

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

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ABSTRACT

Objectives: To declare the pediatrics and neonates' standardized concentration of miscellaneous mediations intravenous infusion as new initiatives in the Kingdom of Saudi Arabia. **Methods:** It is a new initiative project drove by national standardized concentration of miscellaneous mediations 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 contained 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 miscellaneous mediations intravenous infusion services with a defined vision, mission and goals. The services had multiple benefits including clinical and economic on patients, the continuous of the project assured by risk management model description and the monitoring and controlling of the services as declared as explored in the review. The transition to operation project though closing project stage demonstrated in the analysis. **Conclusion:** The pediatrics and neonates' standardized concentration of miscellaneous mediations intravenous infusion services is a new initiative as part of the intravenous admixture program. The pediatrics and neonates' standardized concentration of miscellaneous mediations intravenous infusion might improve patient outcome and avoid added unnecessary cost; it is highly recommended to implement in the Kingdom of Saudi Arabia.

Keywords: Pediatrics, Neonates', Standardized, Concentration, Miscellaneous, Intravenous, Services, Saudi Arabia.

INTRODUCTION

The medication errors prevention is vital in the neonatal and pediatrics field.^[1] The pharmacist had a crucial role in the intervention and medication mistakes prevention of neonates' and pediatrics patients in Saudi Arabia.^[1] Besides, the pharmacist properly decreases the economic burden on the pharmacy and healthcare system.^[2] The majority of mistakes were dosing related and measured as the third type of errors. Various medications involved in mistakes, not specialized groups of medications.^[1] Multiple literatures discussed pediatrics and neonate's standardized concentration of high-risk medications. It included cardiopulmonary medication, electrolyte and total parenteral nutrition for neonates' and pediatrics.^[3-6] However, some miscellaneous medications not discussed in those literatures. The authors were not familiar with any investigations based on their knowledge discussed the pediatrics or neonatal standardized concentration of miscellaneous medications not involved antibiotics, chemotherapy, cardiovascular medications and central nervous system medications.^[7-9] The aim of the current review is to declare the neonatal and pediatrics standardized concentration of intravenous infusion of miscellaneous medication as new initiatives project in the kingdom of Saudi Arabia.

Method of the Project

It is a new initiative project drove by the national IV admixture programs. The task force team of pediatrics and neonates' standardized miscellaneous medications concentration formulated and contained from the author's expertise in the parenteral medications. All antibiotics, chemotherapeutic agent CNS medications, cardiovascular medications will be excluded from the revision. The committee utilized and drove the pharmacy parenteral administration guidelines, from the textbook and international literature pediatrics and neonates' standardized concentration of miscellaneous medications. It was written by utilizing the international business model, pharmacy project guidelines and project management institution guidelines of a new project.^[10-13] The pediatrics and neonate's standardized concentration adjusted based on the drug strength, 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.

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Initiative Phase

Assessment Needs

The majority of the intravenous admixture services in the pharmacy unit made guidelines for parenteral dilution and administration of the medications special for them. The guidelines comprised of medications, drug strength, rate of administration and stability of intravenous infusions. The pharmacists and pharmacy technician prepares multiple medications with various concentrations and different diluent solutions. Moreover, the healthcare providers, including physicians and nurses, might deal with a different method of administration with multiple concentrations and various solutions. The pediatrics and neonate's standardized concentration of medications are essential to prevent drug-related errors. The workload of healthcare professionals might be enlarged through prescribing or dispensing and administration of multiple concentration medications. The various factors of the workforce may affect the safety culture and lead to medication errors. If the unified concentration with the solution will lessen the workload and prevent medication errors.

SWOT Analysis

The SWOT analysis measured one of the common tools for each new project analysis. The SWOT analysis stands for strength, weakness, opportunities and threats. The strengths points of the project are set up the medication safety and prevention of mistakes, reductions of pharmacy and healthcare provider workload, while the weak points are limited medication concentration and few numbers of diluent solution. The opportunities points are quality methods for accreditation and patient safety program implementation. The threat points are if the pharmacy strategic plan does not happen and if the administration planner not available.

Market Analysis

The majority of the intravenous admixture service had a specific method of parenteral medications. The manual of preparation comprised of medications, route of administration, the stability of preparation, with normal and maximum concentration and medication compatibility. Most of the governmental or private healthcare organizations had the same guideline with different medications. There is no standardized concentration for medications or standardized diluent solutions for pediatrics or neonates'. It is a special method for standardized concentration to reassure pharmaceutical companies to manufacture the same, although

some ready-made medications with specific standardized concentration a variable in the market.

