

Adult's Total Parenteral Nutrition: Initiative and Implementation of Standardized Formulation in Saudi Arabia

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Abstract

The general administration of pharmaceutical care started potential pharmacy practice program. The program is part of accreditation professional's process of national and international regulations. The adult's parenteral nutrition was one of the critical programs. The most healthcare professionals are not familiar with the new system. The new initiatives system adult's standardized concentration formulation of total parental nutrition as complementary to the previous one. The new formulation consisted of all parental nutrition requirements based on national and international standards. The new system can be converted as computerized physician orders. The new initiatives may implement as project management model over one year or less than that's. The new system prevents nutrition-related problems, and medication errors, and improve clinical outcomes of the adults' population in the Kingdom of Saudi Arabia.

Keywords: Adult total parenteral nutrition, formulation, Pharmacy, Ministry of Health, Saudi Arabia.

INTRODUCTION

The general administration of pharmaceutical care established the national total parental nutrition program at Ministry of Health institutions among part of pharmacy strategic plan in Saudi Arabia [1-2]. The plan of national total parental nutrition (TPN) consisted of several part over several years. The standardized concentration and formulation as part of it. The author and his team established the adult's, pediatrics and neonatal TPN formulation at three major hospitals. Several investigation around the world showed that benefit of the formulation improves clinical outcomes and reduced economic burden in healthcare system [3-6]. The standardized formulation of adult's TPN is existed not exceed more than 45 % base on the last survey done by the Alomi YA et al in Saudi Arabia [7]. Another study done by the same author and his colleagues showed that most pharmacist interventions in the TPN were dosing correction and drug therapy omission [8]. Therefore, the formulation of TPN founders to improve clinical outcomes and prevent drug

related problem in the Total parental practice in Saudi Arabia. The author is not familiar with any publications in Saudi Arabia, and Gulf countries or the Middle East described the standardized formulation of Adult's Total Parenteral nutrition.

ADULTS TOTAL PARENTERAL NUTRITION STANDARDIZED FORMULATION IN SAUDI ARABIA

It is standardized formulation of total parental nutrition for adults. The formulation derived from current literature and American Society for Parenteral and Enteral Nutrition (ASPEN) guidelines for adults population with average of seventy-kilogram body weight [4,9]. The formulation consisted of several parts democratic data of the patients, total macronutrients, total micronutrients, the calculated total calories and non-protein calories over nitrogen ratio, and pharmacy preparation part. The formulation consisted of first three consequence days of starting TPN through central line administration. Each day contained one third of the

qualities of the total fluid requirements, total calories, carbohydrates, protein, electrolyte, traces elements and multivitamins as explored in appendix 1, 2 and 3.

SWOT ANALYSIS

The analysis of the project consisted of four directions. The strength of the project which included the adult formulations including all information of starting total parental nutrition is available, dosing of TPN component is available, prevent mistakes in writing TPN adults orders, The weakness points are including the formulation is not individualized for all patients, it cannot apply for several disease renal or hepatic failure. It does not contain the TPN administration instruction. The opportunity that is including it is very easy form to convert them as computerized and physician order enter, it can calculate all TPN statistical information. The threats points was including the physician or pharmacist is not used the formulation.

Implementations steps of Adults Total Parenteral Nutrition Standardized Formulation

The pharmacy department Organize Consultation Committee from expert pharmacist especially from Intravenous admixture and total parental nutrition services and clinical pharmacists inside the pharmacy department. The committee should extensively review then approve the standardized formulation of Adults Total Parenteral nutrition. The head of the committee will contact with surgical and medical department for final revisions of the drafting and approval. The head of pharmacy services will submit the final draft of the formulation to Pharmacy and Therapeutic committee for review and approval. The head of the committee will arrange with Computer department to make an electronic order forms. The pharmacy education coordinator arrange with all department including nursing, surgical and medical department to Educate and train the medical staff of using the formulation with additional to pharmacy staff. The pharmacy quality management will setup the key performance indicators (KPI) to measure the impact of the project. All pharmacy concern team including TPN Preparation, clinical pharmacist will Collect the KPI of the project retrospectively in the past three to six months. Then collect the data prospectively in the coming months. The head of the committee will contact with musing and surgical development to start with one surgical 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 surgical department and medical department, review and alter the shape accordingly through committee. The head of the committee will Expand to all hospital department including adults critical care, Review and adjust the formulation accordingly. The pharmacy quality management coordinators will measure the impact of the project by

comparing the KPI before and after starting the project. The head of the committee will analyze the results and review by the consultation committee. The head of pharmacy will submit the final report to Pharmacy and therapeutic committee for final touch and comments. The consultation team will Review the last comments on the project, update it accordingly, and continue the project with next year.

