


Emergency Medications Order for Adults: Standardized Concentration System in Saudi Arabia

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ABSTRACT

The general administration of pharmaceutical care released several publications related to the administration of intravenous medications, which mention about the concentration of intravenous medications for adults, pediatrics and neonatal patients. The publications also include several emergency medications with their concentrations. This new initiative was started in order to guide physicians to select the primary emergency medications in intravenous drip administration. The medications were selected based on common evidence-based standardized concentration for adults. This project required to control high-alert medications and prevent drug-related errors. The list of medications may be covered as computerized physician order entry and this project may be implemented as pharmacy project management.

Keywords: Adults, Emergency, Medications, Standardized Concentration, Saudi Arabia.

INTRODUCTION

The national medication safety program at the Ministry of Health, Kingdom of Saudi Arabia, was founded in 2013.^[1] This program has a strategic plan for several years and follows the national and international accreditation organization, for instance, Saudi *Central Board for Accreditation of Healthcare Institutions* (CBAHI) and Joint Commission.^[2,3] In addition, the program is collaborated with the *Institute for Safe Medication Practices* (ISMP)-the organization for medication safety in the United States of America (USA). The ISMP has several assessments related to the medications safety in the hospitals and in ambulatory care setting.^[4,5] The American Society of Health-System Pharmacist (ASHP) launched standardized concentration before several years.^[6] Recently, the first national survey of medication safety through ISMP assessment was conducted during the Hajj period in Saudi Arabia.^[7-12] The principal defect point of the critical elements of the ISMP assessment was the standardized concentration of medications during administration through drug devices.^[9,10] The new initiative of adults emergency medications with standardized concentration and administration to improve medication safety culture and prevent medication error-related issues at three hospitals in Riyadh city, Saudi Arabia. To the best of our knowledge, there are no publications in Saudi Arabia, Gulf, or in Middle Eastern countries describing the standardized concentration of emergency medications for adults.

Adults Emergency Medications Standardized Concentration in Saudi Arabia

The standardized formulation of emergency medications include cardiopulmonary resuscitation requirements for adults. The formulation was derived from the current literature and guidelines for adults with an average body weight

of 70 kg. The medication consists of dopamine, dobutamine, epinephrine, norepinephrine and so on. The physician order form consisted of several parts: Patient's demographic data, medication names, the standardized concentration and maximum concentration of the medication, the type of crystallized fluid the type of administration through a central or peripheral vein, the dosing range as explored in the physician order entry form (Figure 1).

SWOT Analysis

The Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis method was used in this project. The strengths of the physician order forms for adults includes all information regarding common medications used in emergency situations, dosing of medications, fixed standardized concentration of emergency medications, the method of administration and prevented mistakes in writing emergency medications orders for adults are available. The weaknesses include dosing drips used outside another's resources and it cannot apply to diseases such as renal or hepatic failure. The opportunities include a straightforward form to convert the physician order form into a computerized and physician order entry; it can perform statistical calculations on all emergency care medications. The threat points include the physician or the pharmacist not using the standardized concentration.

Implementations Steps of Emergency Medications Standardized Concentration for Adults

The pharmacy department organizes consultation with the committee of expert pharmacists especially from those experts on intravenous admixture and clinical pharmacists in critical care in the pharmacy department. The commit-

tee should extensively review and then approve the standardized concentration form of adults' emergency medications form. The head of the committee will contact with the surgical and medical department for final revisions of the draft and its approval. The head of pharmacy services will submit the final draft of the formulation to the pharmacy and therapeutic committee for review and approval. The head of the committee will arrange with computer department to prepare electronic order forms. The pharmacy education coordinator arranges with all departments including nursing, surgical and medical department to educate and train the medical staff about using the formulation in addition to the pharmacy staff. The pharmacy quality management will set up the Key Performance Indicators (KPIs) to measure the impact of the project. All pharmacy-related teams including emergency medications preparation and clinical pharmacist will collect the KPIs of the project retrospectively over 3-6 months. Another collection of the data prospectively after implementations. The head of the committee will contact the nursing and medical department to start with one medical department as the pilot trial. The pharmacist will review the pilot trial and correct the form according to the pharmacy consultation committee. The team will expand to all medical department and surgical department. Review and alter the shape accordingly through committee. The head of the committee will expand to all hospital department including adult's critical care, review and adjust the formulation accordingly. The pharmacy quality management coordinator measures the impact of the project by comparing the KPI before starting the project. The head of the committee will analyze the results and review with the consultation committee. The head of the pharmacy

will submit the final report to the pharmacy and therapeutic committee for final comments. The consultation team reviews the final comments on the project, update it accordingly and continue the project with next year

CONCLUSION

The standardized concentration of emergency medications for adults is an essential demand to prevent attributable errors and improve patient outcomes in addition to the regulatory requirements of high-alert medications at the Ministry of Health hospitals in the Kingdom of Saudi Arabia.