Planning Phase

Scope of the Project

The project covers a pediatrics and neonates' standardized concentration of miscellaneous intravenous medications. It is not comprised antibiotics, cardiovascular medications, CNS medications and chemotherapy agents including common and maximum concentration based on the dosage, frequency administration and medications strength. Moreover, the diluent solution for pediatrics and neonates' miscellaneous medications.

Vision, Missions, Goals

The vision of the project is to reach the best pediatrics and neonate's standardized concentration of intravenous infusion of miscellaneous medications, while the message to provide the appropriate pediatrics and neonates' fixed standardized concentration of intravenous infusions of miscellaneous medications with appropriate diluent solutions. The goals of the project is to fix the pediatrics and neonates' standardized concentration of intravenous infusion of miscellaneous medications, to inhibit any mistakes related to medication concentration, to reduce the workload for pharmacy staff, healthcare providers and to avoid the other needless and additional cost on the pharmacy and healthcare system.

Project Description

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

- ✓ The intravenous admixture committee (IAC) should be formulated at healthcare organizations.
- ✓ The IAC committee should contain of IV pharmacist and pharmacy technician, pediatrics nursing representative, neonates' nursing representative and pediatrics surgical or medical representative and neonatal surgical or physician and nurse representative.
- ✓ The committee revises the standardized concentration of pediatrics and neonate's miscellaneous medications and updates at least annually (Table 1).
- ✓ The education and training sessions should be conducted by the committee to all healthcare providers, including pediatrics and neonates', physicians and nurses, with pharmacy staff.

- ✓ The pediatrics and neonates' standardized concentration of miscellaneous medications distributed to healthcare sectors at the organization.
- ✓ The physician writes the prescription based on the standardized concentration of miscellaneous medications.
- ✓ If the physician wishes to prescribe outside the pediatrics and neonates' a standardized concentration of miscellaneous medication guidelines, he should document the justification.
- ✓ The prescription should send to the pharmacy and IV pharmacist and pharmacy technician will prepare it based on the standardized concentration of miscellaneous medications.
- ✓ The pharmacy staff refers the medications to the nursing department and the nurse administers the medications based on the pediatrics and neonate's standardized concentration of medication guidelines.
- ✓ The pharmacy department should measure the clinical outcome of pediatrics and neonate's standardized concentration of miscellaneous medications.
- ✓ The pharmacy department should measure the economic outcome of pediatrics and neonate's standardized concentration of miscellaneous medications.
- ✓ The pharmacy department should document any prescription non-adherence to the standardized concentration of pediatrics and neonate's miscellaneous medications.

Plan Cost Management

Every new project, the management team must set out the financial budget, which includes the cost of educational courses pediatrics and neonates' healthcare professionals, the cost of the management team meeting and the cost of updated references. The budget must be supervision over a while until the project ended and switch to the operating system.

Executing Phase

Management Team

Project management professionals had various steps. One of the essential steps was executing phase, which had a team lead the program or the project from the beginning until becoming one of the operating systems at a healthcare organization. The team contained of several members, including pediatrics medical clinical pharmacists, neonates' clinical pharmacists, pediatrics and neonates' medical physicians, pharmacists and pharmacy technician experts in the parenteral preparation, pharmacy quality management and medications safety officer representing. The team should

Table 1: Suggested Pediatrics Standardized Concentration of Miscellaneous Medications (17-27)