CONCLUSION

The Adults total parental nutrition standard formulation is new initiative system in Kingdom of Saudi Arabia, Gulf and Middle East counties. The new system has potential and easy to implement. The new formulation prevents nutrition related problems, improves patient outcomes, and reduced economic burden of healthcare system in Saudi Arabia.

Acknowledgment: None

Conflict of Interest: None

Abbreviation Used: TPN: Total parental nutrition, ASPEN: American Society for Parenteral and Enteral Nutrition, SWOT: Strength, Weakness, Opportunities, and Threats. KPI: Key Performance Indicators

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Appendix 1

KINGDOM OF SAUDI ARABIA MINISTRY OF HEALTH PHARMACEUTICAL SERVICES IV ADMIXTURE AND TPN DEPARTMENT			
TOTAL PARENTERAL NUTRITION ADULT FORM			
PRESCRIBER TO COMPLETE NOS. 1 UP TO 8			
NO. 1	Date: / / 20.....	Day(s) of TPN: ... 1ST day (Begin with 1)	
	Central Peripheral		
NO.2	Dextrose: 200 gm/day (2-6 mg/kg/min = 2.88-8.64gm/kg/day)		
NO.3	Amino Acids: 30 gm/day (start with 0.5gm/kg/day, increment with 0.5 gm/kg/day, up to 1.5-2 gm/kg/day)-monitor BUN		
NO.4	Fat 20% : 20 gm/day (start with 0.5gm/kg/day, increment with 0.5 gm/kg/day, up to 1.5 gm/kg/day)-Monitor TGs		
NO.5	Total volume of TPN:----- 900 --- mL/day Total volume of FAT:----- 100 --- mL/day Total volume of IVF:----- mL/day (Type of IVF:) Total volume of PO:----- mL/day Total fluids:----- 1000 --- mL/day Total fluids:----- 14.28 --- mL/kg/day		
NO.6	TPN rate: ----- 37.5 ----- mL/hr FAT rate:-- 5.5 -- mL/hr over 18 hrs (max. rate: 0.11 gm/kg/hr)		
	NO. 7		
Additives	Prescribed amt/day	Maintenance Range	Notes
Sodium	40	70-160 Mmol/day	
Potassium	40	70-160 Mmol/day	
Calcium	2.3	4-6 Mmol/day	Give as Calcium Gluconate PHARMACY: check Ca/PO4 compatibility
Magnesium	2	8-10 Mmol/day	
Phosphate	5	10-15 Mmol/day	Na glycerophosphate(1mL= 1Mmol PO4 & 2 Mmol Na) KPO4(1mL= 3 Mmol PO4 & 4.4 Mmol Na)
Chloride	80	70-150 Mmol/day	
Acetate		As needed	
Fat soluble vit.	5	10 mL of (Vitalipid™ N Adult)*	1 mL contains 15 mcg of vitamin K1
Water soluble vit.	5	10 mL of (Soluvit™ N)*	Contains: Vit. B1, B2, nicotinamide, B6, pantothenic acid, C, biotin, folic acid & B12
Trace Elements	5	10 mL of (Addamel™) Trace Elements	-Contains: Cr, Cu, Fe, Mn, Mo, Se, Zn, F and I Not recommended with obstructive jaundice or Renal Failure.
Insulin, regular		As needed	
Heparin		0.5-1 unit/ each mL of TPN	USED FOR PERIPHERAL TPN, Check PT/PTT, avoid in case of HIT or thrombocytopenia
Hydrocortisone		5mg/ each liter of TPN	USED FOR PERIPHERAL TPN and to prevent thrombophlebitis
* Check with IV Room for brand changing			
Prescriber name & sign.		Bleep of prescriber	RPh name
Prescriber ID		Nurse name	Technician

A1

Name: _____

Hospital No: _____

Nationality: _____

Treating physician: _____

(TPN Formula for Adult 70 kg Non-diabetic normal kidney & liver function)

