Cost Analysis of Neonatal Drug Distribution Services at Ministry of Health in Saudi Arabia

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ABSTRACT

Objectives: The cost estimation of delivery of drug therapy management (unit dose, floor stock and discharge) for neonatal inpatient is a part of the pharmacoeconomic program and changing the system to the Saudi vision 2030 at MOH in Saudi Arabia. The study explored the cost calculations of delivery of drug therapy services for neonate's population by using American Model with local cost. **Methods:** It is cross-sectional 6-months analysis of drug distribution services for neonate patients conducted in 2016. It was at 300-Bed Maternity and Pediatrics Hospital in Riyadh, Saudi Arabia. The cost analysis consisted of three domains. Domain one; the cost of delivery of Adults drug therapy management with 144 beds. Domain two; the cost of delivery of pediatrics drug treatment services with 55 beds. Domain three; cost of delivery for neonate's therapy services with 82 beds. For each domain, the physician prescribed the medications. The pharmacist reviewed and prepared drugs and distributed through unit dose system, floor stock distribution and discharge medications. The nurse administered drugs and followed up with doctors. The drugs were prepared through ASHP standards and facilities. The oral and topical ready to deliver drugs were included in the study while sterile product and compounding formulations were excluded from the study. The cost was derived from Ministry of Health information database. The cost model was calculated based on variable expenses including personal cost, material and supply cost. Fixed costs including direct cost, non-salary cost and overhead cost. All cost was used US dollar currency and local prices. This study analyses the three domains. **Results:** The estimated daily cost of neonatal unit dose drug distribution system for all total pediatrics 82 beds was (1,303.31 US). It contained three types; the unit dose system (794.83 USD), drug floor stock distribution system (371.37 USD) and discharge medication system (137.11 USD). The cost of delivery of medicines to single bed per day was (41.64 USD) with highest estimated cost of delivery from discharge medication (27.42 USD), followed by unit dose services (9.69 USD) and floor stock therapy (4.53 USD). The majority of cost came from overhead cost in floor stock services and discharge medication delivery; while the personal cost in unit dose services delivery. The total estimated annual expenditures of drug distribution services were (475,708.15 USD). **Conclusion:** The estimated cost of delivery of neonatal medication therapy is a part of the pharmacoeconomic program at pharmacy services and future vision 2030 in Saudi Arabia.

Key words: Cost, Analysis, Neonatal, Drug, Distribution, Services, Ministry of Health, Saudi Arabia.

INTRODUCTION

The medications distribution system is well established for more than thirty year back,[1,2] though the international pharmacy societies and accreditation standards institutions.[3,4] Neonatal intensive care is stared as one of the classiest workings of pediatric health care including diseases management and drug therapy delivery. The drug distribution for neonates consisted of the famous three types; drug distribution through unit dose system, drug distribution as floor stock system and drug distribution to discharge neonatal patients.[1,2] Absence of local data on approximations of cost and efficiency of health interferences leads health planners to use indication produced away, often from a setting dissimilar to the local one. This types it significant to gain visions into the cost of facility-based newborn care. With the new update of Pharmacy strategic plan of new Saudi vision 2030.[5] The pharmacy plan required to implement the healthcare and pharmacy economic system. There are several projects including in the Pharmacoeconomic, for instance; neonatal medications prices, coat analysis of neonatal pharmacy services, cost avoidance impact of pharmacist pharmacy-related issues. Several local publications established the cost analysis of neonatal total parental nutrition, adult's drug information services, adult's clinical pharmacy activities.[6-9] However, the cost analysis of neonatal drug distribution system not well established yet.[10-12] Previous studies have limited their focus on the pediatric delivery treatment costs for specific services and in focal geographic areas. It is evident that there is a scarcity of studies that specifically discourse intensive care costs, with variations in study populations and differing economic appraisal methods. Thus, there is constant need for cost valuation and economic examines particularly about direct medical costs, which influence on the funds of the hospital. The authors to the best of their knowledge are not aware of any publications in Saudi Arabia or Gulf and Middle East countries about this project. The aim of the study to explore the cost analysis of neonatal drug distribution system in the Kingdom of Saudi Arabia.

