others (423 (34.62%)), inappropriate dose (245 (20.05%)) and therapeutic duplication (138 (11.29%)) (Table 4). The majority of the pharmacist's recommendation through intervention were dose changes (383 (31.34%)) and discontinue drug order (226 (18.49%)) followed by other recommendations (164 (13.42%)) and initiate drug order (145 (11.87%)), whereas the majority of the type order changed based on pharmacist recommendations were dose changed (363 (29.71%)), followed by drug discontinued (213 (17.43%)) and drug added (108 (8.84%)) (Table 5). The majority of patient outcome was unknown outcomes (539 (44.1%)) followed by patient condition improved (408 (33.4%)) and therapeutic endpoint reached (133 (10.9%)) (Table 6).

DISCUSSION

Critical care pharmacy services are one of the pharmacy practice programs which was established by the central committee at the General Administration of Pharmaceutical Care in the MOH, KSA.[13] The committee consists of several representative critical care pharmacists. The committee set up a strategic plan for the program and related KPIs. Several KPIs were started with pharmacy practice programs.[14,15] The documentation of

Table 1: Patients' demographic information.

Age		
Answer Options	**Response Count**	**Response Percent**
0-30 days	36	2.95%
1 month- 6 years	56	4.59%
6-12 years	17	1.39%
12-18 years	22	1.80%
18-40 years	368	30.14%
40-65 years	263	21.54%
65 or older	459	37.59%
answered question		1221
skipped question		1
Sex		
Answer Options	Response Count	Response Percent
Female	540	44.19%
Male	682	55.81%
answered question		1222
skipped question		0
Nationality		
Answer Options	Response Count	Response Percent
Saudi	956	78.23%
Non-Saudi	266	21.77%
answered question		1222
skipped question		0

Table 2: Prescriber qualification.

Answer Options	**Response Count**	**Response Percent**
Consultant	743	60.80%
Specialist	386	31.59%
Physicain non specified	78	6.38%
Intern	0	0.00%
Nurses	9	0.74%
Nutritist	6	0.49%
answered question	1222	
skipped question	0	
Intervention severity codes	Response Count	Response Percent
Potentially Fatal	3	0.2%
Potentially Serious	360	29.5%
Potentially Significant	610	49.9%
Neutral	249	20.4%
Other	0	0.0%
	1222	

Table 3: Pharmacological groups of interventions.

Answer Options	Response Count	Response Percent
Gastro-intestinal system	121	9.90%
Cardiovascular system	169	13.83%
Respiratory system	20	1.64%
Central nervous system	30	2.45%
Infections	363	29.71%
Endocrine system	47	3.85%
Obsterics disorders	0	0.00%
Gynaecology disorder	5	0.41%
Urinary-tract disorder	10	0.82%
Malignant disease	0	0.00%
immunosuppression	1	0.08%
Nutrition and blood	137	11.21%
Musculoskeletal and joint diseases	4	0.33%
Eye disorder	9	0.74%
Ear, Nose and Oropharynx	6	0.49%
Skin disorders	4	0.33%
Immunological products and vaccines	0	0.00%
Anaesthesia	7	0.57%
Other	289	23.65%
answered question	**1222**	
skipped question	**0**	

Table 4: Rationale for clinical activity (clinical intervention activity)

Answer Options	Response Count	Response Percent
Pharmacokinetic consult	1	0.08%
Adverse drug reaction	18	1.47%
Therapeutic Duplication	138	11.29%
Alternative Therapy	62	5.07%
Dose Standardization	80	6.55%
Contraindication	7	0.57%
Dosage Calculation	21	1.72%
Inappropriate Dose	245	20.05%
Inappropriate Route	84	6.87%
Inappropriate Schedule	66	5.40%
Non-formulary Med Ordered	0	0.00%
Incompatibility	2	0.16%
Drug-Drug Interaction	24	1.96%
Abnormal Lab Test Result	28	2.29%
Changed Lab Test Ordered	0	0.00%
Drug Therapy Omission	1	0.08%
Failure to Receive Medication	0	0.00%
TPN Consultation	22	1.80%
Other	423	34.62%
answered question	**1222**	
skipped question	**0**	

Table 5: Pharmacist's Recommendation.

