Pediatrics Standardized Concentration of Chemotherapy Intravenous Infusion: A New Initiative in Saudi Arabia

Yousef Ahmed Alomi^{*}, BSc.

Pharm, MSc. Clin Pharm, BCPS, BCNSP, DiBA, CDE, Critical Care Clinical Pharmacists, TPN Clinical Pharmacist, Freelancer Business Planner, Content Editor and Data Analyst, Riyadh, Saudi Arabia.

Faiz A Bahadig, R.Ph, Informatics Pharmacist, Pharmaceutical Care Department, King Abdul-Aziz Medical, City-WR-Jeddah, Ministry of National Guard, Saudi Arabia.

Hani Alhamdan, BSc.Pharm, MSc. Pharm, MBA, Director, Pharmaceutical Care services Department at KAMC-Jeddah, Ministry of National Guard, Saudi Arabia.

Correspondence:

Dr. Yousef Ahmed Alomi, Bsc. Pharm, msc. Clin pharm, bcps, bCNSP, DiBA, CDE Critical Care Clinical Pharmacists, TPN Clinical Pharmacist, Freelancer Business Planner, Content Editor and Data Analyst, PO.BOX 100, Riyadh 11392, Riyadh, SAUDI ARABIA.

Phone no: +966 504417712 E-mail: yalomi@gmail.com

Received: 22-10-2019; Accepted: 01-01-2020

Copyright: [®] the author(s), publisher and licensee International Journal of Pharmacology and Clinical Sciences. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited. This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License

Access this article online



ABSTRACT

Objectives: To discover the pediatrics and neonates standardized concentration of chemotherapy intravenous infusion as new initiatives in the Kingdom of Saudi Arabia. Methods: It is a new initiative project drove by national standardized concentration of chemotherapy intravenous infusion services. The projects formulated from the international business model, pharmacy project guidelines and project management institution guidelines of a new project. The initiative project is written through project management professionals and consisted of several parts, including the initial phase, the planning phase, the execution phase, the monitoring and controlling phase. Results: The pediatrics and neonates standardized concentration of chemotherapy intravenous infusion services with a defined vision, mission and goals. The services had various paybacks including clinical and economic on patients as discovered in the review. The continuous of the project was assured by risk management model description and the monitoring and controlling of the services as declared. The transition to operation project though closing project stage demonstrated in the analysis. **Conclusion:** The pediatrics and neonates standardized concentration of chemotherapy intravenous infusion services is a new initiative as part of the intravenous admixture program. The pediatrics and neonates standardized concentration of chemotherapy intravenous infusion will lessen medication errors and recover patient safety at healthcare system; it is highly recommended to implement in the Kingdom of Saudi Arabia. Keywords: Pediatrics, Neonates, Standardized, Concentration chemotherapy,

Intravenous, Saudi Arabia.

INTRODUCTION

In 2012-2015, during the implementation of the medications safety program, the pediatrics pharmacy program was part of the plan at several hospitals in the Kingdom of Saudi Arabia.^[1,2] The pediatrics or neonatal pharmacy services contained of several programs and projects. The pediatrics medications safety program was part of the plan. The pharmacist did an excellent job during this period and declared the clinical and economic outcome of medication safety in pediatrics healthcare services.^[3,4] Furthermore, the pharmacist discovered the noteworthy role in total parenteral nutrition, intervention to reduce morbidity and avoid additional superfluous costs in the healthcare system.^[5,6] The pharmacist started standardized total parenteral nutrition in the pediatrics, neonates to prevent TPN related problems, and reduce healthcare providers and pharmacy staff workload.^[7,8] Several litterateurs' showed mistakes with chemotherapy in pediatric patients, while local or the Middle East literature not existed.^[9,10] On the other hand, the standardized concentration of chemotherapy medications is a new initiative project as expandable of the role of the intravenous pharmacist in the medications safety program with pediatrics and neonatal populations.[11-14] The aim of the project is to review pediatrics and neonatal standardized concentration of chemotherapy medications in the Kingdom of Saudi Arabia.

Method of the Project

It is a new initiative project drove from the national IV admixture and chemotherapy program.^[15] The task force team of standardized chemotherapeutic concentration formulated and involved of from author's expert in the parenteral medications. The committee utilized and drove the pharmacy parenteral administration guidelines and from the textbook and international literature standardized concentration of chemotherapeutic written by utilizing the international business model, pharmacy project guidelines and project management institution guidelines of a new project.[16-19] The standardized concentration adjusted based on the acceptable concentration, daily dose and the volume of bag as possible. The project is written through project management professionals and entailed of several parts, including the initial phase, the planning phase, the execution phase, the monitoring and controlling phase.