No.	Generic medications	Initial Strength	Diluents	Reconstitution Volume	Final Concentration	Final Preparation with Maximum Concentration	Maximum Conc.	Final Preparation with Standard Concentration	Stability of mixed Solution RT	Ref	Rate of Administration IVPB
1	Acetaminophen	10mg/ml	NA	NA	10mg/ml	250mg/25ml 500mg/50ml	10mg/ml	250mg/25ml 500mg/50ml	6 hrs	NA	15 mint
2	Azathioprine	100 mg	D5W, NS	10 ml SWFI	NA	25mg/50ml D5W 50mg/50ml D5W	<10mg/ ml	25mg/25ml D5W 50mg/25ml D5W	16 days	16 days	30-60 mint
3	Basiliximab	20 mg	D5W, NS	5 ml SWFI	0.4 mg/ml	25mg/50ml NS 50mg/50ml NS	NA	25mg/25ml NS 50mg/25ml NS	24 hrs	24 hrs	20-30 mint
4	Cyclosporine	250mg/5ml	NS, D5W	NA	0.5mg/ml	10mg/25ml D5W 20mg/50ml D5W	2.5mg/ml	10mg/25ml D5W 20mg/50ml D5W	24 hrs	24 hrs	2-6 hr
5	Dantrolene	20 mg injection	SWFI	60 ml	0.33mg/ ml	25mg/ 50ml NS 50mg/ 100ml NS 100mg/ 100ml NS	0.33mg/ ml	25mg/ 25ml NS 50mg/ 50ml NS 100mg/ 50ml NS	6 hrs	NA	60 mint
6	Dexamethasone Sodium phosphate	4mg/ml	NS D5W	NA	0.093mg/ml	1mg/25ml NS 4mg/25ml NS 6mg/25ml NS 10mg/25ml NS	1mg/ml	2mg/25ml NS 8mg/25ml NS 12mg/25ml NS 20mg/25ml NS	2 days	30 days	15-60 mint
7	Diphenhydramine	50mg/ ml	D5W NS	NA	0.1mg/ ml	1mg/25ml D5W 4mg/25ml D5W 6mg/25ml D5W 10mg/25ml D5W	Less than 50mg/ ml	2mg/25ml D5W 8mg/25ml D5W 12mg/25ml D5W 20mg/25ml D5W	24 hrs	NA	10-15 mint
8	Human Soluble Insulin Regular	100U/ ml	NA	NA	0.5U/ ml	15mg/ 25ml NS 25mg/ 25ml NS	1U/ ml	15mg/ 10ml NS 25mg/ 10ml NS	24 hrs	14 days	Titrate depend on Blood Glucose

Table 1: Suggested Pediatrics Standardized Concentration of Miscellaneous Medications (17-27)

9	Hydrocortisone Sodium Succinate	100mg or 500mg injection	D5W NS	2 ml of NS for 100 mg and 10 ml for 500 mg	1mg/ ml	10mg/10ml D5W 25mg/25ml D5W 50mg/50ml D5W 100mg/100ml D5W 10mg/10ml NS 25mg/25ml NS 50mg/50ml NS 100mg/100ml NS	5mg/ ml 10mg/5ml NS 25mg/10ml NS 50mg/25ml NS 100mg/50ml NS	10mg/5ml D5W 25mg/10ml D5W 50mg/25ml D5W 100mg/50ml D5W	4 hrs	24 hrs	20-30 mint
10	Iron Dextran	50mg/ml (2ml)	NS	NA	NA	50mg/50ml NS 100mg/100ml NS	NA	50mg/25ml NS 100mg/100ml NS	NA	NA	2-6 hrs
11	Iron Saccharate	100mg/5ml	NS	NA	1mg/ml	50mg/50ml NS 100mg/100ml NS	2mg/ml	50mg/25ml NS 100mg/100ml NS	7 days	NA	Each 100 mg over at least 30- 60 minutes
12	Methylprednisolone Sodium succinate	40 mg 500 mg	D5W NS	NA	NA	20mg/ 50ml NS 30mg/ 50ml NS 250mg/ 50ml NS 20mg/ 50ml D5W 30mg/ 50ml D5W 250mg/ 50ml D5W	NA	20mg/ 25ml NS 30mg/ 25ml NS 250mg/ 25ml NS 20mg/ 25ml D5W 30mg/ 25ml D5W 250mg/ 25ml D5W	24 hrs	24 hrs	30-60 mint
13	Ondansetron	2mg/ml (2 ml)	D5W NS	NA	NA	2mg/25ml D5W 4mg/25ml D5W 2mg/25ml NS 4mg/25ml NS	1mg/ ml	4mg/15ml D5W 8mg/15ml D5W 4mg/15ml NS 8mg/15ml NS	2 days	7 days	15 mint
14	Pamidronate	30 mg Injection	NS,D5W	10 SWFI	NA	15 mg/500 ml NS 30 mg/500 ml NS 15 mg/500 ml D5W 30 mg/500 ml D5W	NA	15 mg/250 ml NS 30 mg/250 ml NS 15 mg/250 ml D5W 30 mg/250 ml D5W	7 day	30 days	2-24 hrs
15	Pantoprazole	40 mg Injection	NS,D5W	10 NS	0.4mg/ml	20 mg/50 ml NS 40 mg/100 ml NS 20 mg/50 ml D5W 40 mg/100 ml D5W	0.8mg/ml	20 mg/25 ml NS 40 mg/50 ml NS 20 mg/25 ml D5W 40 mg/50 ml D5W	24 hrs	48 hrs	15 mint