METHODS

It is a cross-sectional 6-months analysis of drug distribution services for neonatal patients conducted in 2016. It was at 300-Bed Maternity and Pediatrics Hospital in Riyadh, Saudi Arabia. The cost analysis consisted of three domains. Domain 1; the cost of delivery of Adults drug therapy management with 144 beds. Domain 2; the cost of delivery of pediatric drug treatment services with 55 beds. Domain 3; the cost of delivery for neonate's therapy services with 82 beds. The study was conducted at pediatrics and maternity hospital ambulatory care patient. The hospital had 2801 bed capacity and consisted of maternity and operation related pediatrics section. It had a different type of pediatrics specialties for instant pediatrics endocrinology, pediatric neurology, pediatric infectious disease. The hospital had neonatal critical care and critical maternity sections. The pharmacy distributed the medication through a unit dose system responded to electronic prescriptions. The pharmacy had provided the services 24×7 to hospital sections. The pharmacy had inpatient and outpatient pharmacy, big extemporaneous preparation section and active medications safety officer. The pharmacy had a drug information center and patient education clinic as part first clinical pharmacy services at the hospital. For each domain, the physician prescribed the medications. The pharmacist reviewed and prepared drugs and distributed through the unit dose system, floor stock distribution and discharge medications. The nurse administered drugs and followed up with doctors. The drugs were prepared through American Society of Health-System Pharmacist (ASHP) standards and facilities. The oral and topical ready to deliver drugs were included in the study while sterile product and compounding formulations were excluded from the study. The cost was derived from ministry of health information database. The cost model was calculated based on variable expenses including personal cost, material and supply cost. Fixed costs including direct cost, non-salary cost and overhead cost.[13] All cost was used US dollar currency and local prices. This study analyses the three domains.

RESULTS

The estimated daily cost of neonatal unit dose drug distribution system for all total pediatrics 82 beds was (1,303.31 US) and (41.64 USD) per bed. The estimated daily cost of neonatal units' drug distribution system for all total neonatal 82 beds was (794.83 USD) and (9.69 USD) per bed. The majority of cost came from personal cost (63.61%) and overhead cost (27.93%) (Table 1). The estimated daily cost of neonatal floor stock drug distribution system for all total neonatal 82 beds was (371.37 USD) and (4.53 USD) per bed. The majority of cost came from overhead cost (59.78%) and personal cost (22.49%) (Table 2). The estimated daily cost of neonatal 's Discharge Medication services for all total 5 neonates daily discharge was (137.11 USD) and (27.42 USD) per patient. The majority of cost came from overhead cost (50.74%) and non-salary cost (45.57%) (Table 3). The cost of delivery of medicines to single bed per day was (41.64 USD) with the highest estimated cost of delivery from discharge medication (27.42 USD), followed by unit dose services (9.69 USD) and floor stock therapy (4.53 USD). The total estimated annual expenditures of Drug distribution services were (475,708.15 USD). The highest budget expenditures from unit dose services 60.99% (290,112.95 USD), followed by floor stock medication delivery 28.49 % (135,550.05 USD) and discharge drug therapy 10.52% (50,045.15 USD) (Table 4).

Table 1: Cost analysis of neonatal unit dose drug distribution system.

Type of Cost	Content of Items	unit dose system Cost (USD)	Percent
Personal cost	Salaries of Physicians, pharmacist and nurses	505.55	63.61%
Over Head cost	Rent, Bed, Computer, Zebra label printer (Direct Thermal), Equipment: Refrigerator Medication trolley, shelves, creaser and Chairs	221.99	27.93%
Material and Supply cost	Average cost of empty zip lock bag small and big.	4.81	0.60%
Non Salary cost	Education and Training Inpatient pharmacy resources	62.48	7.86%
Total cost (USD)		794.83	

Table 2: Cost analysis of neonatal floor stock drug distribution system.