Initiative Phase

Assessment Needs

Each intravenous admixture services prepare a daily basis for various medications with

different concentrations and multiple diluent solutions. Also, the nurses administer different medications with different concentrations and solution. A higher workload of parenteral admixture services had been done by pharmacy staff and received by patients through nursing care. The high workload of the various number of concentration and solution may lead to the preparation or administration mistakes. As a result, the standardized concentration and solution of demand to prevent medication errors and reduce the workload of healthcare providers. Moreover, it's excellent opportunity to inspire pharmaceutical companies to manufacture the same and frequency fixed ready-made solutions.

Market Analysis

Several medications came as powers for reconstitution or ampoules for mixing with diluent solutions. Other medications came as ready-made solution or diluted with a solution ready for administration. The ready came as strength of medications regardless of the approbate concentration administration through a central venous or peripheral line. Also, the pharmacy services had a manual preparation of parenteral medications with various concentration and solution diluted in. Those multiple factors may progress to increase workload and medications mistake. As a result, the standardized concentration of intravenous medications might decrease the workload and advance medication safety in practice.

SWOT Analysis

The most popular method utilized in quality management called the SWOT Analysis, which stands for the strengths, weaknesses and opportunities elements. The project had several strong points; for instance, implemented medication safety prevention measures, the reductions of the pharmacy with healthcare workload reductions. On the other hand, the weak points, including a few medications concentration and a limited number of diluent solutions. Moreover, there are multiple points for the opportunity; for instant implementation of patient safety and accreditation standards processes, while the threat points are if the higher administration of the project or pharmacy plan changes in the future.

Planning Phase

Scope of the Project

The project covers the pediatrics and neonatal standardized chemotherapy concentration based on drug dosing and frequency administration. Besides, the concentration used as a common and maximum one with one to two solution dilution of chemotherapy with excellent stability.

Vision, Missions, Goals

The vision of the project is best pediatrics and neonatal standardized intravenous chemotherapy concentration. The message of the project is to provide suitable standardized intravenous chemotherapy concentrations for pediatrics and neonates with high stability and diluent solution. The aim of the project is to standardize the concentration of intravenous chemotherapy for pediatrics and neonates to prevent any drug concentrationrelated problems, diminution the workload of healthcare providers and pharmacy staff and prevent the economic burden of the healthcare system of medication wastage.

Project Description

The following policies were put in place for every pharmacist and other health care individuals:

- ✓ The pediatrics and neonatal standardized chemotherapy concentration committee should be formulated at healthcare organizations.
- ✓ The pediatrics and neonatal standardized chemotherapy concentration committee should consist of pediatrics, neonate's IV pharmacist, pharmacy technician, pediatric oncology nursing representative, pediatric oncology surgical or medical representative, pediatrics physician, nurse representative, neonatal physician and nurse representative.
- ✓ The committee revises the pediatrics and neonatal standardized chemotherapy concentration and informs at least annually.
- ✓ The education and training sessions should be conducted by the committee to all healthcare providers, including oncology physicians and nurses, with pediatrics and neonate's pharmacy staff.
- ✓ The pediatrics and neonatal standardized chemotherapy concentration distributed to healthcare sectors at the institutions (Table 1).
- ✓ The physician transcribes the prescription based on the pediatrics and neonatal standardized chemotherapy concentration.
- ✓ If the physician wishes to prescribe outside the pediatrics and neonatal standardized chemotherapy concentration guidelines, he should document the justification.

- ✓ The prescription should send to the pharmacy, pediatrics IV pharmacist and pharmacy technician will prepare it based on the pediatrics and neonatal standardized chemotherapy concentration.
- ✓ The pharmacy staff sends the medications to the nursing department, and the nurse administers the medications based on the standardized concentration of medication guidelines.
- ✓ The pharmacy department should measure the clinical outcome of the pediatrics and neonatal standardized chemotherapy concentration.
- ✓ The pharmacy department should measure the economic outcome of the pediatrics and neonatal standardized chemotherapy concentration.
- ✓ The pharmacy department should document any prescription non-adherence to the pediatrics and neonatal standardized chemotherapy concentration.

Plan Cost Management

The financial budget should be selected in every new project. Also, the budget comprehends several things included the cost of the administration team meeting, educational courses and updated references. However, the budget should be observed from time to time.