Ward		Age	
Wt.	70 kg	Height	cm
Diagnosis			
TPN indication(s)			

NO. 8	Daily Calories intake
Dextrose (gm/day) × 3.4 = (200) × 3.4 =	680 Kcal/day
Fat (gm/day) × 10 = (20) × 10 =	200 Kcal/day
Total =	880 Kcal /day
Total/Wt =	12.57 Kcal /kg/day
Non Protein Calories/ Nitrogen :	183 / 1
(Recommended ratio = 150 / 1)	

**TOTAL PARENTERAL NUTRITION
ADULT FORM**

PRESCRIBER TO COMPLETE NOS. 1 UP TO 8

NO. 1	Date: / / 20..... Day(s) of TPN:2 nd day..... Central Peripheral
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NO.2	Dextrose: 400 gm/day (2-6 mg/kg/min = 2.88-8.64gm/kg/day)
NO.3	Amino Acids: 60 gm/day (start with 0.5gm/kg/day, increment with 0.5 gm/kg/day, up to 1.5-2 gm/kg/day)-monitor BUN
NO.4	Fat 20% : 40 gm/day (start with 0.5gm/kg/day, increment with 0.5 gm/kg/day, up to 1.5 gm/kg/day)-Monitor TGs
NO.5	Total volume of TPN:-----1500----- mL/day Total volume of FAT:---200----- mL/day Total volume of IVF:----- mL/day (Type of IVF:) Total volume of PO:----- mL/day Total fluids:-----1700----- mL/day Total fluids:-----24.28----- mL/kg/day
NO.6	TPN rate: ----- 62.5 ----- mL/hr FAT rate:- 11 mL/hr over 18 hrs (max. rate: 0.11 gm/kg/hr)

NO. 7

Additives	Prescribed amt/day	Maintenance Range	Notes	FOR PHARMACY ONLY
Sodium	80	70-160 Mmol/day		<ul style="list-style-type: none"> Base Solution: _800_ ml Dextrose _50_% _400_ ml Amino A _15_% _176_ ml Sterile Water Additives: _24_ mL Sodium _14.6%_ _40_ mL Potassium _15%_ _20_ mL Calcium _10%_ _10_ mL Magnesium So4 _10%_ _10_ mL Phosphate _____ _10_ mL Water soluble vit. _10_ mL Trace Elements Fat: Fat _20_% Volume _200_ mL
Potassium	80	70-160 Mmol/day		
Calcium	4.6	4-6 Mmol/day	Give as Calcium Gluconate PHARMACY: check Ca/PO4 compatibility	
Magnesium	4	8-10 Mmol/day		
Phosphate	10	10-15 Mmol/day	Na glycerophosphate(1mL= 1Mmol PO4 & 2 Mmol Na) KPO4(1mL= 3 Mmol PO4 & 4.4 Mmol Na)	
Chloride	160	70-150 Mmol/day		
Acetate		As needed		
Fat soluble vit.	10	10 mL of (Vitalipid™ N Adult)*	1 mL contains 15 mcg of vitamin K1	
Water soluble vit.	10	10 mL of (Soluvit™ N)*	Contains: Vit. B1, B2, nicotinamide, B6, pantothenic acid, C, biotin, folic acid & B12	
Trace Elements	10	10 mL of (Addamel™) Trace Elements	-Contains: Cr, Cu, Fe, Mn, Mo, Se, Zn, F and I Not recommended with obstructive jaundice or Renal Failure.	
Insulin, regular		As needed		
Heparin		0.5-1 unit/ each mL of TPN	USED FOR PERIPHERAL TPN, Check PT/PTT, avoid in case of HIT or thrombocytopenia	
Hydrocortisone		5mg/ each liter of TPN	USED FOR PERIPHERAL TPN and to prevent thrombophlebitis	

* Check with IV Room for brand changing

Prescriber name & sign.		Bleep of prescriber		RPh name	
Prescriber ID		Nurse name		Technician	

Name: _____ **A2**

Hospital No: _____

Nationality: _____

Treating physician: _____

(TPN Formula for Adult 70 kg Non-diabetic normal kidney & liver function)

Ward		Age	
Wt.	70 kg	Height	cm

Diagnosis

TPN indication(s)