ACKNOWLEDGEMENT

None.


CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

ABBREVIATIONS

KSA: Kingdom of Saudi Arabia; **MOH:** Ministry of Health; **USA:** United States of America; **CBAHI:** Saudi Central Board for Accreditation of Healthcare Institutions; **ISMP:** Institute of Safe Medication Practice; **SWOT:** Strengths, Weaknesses, Opportunities and Threats; **KPIs:** Key Performance Indicators.


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<p>KINGDOM OF SAUDI ARABIA</p>  <p>وزارة الصحة Ministry of Health</p> <p>Hospital: _____ مستشفى:</p> <p>Region: _____ المنطقة/المحافظة:</p> <p>Dept./Unit: _____ القسم/الوحدة:</p>	<h2>Figure 1</h2>	<p>MRN: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p> <p>Name: _____ الاسم: _____ الطبي:</p> <p>Nationality: _____ الجنسية:</p> <p>Age: _____ العمر:</p> <p>Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female الجنس:</p>
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Adults Emergency Medications (1)(2)(3)(4)(5)

Diagnosis: _____		Allergy: _____		W	Height: _____	BSA: _____
Starting Date: _____						
Medications	Standard Formula	Concentration	Rate	Disp.	Rate	
Peripheral line Administration						
1	Aminophylline	500mg/500ml D5W	1mg/ml			(0.1-1.2) mg/kg/hr
2	Aminophylline	500mg/250ml D5W	2mg/ml			(0.1-1.2) mg/kg/hr
3	Aminophylline	500mg/100ml D5W	5mg/ml			(0.1-1.2) mg/kg/hr
4	Aminophylline	250mg/50ml D5W	5mg/ml			(0.1-1.2) mg/kg/hr
5	Fentanyl	500 mcg / 50 ml	10 mcg/ml			0.5-10 mcg/kg/hr
6	Fentanyl	100 mcg / 10 ml	10 mcg/ml			0.5-10 mcg/kg/hr
7	Furosamide	100 mg / 100 ml D5W	1 mg / ml			10-40mg/hr
8	Furosamide	50 mg / 50 ml D5W	1 mg / ml			10-40mg/hr
9	Heparin	25000 Units / 250 ml D5W	100 units/ml			10 ml/hr
10	Heparin	10000 Units / 100 ml D5W	100 units/ml			10 ml/hr
11	Heparin	5000 Units / 50 ml D5W Syringe Pump	100 units/ml			10 ml/hr
12	Insulin	100 units / 100 ml NS	1 units / ml			0.5-1 ml/hr
13	Insulin	50 units / 50 ml NS Syringe Pump	1 units / ml			0.5-1 ml/hr
15	Midazolam	5 mg / 10 ml D5W Syringe Pump	0.5 mg / ml			10-100 mcg/kg/hr Anesthesia: CI: 0.25 to 1 mcg/kg/min Sedation in mechanically-ventilated patients: Maintenance infusion: 0.3 to 1.7 mcg/kg/min Status epilepticus: CI: 0.83 to 33.2 mcg/kg/min