Executing Phase

Management Team

Each project had to have a leading administrative team. The team comprised of several essential memberships' specialties. For an instant, a pediatric oncology clinical pharmacist, oncology distributive pharmacist, pharmacy technician, pharmacy total quality pharmacist, pediatrics medications safety pharmacist and pediatric oncology physician. The team had responsibilities for the implementation and monitoring of the project. The team had to educate and train concern healthcare providers about the project. The team update all standardized concentration medications list periodically and resolve any project problem-related issues until the project become one of operation system in healthcare organizations.

Education and Training

Any new project needs orientation for management team members, education, and training for pharmacy staff, including pharmacists, pharmacy technicians and the healthcare providers, including physicians and nurses. Regular orientation for the project

Table	al: Suggested Pe	diatrics an	d Neonate	es standardize	ed chemoth	erapy medication (12-1	3,23-36)				
No.	Medication	Strength	Solution	Reconstitution Volume	Standard Concentration	Final Preparation with Standard Concentration	Maximum Concentration	Final Preparation With Maximum	Stability of sc	olution	Rate of infusion
								Concentration	RT	Ref	
1	Alemtuzumab	300 mg Vial	NS, D5W	NA	NA	15mg/100 ml NS 15mg/100 ml D5W	0. 3mg/mL	15mg/50 ml NS 15mg/50 ml D5W	8 hr	8 hr	2-4 hrs
7	Arsenic Trioxide	1 mg/ ml 10ml Injection	NS, D5W	NA	NA	3mg/250 ml NS 3mg/250 ml D5W	NA	3mg/100 ml NS 3mg/100 ml D5W	24 hr	48 hr	2-4 hrs
ς	Asparaginase E.coli	10,000 IU/ vial	NS, D5W	SWFI 2ml 5ml	NA	3,000 IU/100 ml NS 15,000 IU/100 ml NS 3,000 IU /100 ml D5W 15,000 IU /100 ml D5W	NA	3,000 IU/50 ml NS 15,000 IU/50 ml NS 3,000 IU /50 ml D5W 15,000 IU /50 ml D5W	АЛ	NA	30-60 mint
4	Azacitidine	100 mg	NS	SWFI 10ml	10mg/mL (IV)	25mg/100 ml NS 50mg/100 ml NS 100mg/100 ml NS		25mg/50 ml NS 50mg/50 ml NS 100mg/50 ml NS	Prepare immediately before each dose	NA	10-40 mint
5	Bevacizumab	25mg/ml 4	NS	SWFI 4ml	NA	75mg/100 ml NS 150mg/100 ml NS	NA	75mg/100 ml NS 150mg/100 ml NS	NA	8 hrs	60-90 mint
9	Bleomycin	15 IU /Vail	NS	5-10 ml NS	NA	5mg/10 ml NS 10mg/20 ml NS	3 units/ml	5mg/5 ml NS 10mg/10 ml NS	24 hrs	NA	10 mint
М	Carobplatin	150 mg 450 mg	NS, D5W	NA	0.5 mg/ mL	50mg/250 ml NS 100mg/250 ml NS 150mg/250 ml NS 50mg/250 ml DSW 100mg/250 ml DSW 150mg/250 ml DSW	NA	50mg/100 ml NS 100mg/100 ml NS 150mg/100 ml NS 50mg/100 ml DSW 100mg/100 ml DSW 150mg/100 ml DSW	8 8	NA	60 mint
×	Carmustine	100 mg	NS, D5W	27 ml SWFI	0.2 mg/mL	50mg/250 ml NS 100mg/250 ml NS 50mg/250 ml D5W 100mg/250 ml D5W	1 mg/mL	50mg/100 ml NS 100mg/250 ml NS 50mg/100 ml D5W 100mg/250 ml D5W	8 hr	24 hr	at least 2 hrs
6	Cisplatin	50 mg	NS	50 ml SWFI	0.05/mL	15mg/250 ml NS 25mg/500 ml NS 50mg/1000 ml NS	0.5 mg/mL	15mg/100 ml NS 25mg/250 ml NS 50mg/500 ml NS	24 hrs	Don't Ref	6-8 hrs
10	Cladribine	10	NS	NA	1mg/mL	2.5mg/250 ml NS 5mg/250 ml NS	2 mg/mL	2.5mg/100 ml NS 5mg/100 ml NS	8 hr	24 hr	2-24 hrs
=	Clofarabine	20 mg/20ml	NS, D5W	NA	0.15mg/ml	10mg/100 ml NS 20mg/100 ml NS 10mg/100 ml D5W 20mg/100 ml D5W	0.4mg/ml	10mg/50 ml NS 20mg/50 ml NS 10mg/50 ml D5W 20mg/50 ml D5W	NA	24 hrs	2 hrs