Answer Options	Response Count	Response Percent
Initiate Drug Order	145	11.87%
Discontinue Drug	226	18.49%
Change Drug	92	7.53%
Change Dose	383	31.34%
Change Duration	0	0.00%
Change Route	90	7.36%
Change Schedule	67	5.48%
Add Lab Test	54	4.42%
Discontinue Lab Test	1	0.08%
Other	164	13.42%
answered question	**1222**	
skipped question	**0**	

Order changed based upon Pharmacists recommendation

Answer Options	Response Count	Response Percent
Drug Discontinued	213	17.43%
Drug Changed	81	6.63%
Drug Added	108	8.84%
Dose Changed	363	29.71%
Schedule Changed	67	5.48%
Route Changed	84	6.87%
Duration Changed	0	0.00%
Additional Lab Test Ordered	48	3.93%
Unknown	6	0.49%
Other	252	20.62%
answered question	**1222**	
skipped question	**0**	

Table 6: Patient outcome.

	Response Count	Response Percent
Therapeutic End Point Reached	133	10.9%
Patient's Condition Improved	408	33.4%
Patient's Condition Worse	3	0.2%
Laboratory Value Improved	42	3.4%
Laboratory Value Worse	4	0.3%
Patient's Mental Status Worse	1	0.1%
Unknown	539	44.1%
Infection Improved	87	7.1%
Infection Worse	5	0.4%
Renal Function Improved	0	0.0%
Other (please specify)	5	0.4%
answered question	**1222**	
skipped question	**0**	

pharmacist intervention was one of the KPIs used for several programs. The pharmacy practice extends the implementation to some governmental and private hospitals. The authors from the most prominent hospital pharmacies in Riyadh city measured the KPIs of pharmacist intervention at critical care units. During the 6 months, data were collected from critical care pharmacist working at critical care units. The clinical pharmacist monitored both male and female adults at the critical care unit. All these patients had taken at least one intervention during the study period. This finding higher number of interventions than that what reported in the previous results.[9] This is because pharmacist monitored many patients who required different types of critical care services. Moreover, the hospital might have not approved drug therapy guidelines at critical care units. Most of the interventions were related to young and old patients because most of those covered by healthcare insurance and very easy for them to access the healthcare services from the private hospital. Some patients were old and their children might have health insurance. Our results showed that the majority of interventions administered at critical care units were for potentially significant or serious ailments, which was found to be similar to the previous study which was related to the natural area of critical care setting that used high-risk medications.[9] Most of the interventions belonged to the class of anti-infective medications, nutrition and blood products, or cardiovascular medications. All these medications are frequently used in the critical care units treating critical diseases.[16,17] This is an important finding. Similar findings have been reported by Aljbouri.[18] He reported that most of the interventions used were inappropriately dosed and there was drug duplication. This may be due to the missing guidelines of critical care using medications, or multiple physicians visited the patients and prescribed the same medication with different brands without existing the communication between several treating teams. These results were similar to previous studies at governmental or private institutions.[3,8,9] The pharmacist interpreted and changed drug dosing or discounted medications. The clinical outcome was unknown with half of the patients during the study period because most of the patients had improvement and were transferred to the regular ward and the clinical pharmacist missed to follow-up these patients. While the remaining patients had improved or had reached treatment goals and that similar what reported in the previous studies.[3,9] The clinical pharmacist plays a very important role in critical care units of the private hospital. Therefore, we recommend expanding the critical care pharmacy services at the hospital. The critical care clinical pharmacist is required at all private hospitals providing critical care services to improve patients' clinical outcome and prevent drug-related problems in the KSA.

CONCLUSION

The critical care clinical pharmacist has a vital role in acute patient care. The pharmacist decreases drug-related morbidity and improves patient outcome at a private hospital. Expanding critical care clinical pharmacy services is required for all private healthcare institutions in the KSA.

ACKNOWLEDGEMENT

CONFLICT OF INTEREST

None.

ABBREVIATIONS

KSA: Kingdom of Saudi Arabia; **KPIs:** Key performance indicators; **MOH:** Ministry of Health; **HMG:** Dr. Sulaiman Al-Habib Medical Group; **GCC:** *Gulf Cooperation Council.*

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