NO. 8 Daily Calories intake

Dextrose (gm/day) × 3.4 = (400) × 3.4 = 1360 Kcal/day

Fat (gm/day) × 10 = (40) × 10 = 400 Kcal/day

Total = 1760 Kcal /day

Total/Wt = 25.14 Kcal /kg/day

Non Protein Calories/ Nitrogen : 183 / 1

(Recommended ratio = 150 / 1)

**TOTAL PARENTERAL NUTRITION
ADULT FORM**

Name: _____ **A3**
Hospital No: _____
Nationality: _____
Treating physician: _____
(TPN Formula for Adult 70 kg Non-diabetic normal kidney & liver function)

PRESCRIBER TO COMPLETE NOS. 1 UP TO 8

NO. 1	Date: / / 20..... Day(s) of TPN:3 rd day.....
	Central Peripheral

NO.2	Dextrose: 600 gm/day (2-6 mg/kg/min = 2.88-8.64gm/kg/day)
NO.3	Amino Acids: 90 gm/day (start with 0.5gm/kg/day, increment with 0.5 gm/kg/day, up to 1.5-2 gm/kg/day)-monitor BUN
NO.4	Fat 20% : 60 gm/day (start with 0.5gm/kg/day, increment with 0.5 gm/kg/day, up to 1.5 gm/kg/day)-Monitor TGs
NO.5	Total volume of TPN:----2200---- mL/day Total volume of FAT:----300---- mL/day Total volume of IVF:----- mL/day (Type of IVF:) Total volume of PO:----- mL/day Total fluids:-----2500---- mL/day Total fluids:----35.7----- mL/kg/day
NO.6	TPN rate: -----91.6----- mL/hr FAT rate: 16.7 mL/hr over 18 hrs (max. rate: 0.11 gm/kg/hr)

Ward		Age	
Wt.	70 kg	Height	cm

Diagnosis	
TPN indication(s)	

NO. 8	Daily Calories intake
Dextrose (gm/day) × 3.4 = (600) × 3.4 = 2040 Kcal/day	
Fat (gm/day) × 10 = (60) × 10 = 600 Kcal/day	
Total = 2640 Kcal /day	
Total/Wt = 37.7 Kcal /kg/day	
Non Protein Calories/ Nitrogen : 183 / 1 (Recommended ratio = 150 / 1)	

NO. 7

Additives	Prescribed amt/day	Maintenance Range	Notes	FOR PHARMACY ONLY
Sodium	120	70-160 Mmol/day		<ul style="list-style-type: none"> Base Solution: 1200 mL Dextrose 50 % 600 mL Amino A 15 % 224 mL Sterile Water Additives: 36 mL Sodium 14.6% 60 mL Potassium 15% 30 mL Calcium 10% 15 mL Magnesium So4 10% 15 mL Phosphate 10 mL Water soluble vit 10 mL Trace Elements Fat: Fat 20 % Volume 300 mL
Potassium	120	70-160 Mmol/day		
Calcium	4.6	4-6 Mmol/day	Give as Calcium Gluconate PHARMACY: check Ca/PO4 compatibility	
Magnesium	6	8-10 Mmol/day		
Phosphate	15	10-15 Mmol/day	Na glycerophosphate(1mL= 1Mmol PO4 & 2 Mmol Na) KPO4(1mL= 3 Mmol PO4 & 4.4 Mmol Na)	
Chloride	240	70-150 Mmol/day		
Acetate		As needed		
Fat soluble vit.	10	10 mL of (Vitalipid™ N Adult)*	1 mL contains 15 mcg of vitamin K1	
Water soluble vit.	10	10 mL of (Soluvit™ N)*	Contains: Vit. B1, B2, nicotinamide, B6, pantothenic acid, C, biotin, folic acid & B12	
Trace Elements	10	10 mL of (Addamel™) Trace Elements	-Contains: Cr, Cu, Fe, Mn, Mo, Se, Zn, F and I Not recommended with obstructive jaundice or Renal Failure.	
Insulin, regular		As needed		
Heparin		0.5-1 unit/ each mL of TPN	USED FOR PERIPHERAL TPN, Check PT/PTT, avoid in case of HIT or thrombocytopenia	
Hydrocortisone		5mg/ each liter of TPN	USED FOR PERIPHERAL TPN and to prevent thrombophlebitis	

* Check with IV Room for brand changing

Prescriber name & sign.		Bleep of prescriber		RPh name	
Prescriber ID		Nurse name		Technician	