	1-6 hrs	1-3 hrs	60 mint	60 min	15-60 min
	6 days NS 36 hrs D5W	NA	48 hrs	48 hrs	ИА
	24hrs	8 days	24 hrs	6 hrs	NA
	50mg/15 ml NS 100mg/25 ml NS 200mg/50 ml NS 500mg/100 ml NS 50mg/15 ml D5W 100mg/25 ml D5W 200mg/50 ml D5W	50mg/250 ml NS 100mg/250 ml NS 500mg/250 ml NS 1000mg/250 ml D5W 500mg/250 ml D5W 500mg/250 ml D5W 1000mg/250 ml D5W	20mg/25 ml NS 40mg/25 ml NS 20mg/25 ml D5W 40mg/25 ml D5W	20mg/100 ml NS 50mg/100 ml NS 20mg/100 ml D5W 50mg/100 ml D5W	10mg/50 ml NS 15mg/50 ml NS 20mg/50 ml NS 30ng/50 ml NS 10mg/50 ml D5W 30mg/50 ml D5W 50mg/50 ml D5W
3,23-36)	20 mg/mL	NA	NA	0.74mg/mL	NA
rapy medication ⁽¹²⁻¹	50mg/25 ml NS 100mg/50 ml NS 200mg/100 ml NS 500mg/25 ml D5W 100mg/26 ml D5W 200mg/100 ml D5W	500mg/500 ml NS 100mg/500 ml NS 500mg/500 ml NS 1000mg/500 ml D5W 100mg/500 ml D5W 500mg/500 ml D5W	20mg/50 ml NS 40mg/50 ml NS 20mg/50 ml D5W 40mg/50 ml D5W	20mg/250 ml NS 50mg/250 ml NS 20mg/250 ml D5W 50mg/250 ml D5W	10mg/100 ml NS 15mg/100 ml NS 20mg/100 ml NS 30mg/100 ml NS 15mg/100 ml D5W 30mg/100 ml D5W 30mg/100 ml D5W
d chemothe	2mg/mL	NA	NA	0.3mg/mL	NA
s standardize	25ml SWFI or NS for each 500 mg	ΥN	4 ml	NA	5 ml NS for 10 mg, and 25 ml for 50 mg vial
d Neonate	NS, D5W	NS, D5W	NS, D5W	NS, D5W	NS, D5W
diatrics and	100 mg 200 mg 500 mg	100 mg 500 mg 2000mg 2000mg	20 mg	20 mg/ml (1mL, 4mL vials) 80 mg Injection	10 mg 50 mg
e1: Suggested Pe	Cyclophosphadime	Cytarabine	Daunorubicin	Docetaxel	Doxorubicin
Table	12	13	14	15	16