Abbreviations: IVBP: Intravenous Piggyback, NA: Not Applicable/ Not available, NS: Normal Saline, Ref: Refrigerate, RT: Room Temperature, SWFI: Sterile Water For Injection, Hrs :hours, Mint: Minutes

Note: The healthcare professionals should adjust the concentration and the dose requirement according to the patient condition. The pharmacist should review the appreciate concentration of final preparations according the strength of the medications, prescribing dose, and their local healthcare institution policy

implement and follow up on the new services with regular updating of medications list with their concentration. Moreover, the team should educate and train the pharmacy, pediatrics and neonates' staff about the new services and measure the clinical and economic outcome of the project.

Education and Training

Every new project entails special education and training for concern people. This project desires education and training for pharmacy staff, including pediatrics and neonates' clinical pharmacists, pediatrics and neonates' pharmacists and pharmacy technicians. The healthcare professionals, counting pediatrics and neonates' physicians and nurses, need another special education and training. Moreover, the team management needs orientation education about the project for all healthcare professionals. The orientation emphasis on for any new staff healthcare providers joined the healthcare institutions.

Monitoring and Controlling Phase Project

Total Quality Management

There are numerous tools used for total quantity management with new project pediatrics and neonates' standardized concentration of miscellaneous medications during the implementation phase and reflect the impact and the balance scored cards was among them.^[14] The tools monitor consisted of four-part that's including the customer, finance, internal process, education and innovation. The assessment of healthcare services of adult's standardized concentration of miscellaneous medications was an example of an internal process type. The clinical outcome of pediatrics and neonates' standardized concentration of miscellaneous medications, which may imitate the education and competency of pediatrics and neonates' clinical pharmacists, distributive pharmacists and pharmacy technicians as an example of the education type. The financial type had another example of measuring the cost avoidance of the pediatrics and neonate's standardized concentration of central nervous system medications. The fourth type was the customer types with measuring the patient's satisfaction with healthcare providers, including pharmacists and pharmacy technicians of pediatrics and neonates' standardized concentration of miscellaneous medications satisfaction in the Kingdom of Saudi Arabia.

Risk Management

There are various measured risks including schedule risks, scope risks, budget risks,

personal risks, technical risks and quality risks.^[15,16] The project mostly exposed to risks such as personnel, budget, technical and quality risks. The project correctly suffered from personal risks with not trained healthcare professionals or nor sufficient pharmacists and pharmacy technicians. The budget risk was not covered the education and training courses for all pharmacy staff and healthcare professionals. There is another of technical risk maybe exposed. The technical risk, which is limited to electronic recourses, or not friendly use computer system in pharmacy practice. The project maybe exposed to quality risks with not implemented pediatrics and neonates' medications safety tools or non-trained personnel.

Closing of the Project

The standardized concentration of pediatrics and neonates' miscellaneous medications at all healthcare organizations of governmental and private sectors are mandatory to prevent drug-related mistakes, lead to morbidity and mortality and avert an economic burden on pharmacy and healthcare systems, including the hospitals and primary healthcare centers services in Saudi Arabia. The project should endure at the intravenous admixture of pediatrics and neonates' parenteral medications at each pharmacy unit and keep supervision through related committees. The standardized pediatrics and neonates' concentration education and training should be implemented accordingly. Pediatrics and neonate's miscellaneous medications concentration should inform regularly and expand the number of medications is recommended in the future. The annual celebration of all intravenous admixture pediatrics and neonates' pharmacy staff, including pharmacists and pharmacy technicians is highly optional in Saudi Arabia.

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CONFLICT OF INTEREST

None.

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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-and-policy/decision-charts-2018/index.html>

ABBREVIATIONS

MOH: Ministry of Health; **KSA:** Kingdom of Saudi Arabia; **SWOT:** Strengths, Weaknesses, Opportunities and Threats; **CNS:** Central Nervous System; **IV:** Intravenous; **BSC:** Balance Scored Cards; **IAC:** intravenous admixture committee.

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