17	Nitroglycerin	10mg/50ml D5W Syringe Pump				5 mcg / min
18	Oxytocin	30 units / 500 ml NS	60 miliunits / ml			60 to 120 mU /hour (1-2ml/hour EVERY 30 to 60 minute)
19	Oxytocin	30 units / 500 ml D5W	60 miliunits / ml			60 to 120 mU /hour (1-2ml/hour EVERY 30 to 60 minute)
20	Sodium Nitroprusside	50 mg / 250 ml PROTECT FROM LIGHT	200 mcg / ml			(0.25--10) mcg /kg/min
21	Sodium Nitroprusside	10mg/50ml D5W Syringe Pump	200 mcg / ml			(0.25--10) mcg /kg/min
22	Vasopressin	80 units / 100 ml NS GIT Preparation	0.8 units / ml			0.1-1.5 units / min
23	Vasopressin	40 units / 50 ml NS GIT Preparation Syringe Pump	0.8 units / ml			0.1-1.5 units / min
24	Vasopressin	20 units / 100 ml NS Cardiac Preparation	0.2 units / ml			0.01-0.06 units / min
25	Vasopressin	10 units / 50 ml NS Cardiac Preparation Syringe Pump	0.2 units / ml			0.01-0.06 units / min
Central line Administration						
1	Bretylium	2000mg/500ml D5W	4 mg/ml			(0.014--0.028) mg/kg/min
2	Bretylium	2000mg/250ml D5W	8 mg/ml			(0.014--0.028) mg/kg/min
3	Bretylium	800mg/100ml D5W	4 mg/ml			(0.014--0.028) mg/kg/min
4	Bretylium	400mg/50ml D5W Syringe Pump	4 mg/ml			(0.014--0.028) mg/kg/min
15	Dobutamine	1000mg/500ml D5W	2 mg/ml			(2.5--40) mcg/kg/min
6	Dobutamine	1000mg/250ml D5W	4 mg/ml			(2.5--40) mcg/kg/min
7	Dobutamine	500mg/100ml D5W	5 mg/ml			(2.5--40) mcg/kg/min
8	Dobutamine	250mg/50ml D5W Syringe Pump	5 mg/ml			(2.5--40) mcg/kg/min
9	Dopamine	800mg/500ml DW5	1.6 mg/ml			(1—50) mcg/kg/min
10	Dopamine	800mg/250ml DW5	3.2 mg/ml			(1—50) mcg/kg/min
11	Dopamine	320mg/100ml DW5	3.2 mg/ml			(1—50) mcg/kg/min
12	Dopamine	160mg/50ml DW5 Syringe Pump	3.2 mg/ml			(1—50) mcg/kg/min
13	Epinephrine 1:10,000	4000mcg / 500 ml D5W	8 mcg / ml			(0.01---0.5) mcg/kg/min

14	Epinephrine 1:10,000	4000mcg / 250 ml D5W	16 mcg / ml			(0.01---0.5) mcg/kg/min
15	Epinephrine 1:10,000	2000mcg / 100 ml D5W	20 mcg / ml			(0.01---0.5) mcg/kg/min
16	Epinephrine 1:10,000	1000mcg / 50 ml D5W Syringe Pump	20 mcg / ml			(0.01---0.5) mcg/kg/min
16	Isoproterenol	1000 mcg / 250 ml D5W	4 mcg/ml			(2--20) mcg / min
17	Isoproterenol	400 mcg / 100 ml D5W	4 mcg/ml			(2--20) mcg / min
18	Isoproterenol	200 mcg / 50 ml D5W	4 mcg/ml			(2--20) mcg / min
19	Lidocaine	2000 mg/500ml D5W	4000 mcg/ml			(1--4) mg / min
20	Lidocaine	2000 mg/250ml D5W	8000 mcg/ml			(1--4) mg / min
21	Lidocaine	800 mg/100ml D5W	8000 mcg/ml			(1--4) mg / min
22	Lidocaine	400 mg/50ml D5W Syringe Pump	8000 mcg/ml			(1--4) mg / min
23	Norepinephrine	4000mcg / 500 ml D5W	8 mcg / ml			Initial: (0.1---0.3) mg/ kg /min Maintenance: (0.01---0.06) mcg / kg / min
24	Norepinephrine	4000mcg / 250 ml D5W	16 mcg / ml			Initial: (0.1---0.3) mg/ kg /min Maintenance: (0.01---0.06) mcg / kg / min
25	Norepinephrine	4000mcg / 100 ml D5W	40 mcg / ml			Initial: (0.1---0.3) mg/ kg /min Maintenance: (0.01---0.06) mcg / kg / min
26	Norepinephrine	2000mcg / 50 ml D5W Syringe Pump	40 mcg / ml			Initial: (0.1---0.3) mg/ kg /min Maintenance: (0.01---0.06) mcg / kg / min
27	Procainamide	1000 mg / 250 ml D5W	4000 mcg / ml			(1-6) mg/ min
28	Procainamide	400 mg / 100 ml D5W	4000 mcg / ml			(1-6) mg/ min
29	Procainamide	200 mg / 50 ml D5W Syringe Pump	4000 mcg / ml			(1-6) mg/ min

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