e	: Suggested P	ediatrics an	d Neonate	es standardiz	ed chemotin	erapy medication	00-07'0				
	Etoposide	100 mg/5ml	NS, D5W	NA	0.2 mg/mL	20mg/100 ml NS 30mg/250 ml NS 50mg/500 ml NS	0.4 mg/mL	20mg/50 ml NS 30mg/100 ml NS 50mg/250 ml NS	24-96 hr	NA	60 mint
						20mg/100 D5W 30mg/250 ml D5W 50mg/500 ml D5W		20mg/50 D5W 30mg/100 ml D5W 50mg/250 ml D5W			
	Fludarabine	50 mg Injection	NS, D5W	2 ml SWFI	0.25mg/ml	10mg/50 ml NS 15mg/50 ml D5W	1 mg/ml	10mg/25 ml NS 15mg/25 ml D5W	24hrs	24 hrs	30 mint
	Fluorouracil	50 mg/ mL (5 ml/10 ml) Injection	NS, D5W	NA	1mg/mL	250mg/100 ml NS 500mg/100 ml NS 250mg/100 ml D5W 500mg/100 ml D5W	10mg/mL	250mg/50 ml NS 500mg/50 ml NS 250mg/50 ml D5W 500mg/50 ml D5W	14 days	14 days	23-24 hrs
	Gemcitabine	200mg 1000mg	NS	5 ml NS for 200 mg, and 25 ml for 1000 mg vial	0.1 mg/mL	250mg/250 ml NS 500mg/250 ml NS	38mg/mL	250mg/100 ml NS 500mg/100 ml NS	24 hrs	NA	30 mint
	Idarubicin	1mg/ml Injection	NS,D5W	10 SWFI	1mg/ml	5 mg/25 ml NS 10 mg/25 ml D5W	NA	5 mg/10 ml NS 10 mg/10 ml D5W	72 hrs Protect from light	NA	10-15 mint
	Ifosfamide	1 gm	NS, D5W	20 SWFI	0.6 mg/mL	500mg/100 ml NS 1000mg /250 ml NS `500mg/100 ml D5W 1000mg /250 ml D5W	20mg/mL	500mg/50 ml NS 1000mg /100 ml NS `500/50 ml D5W 1000mg /100 ml D5W	NA	24 hrs	1-6 hrs
	Irinotecan	100 mg/5ml Injection	D5W	NA	0.12mg/mL	25 mg/250 ml D5W 50 mg/250 ml D5W 100 mg/250 ml D5W	2.8mg/mL	25 mg/100 ml D5W 50 mg/100 ml D5W 100 mg/100 ml D5W	24 hrs	48 hrs	90 mint
	Leucovorin	15 mg 50 mg	D5W	1.5 ml SWFI for 15 mg	0.1mg/mL	15 mg/25 ml D5W 7.5 mg/25 ml D5W	20 mg/mL	15 mg/10 ml D5W 7.5 mg/10 ml D5W	24 hrs	24 h	15-120 mint Maximum rate not exceed 160mg/min
	Mesna	400 mg	N5, D5W	NA	0.5mg/mL	100 mg/100 ml NS 200 mg/100 ml NS 100 mg/100 ml D5W 200 mg/100 ml D5W	20mg/mL	100 mg/50 ml NS 200 mg/50 ml NS 100 mg/50 ml D5W 200 mg/50 ml D5W	24hrs	48 hrs	15min-24hr
	Melphalan	50 mg Injection	NS	10 ml NS	0.1mg/ml	25 mg/100 ml NS 50 mg/500 ml NS 100 mg/500 ml NS	0.45mg/ml	25 mg/100 ml NS 50 mg/250 ml NS 100 mg/250 ml NS	4 hrs	NA	15-20 min

80

	24 hrs	5-6 mint	30 min	2-6 hrs	30 mint	1-2 hrs	0.5mg/kg/hr to 400mg/hr	2-4 hrs
	30 days	7 days	24 hrs	24 hrs	96 hr	24 hr	24 hr	24 hrs
	7 days	7 days	8 hrs	6hrs	6 hr	Use immediately	24 hr	4 hrs
	25 mg/25 ml NS 50 mg/25 ml NS 100 mg/50 ml NS 250 mg/50 ml NS 500 mg/50 ml D5W 50 mg/50 ml D5W 100 mg/50 ml D5W 250 mg/50 ml D5W 250 mg/50 ml D5W	5 mg/50 ml NS 10 mg/50 ml D5W	50 mg/25 ml NS 100 mg/25 ml NS 250 mg/25 ml NS 50 mg/25 ml D5W 100 mg/25 ml D5W 250 mg/25 ml D5W	25 mg/250 ml D5W 50 mg/250 ml D5W 100 mg/250 ml D5W	25 mg/25 ml NS 50 mg/25 ml NS 25 mg/25 ml D5W 50 mg/25 ml D5W	250 IU /100 ml NS 500 IU /100 ml NS 750 IU /100 ml NS 250 IU /100 ml D5W 500 IU /100 ml D5W	50 mg/25 ml NS 100 mg/50 ml NS 50 mg/25 ml D5W 100 mg/50 ml D5W	50 mg/50 ml NS 100 mg/100 ml NS
3,23-36)	25 mg/ml	NA	10mg/ml	NA	10mg/mL	NA	4mg/mL	1 mg/mL
rapy medication ⁽¹²⁻¹	25 mg/50 ml NS 50 mg/50 ml NS 100 mg/100 ml NS 250 mg/100 ml NS 500 mg/100 ml D5W 50 mg/50 ml D5W 100 mg/100 ml D5W 250 mg/100 ml D5W 250 mg/100 ml D5W	5 mg/100 ml NS 10 mg/100 ml D5W	50 mg/50 ml NS 100 mg/50 ml NS 250 mg/50 ml NS 50 mg/50 ml D5W 100 mg/50 ml D5W 250 mg/50 ml D5W	25 mg/500 ml D5W 50 mg/500 ml D5W 100 mg/500 ml D5W	25 mg/50 ml NS 50 mg/50 ml NS 25 mg/50 ml D5W 50 mg/50 ml D5W	250 IU /100 ml NS 500 IU /100 ml NS 750 IU /100 ml NS 250 IU /100 ml D5W 500 IU /100 ml D5W	50 mg/50 ml NS 100 mg/100 ml NS 50 mg/50 ml D5W 100 mg/100 ml D5W	50 mg/100 ml NS 100 mg/250 ml NS
ed chemothe	ХХ	NA	1mg/ml	0.7 mg/ml	1mg/mL	А	1mg/mL	0.5 mg/mL
es standardize	0.97 ml NS for 50 mg 9.7 ml NS for 500 mg NS	NA	VN	10 ml SWFI OR D5W for 50 mg 20 ml for 100 mg	AN	V Z		10 ml of SWFI
d Neonate	NS,D5W	NS,D5W	NS,D5W	D5W	NS,D5W	NS,D5W	NS,D5W	NS
ediatrics an	50mg 500mg	20mg	100 mg/10ml 40 mg/4ml Injection	50mg 100mg	100 mg/4ml Injection	750 units/ ml	100mg 500mg	100 mg Vial
1: Suggested Pe	Methotrexate	Mitoxantrone	Nivolumab	Oxaliplatin	Pembrolizumab	Pegaspargase	Rituximab	Thiotepa
Table	27	28	29	30	31	32	33	33