Type of Cost	Content of Items	drug floor stock distribution system Cost (USD)	Percent
Personal cost	Salaries of Physicians, pharmacist and nurses	83.52	22.49%
Over Head cost	Rent, Bed, Computer, Zebra label printer (Direct Thermal), Equipment: Refrigerator Medication trolley, shelves, creaser and Chairs	221.99	59.78%
Material and Supply cost	Average cost of empty zip lock bag small and big.	3.38	0.91%
Non Salary cost	Education and Training Inpatient pharmacy resources	62.48	16.82%
Total cost (USD)		371.37	

Table 3: Cost analysis of neonatal Discharge Medication services.

Type of Cost	Content of Items	Adults Discharge Medication services Cost (USD)	Percent
Personal cost	Salaries of Physicians, pharmacist and nurses	2.49	1.81%
Over Head cost	Rent, Bed, Computer, Zebra label printer (Direct Thermal), Equipment: Refrigerator Medication trolley, shelves, creaser and Chairs	69.57	50.74%
Material and Supply cost	Average cost of empty zip lock bag small and big.	2.57	1.88%
Non Salary cost	Education and Training Inpatient pharmacy resources	62.48	45.57%
Total cost (USD)		137.11	

Table 4: Cost analysis of comparisons of all types of Neonatal Medication distribution services.

No	Method of drug delivery system	Cost per day	Cost per bed per day	Total cost per bed annually	Cost percent
1	Unit dose drug distribution system Cost (USD)	794.83	9.69	290,112.95	60.99%
2	Discharge Medication services Cost (USD)	137.11	27.42	50,045.15	10.52%
3	Drug floor stock distribution system Cost (USD)	371.37	4.53	135,550.05	28.49%
	Total cost (USD)	1,303.31	41.64	475,708.15	

DISCUSSION

In1960s the unit dose system implementation around the world took place after two methods of drug distribution of floor stock or dispensing per physician order.[1] The system had potential advantages of prevention medications errors and enhanced medications safety. Besides, the reduction of economic burden on the health care system.[2] All those advantages implemented with all type of patient, including neonates. To calculate the cost avoidance of a unit dose system, drug distribution services needs to calculate the cost analysis of drug distribution services, including unit dose drug therapy.[13] In the current study, the findings showed over 82 beds of neonates the unit dose system had a higher cost than floor stock and discharge patients' distribution system. That is related to high used personally for preparation of medications inside the trolley and highly expensive equipment. While floor stock lower cost with a personal and high cost of equipment used for stocking and refrigerators. Other discharge patient drug distribution the lowest one and that's similar to the previous studies[10,12] and higher cost than other study due to different site research,[11] which was excepted because they lower personal and types of equipment. The highest cost of per patient was with discharge patients that are related to a few number of patients discharge relative to the beds. Almost not exceed more 10% of the total number of beds while the second highest cost was unit dose because of the high number of occupied beds while the floor stock the lowest cost that's related to a high number of beds and low personal used. The cost of the budget showed the unit dose system was highest cost within the financial budget that's related to high personal and overhead cost similar to the previous study,[13] while followed by floor stock and discharge with less using of personal and overhead cost. This is the first study done of a cost analysis of three types of drug distribution services in the Kingdom of Saudi Arabia. Neonatal treatment through special care newborn units is cost-intensive and levies noteworthy monetary challenge. Periodically cost estimated is highly recommended of all pharmacy services, including neonatal drug therapy services to prevent high economic burden in healthcare services and meet the new pharmacy strategic plan with new Saudi version 2030.[5,14]

CONCLUSION

The estimated cost of delivery neonatal medication therapy is a part of the pharmacoeconomic program at pharmacy services and future vision 2030 in Saudi Arabia.

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None.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

ABBREVIATIONS

MOH: Ministry of Health; **KSA:** Kingdom of Saudi Arabia; **CEA:** Cost-effectiveness analysis; **USD:** United State Dollars; **ASHP:** American Society of Health-System Pharmacist; **CBAHI:** Saudi Center of Health-care Accreditation.

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