lomi, <i>et al</i> .: Pediatrics an	l Neonates Standardized	Concentration of Cher	motherapy Intravenous	Infusion
-------------------------------------	-------------------------	-----------------------	-----------------------	----------

Table	1: Suggested P	ediatrics an	nd Neonate	s standardize	ed chemothe	rapy medication ⁽¹²⁻	13,23-36)				
34	Topotecan	4 mg/4ml Injection	D5W, NS	NA	NA	0.5 mg/100 ml D5W 1 mg/100 ml D5W	NA	0.5 mg/50 ml D5W 1 mg/50 ml D5W	24 days	7 days	30 mint
						eN Im 001/gm c.u 1 mg/100 ml NS		en im oc/am e.u 1 mg/50 ml NS			
35	Vinblastine	1 mg 10 mg	NS,D5W	NA	NA	0.5 mg/50 ml NS 1 mg/50 ml NS 3 mg/50 ml NS	NA	0.5 mg/25 ml NS 1 mg/25 ml NS 3 mg/25 ml NS	5 days	7 days	15-30 mint
						0.5 mg/50 ml D5W 1 mg/50 ml D5W 3 mg/50 ml D5W		0.5 mg/25 ml D5W 1 mg/25 ml D5W 3 mg/25 ml D5W			
Ŷ	Vincristine	lmg	NS,D5W	NA	0.0015mg/ml	0.5 mg/50 ml NS 0.75 mg/50 ml NS 1 mg/50 ml NS	0.08mg/ml	0.5 mg/25 ml NS 0.75 mg/25 ml NS 1 mg/25 ml NS	21 days	21 days	5-10 mint Or 24 hrs
S						0.5 mg/50 ml D5W 0.75 mg/50 ml D5W 1 mg/50 ml D5W		0.5 mg/50 ml D5W 0.75 mg/50 ml D5W 1 mg/50 ml D5W			
37	Vinorelbine	50mg/5 ml	D5 W,NS	NA	0.5 mg/mL	10 mg/25 ml D5W 15 mg/25 ml D5W	2mg/mL	10 mg/10 ml D5W 15 mg/15 ml D5W	24 hrs	24 hrs	6-30 mint
						10 mg/25 ml NS 15mg/25 ml NS		10mg/10 ml NS 15 mg/15 ml NS			
Abbrev Note: T	iations: IVBP: Intrav he healthcare professi	enous Piggyba onals should a	ck, NA: Not Ap diust the concer	plicable/ Not avai	lable, NS: Normal ose requirement a	Saline, Ref: Refrigerate, RJ	f: Room Temperat dition. The nharm	ure, SWFI: Sterile Water For acist should the review the a	r Injection, Hrs ppreciate conce	:hours, Mint entration of fi	: Minutes nal preparations

according the strength of the medications, prescribing dose, and their local healthcare institution policy

for any new healthcare or pharmacy staff joined the organization.

Monitoring and Controlling **Phase Project Total Quality Management**

The Balance Scored Card is one of the total quantity management tools used for new project pediatrics and neonatal standardized concentration of chemotherapy medications.

BSC consisted of four types the customer, finance, internal process, education, and innovation.20 The declared example of internal processes was the assessment of healthcare services of patients and neonatal standardized concentration of chemotherapy medications. The type of education and innovation measured the clinical outcome of pediatrics and neonatal standardized concentration of chemotherapy medications and also explored the education and competency of pharmacy staff. Another example related to the financial type; the measurement of the economic impact of pediatrics and standardized concentration neonatal chemotherapy medications, while of the customer types may be measure the patients, pharmacy staff, healthcare professionals' pediatrics and neonatal standardized concentration of chemotherapy medications gratification in Saudi Arabia.

Risk Management

There are six types of risk management, for instance, the budget risks, scope risks, schedule risks, personal risks, technical risks and quality risks.^[21,22] The project might have exposed to typical risks such as personnel, budget, technical and quality risks. The current project suffered from personal risks related to the shortage of pharmacists or pharmacy technicians or not trained pharmacy staff. The second risk might be exposed to a financial budget risk; for example, the budget is not adequately covered the education and training and also not applicable to updated references. Also, it does not implement the computerized system during prescribing or alerting as it is another type of technical risk of the current project. The pediatrics and neonatal standardized chemotherapy concentration may be exposed to quality risks including of not fully implemented medication safety or non-quality pharmacist in the total management specialty.

Closing of the Project

The pediatrics and neonatal standardized concentration of chemotherapy at all healthcare governmental and private organizations is highly suggested to prevent medication errors that might lead to mortality. Also, to avoid needless economic burden on hospitals and primary healthcare centers in the Kingdom of Saudi Arabia. The project should continue at chemotherapy IV admixture at each pharmacy services and related committees. The pediatrics and neonatal Education and training for standardized concentration should be done repeatedly, update drug concentration and expanded parental medications necessary in the future. The annual celebration of all pediatrics and neonatal pharmacist and pharmacy technician staff is highly optional in the Kingdom of Saudi Arabia.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

None.

FUNDING

None

CONSENT FOR PUBLICATIONS

Informed consent was obtained from all the participants

ETHICAL APPROVAL

This research exempted from research and ethical committee or an institutional review board (IRB) approval.

https://www.hhs.gov/ohrp/regulations-andpolicy/decision-charts-2018/index.html

ABBREVIATIONS

MOH: Ministry of Health; KSA: Kingdom of Saudi Arabia; TPN: Total Parenteral Nutrition; SWOT: Strengths, Weaknesses, Opportunities and Threats; IV: Intravenous; BSC: Balance Scored Cards; IAC: intravenous admixture committee.

ORCID ID

Yousef Ahmed Alomi in https://orcid. org/0000-0003-1381-628X

REFERENCES

- Alomi YA. National medication safety program at ministry of health in Saudi Arabia. J Pharmacovigil. 2015;3(5):e145.
- Alomi YA, Alghamdi SJ, Alattyh RA. Strategic plan of general administration of pharmaceutical care at ministry of health in Saudi Arabia 2012-2022. J Pharm Pharm Scien. 2015;1(13):1-8.
- Alanazi1 AA, Alomi YA, Almaznai MM, et al. Pharmacist's intervention and medication errors prevention at pediatrics, obstetrics and gynecology hospital in East Province, Saudi Arabia. Int J Pharm Heal Sci. 2019;2(2):122-8.
- Alomi YA, Alanazi AA, Almaznai MM, et al. Costeffectiveness analysis of medication safety program at pediatrics, obstetrics and gynecology hospital, East Province, Saudi Arabia. Pharmacol Toxicol Biomed Reports. 2019;5(3s):S12-6.
- Alomi1 YA, Fallatah AO, Al-Shubaar N, et al. The clinical outcomes of pharmacist interventions in total parenteral nutrition services in Riyadh City, Saudi Arabia. Int J Pharm Heal Sci. 2019;2(2):135-40.
- Alomi YA, Fallatah AO, Bahadig FA, et al. The economic outcomes of pharmacist interventions in total parenteral nutrition services in Saudi Arabia. Pharmacol Toxicol Biomed Reports. 2019;5(3s):S40-9.
- Ahmed AY, Saad AH, Fallatah AO, *et al.* Neonatal Total Parenteral Nutrition: Initiative and implementation of standardized formulation in Saudi Arabia. Res Pharm Heal Sci. 2018;4(3):492-6.
- Ahmed AY, Saad AH, Fallatah AO, *et al.* Pediatrics' total parenteral nutrition: Initiative and implementation of standardized formulation in Saudi Arabia. Res Pharm Heal Sci. 2018;4(3):492-6.
- United States Pharmacopeia. USP General Chapter - Hazardous Drugs- Handling in Healthcare Settings. The United States Pharmacopeial Convention. 2017;1-20.
- Goldspiel B, Hoffman JM, Griffith NL, *et al.* ASHP guidelines on preventing medication errors with chemotherapy and biotherapy. Am J Health Syst Pharm. 2015;72(8):e6-35.
- Murray KL, Wright D, Laxton B, et al. Implementation of standardized pediatric i.v. medication concentrations. Am J Heal Pharm. 2014;71(17):1500-8.
- Benizri F, Bonan B, Ferrio AL, et al. Stability of antineoplastic agents in use for home-based intravenous chemotherapy. Pharm World Sci. 2009;31(1):1-13.
- Vigneron J, Astier A, Hecq JD, et al. SFPO and ESOP recommendations for the practical stability of anticancer drugs: An update. Eur J Oncol Pharm. 2014;8(2):3-13.
- Institute for Safe Medication Practices (ISMP). Standard Concentrations of Neonatal Drug Infusions. ISMP. 2011.
- Alomi YA. National Intravenous (IV) Therapy Program at MOH in Saudi Arabia. EC Pharm Sci. 2016;3(2 and 3):307-11.
- McDonough R. Writing a business plan for a new pharmacy service. The Dynamics of Pharmaceutical Care: Enriching Patients' Health. 2010;23:1-2.
- Harris IM, Baker E, Berry TM, et al. Developing a business-practice model for pharmacy services in ambulatory settings. Pharmacotherapy. 2008;28(2):7e-34e.

- Sachdev G. Sustainable business models: Systematic approach toward successful ambulatory care pharmacy practice. Am J Heal Pharm. 2014;71(16):1366-74.
- PMBOK Guide. A guide to the project management body of knowledge. Sixth Edition. Project Management Institute Inc. 2017.
- Kaplan RS, Norton DP. The balanced scorecard: Measures that drive performance. Harvard Business Review. 2005;83(7):172. Cited 2020 Mar 15. Available from: https://hbr.org/1992/01/thebalanced-scorecard-measures-that-drive-performance-2.
- Ray S. The risk management process in project management - Project Manager. Risk Management. 2017. Cited 2020 Mar 15. Available from: https://www.projectmanager.com/blog/risk-management-process-steps.
- Kaplan RS, Mikes A. Managing risks: A new framework. Harvard Business Review. 2012;90(6):48-60. Cited 2020 Mar 15. Available from: https://hbr. org/2012/06/managing-risks-a-new-framework.
- Brown P. Pediatric acute lymphoblastic leukemia. NCCN Clinical Practice Guidelines in Oncology. 2019;2:1-118.
- Davies K. Pediatric Aggressive Mature B-Cell Lymphomas. NCCN Clinical Practice Guidelines in Oncology. 2019;1:1-35.
- Adams SC, Vyas HM, Anderson RW. Pharmaceutical issues in infusion chemotherapy stability and compatibility. In: Cancer Chemotherapy by Infusion. 1987;100-13.
- 26. Ministry of Health. Ministry of Health Formulary. Health Ministry of Health. 2012.
- Saudi Food and Drug Authority. List of human medicine and herbal health. 2019. [cited 2019 Jun 17]. Available from: https://www.sfda.gov.sa/en/ drug/resources/Pages/DrugsUnderRegistrations. aspx
- Baxter K, Aikman K, Luckhurst R, *et al.* British National Formulary 78 (BNF). Royal Phamaceutical Society. 2019;1-1701.
- Alomi YA, et al. Pediatrics Parenteral Dilution Manual. Ministry of Health. 2015. Available from: https://www.researchgate.net/publication/281710402_Pediatrics_Parenteral_Dilution_ Manual
- Alomi YA, et al. Neonates Parenteral Dilution Manual. Ministry of Health. 2015. Available from: https://www.researchgate.net/publication/281710411_Neonates_Parenteral_Dilution_ Manual
- Wolters Kluwer Clinical Drug Information. Inc. (Lexi-Drugs). Wolters Kluwer Clinical Drug Information, Inc. 2020.
- Drugs.com. Drugs.com, Prescription Drug Information, Interactions and Side Effects. Drugs.com. 2020. [cited 2020 Jun 16]. Available from: https:// www.drugs.com/
- King Abdulaziz Medical City. Unified IV Manual. 2020.
- Wolters Kluwer Clinical Drug Information. Inc. (ASHF Essentials adults and pediatrics). Wolters Kluwer Clinical Drug Information, Inc. 2020.
- Wolters Kluwer Clinical Drug Information. Inc. (Pediatrics and Neonatal Lexi-Drugs). Wolters Kluwer Clinical Drug Information, Inc. 2020.
- Wolters Kluwer Clinical Drug Information. Inc. (Nursing Lexi-Drug). Wolters Kluwer Clinical Drug Information, Inc. 2020.