Saskatoon Health Region	Policies and Procedures Title: **PARENTERAL NUTRITION (PN) – ADULT ADMINISTRATION AND MAINTENANCE** **LPN Additional Competency (LPNAC):** Parenteral Nutrition -Adult Administration and Maintenance with an Established Plan of Care **RN Entry Level Competency** I.D. Number: **1078**
Authorization [x] Former SktnHR Nursing Practice Committee	Source: Nursing Date Reaffirmed: Sept 2018 Date Revised: May 2018 Date Effective: January/February 2000 Scope: **SktnHR Urban Acute Care and Home Care**

DEFINITIONS:

2 – in – 1 PN - consists of dextrose, amino acids, electrolytes, vitamins, minerals and trace elements with intravenous fat emulsion administered on separate lines.

3 – in – 1 PN – (Total Nutrient Admixture) consists of dextrose, amino acids, intravenous fat emulsion, electrolytes, vitamins, minerals and trace elements.

Central – formulation appropriate for delivery via a central line.

Client – Term used to refer to residents, patients and clients.

Creaming – A dense white colour that appears at the top of the formulation.

Established Plan of Care – based on RN assessment of care needs, the plan of care for PN Administration and Maintenance may be considered established for clients who have had PN running for at least two days without complications or for whom PN orders are written weekly. Plan of care must be documented in the client care plan. If a change in the client's status occurs i.e. complications resulting from PN administration or frequent changes in PN orders, the plan of care is no longer considered established.

High-Alert Medication - medications that bear a heightened risk of causing significant patient harm when used in error as defined by the Institute for Safe Medication Practices (ISMP).

Independent Double-Check - the process where two clinicians separately check (alone and apart from each other, then compare results) each component of prescribing, dispensing and verifying the high-alert medication for errors before it is administered to the client. The clinician checking has to form an independent judgment without cues from the clinician doing the initial work.

Parenteral Nutrition (PN) – administration of nutrients via venous route.

Peripheral – formulation appropriate for delivery via peripheral line.

Standardized Commercially Available PN – a commercially manufactured PN product.

Verification – a visual check that the correct medication, dose, rate and route is being administered according to the current prescribed medication order.

ROLES:

Graduate Nurses (GNs) – as assigned, GNs will administer and maintain PN with direct supervision until determined by an RN supervisor to be competent to practice autonomously.

Licensed Practical Nurses (LPNs) – LPNs identified by their manager in targeted practice settings will be certified in the LPN Additional Competency: Parenteral Nutrition – Adult Administration and Maintenance with an Established Plan of Care, to provide care independently as assigned, for clients who are less complex, more predictable and at lower risk for negative outcomes. LPN practice is limited to clients receiving PN through a peripheral IV or PICC line (or another type of CVC if certified). If a change is required in the established plan of care, the LPN will consult with a RN, or physician and work collaboratively to establish a new plan of care. **Prerequisite**: LPN must have completed Sask. Polytechnic IV Therapy/Blood & Blood Products Completer Course or equivalent.

Registered Nurses (RNs) – as assigned, RNs will administer and maintain PN. If a change is required to a plan of care within an LPN's assignment, an RN will provide consultation as needed and work collaboratively with the LPN until a new plan of care is established.

1. PURPOSE

1.1 To ensure clients receive adequate nutritional support

1.2 To safely administer parenteral nutrition

1.3 To decrease the risk of infection, refeeding syndrome and other complications of PN administration

2. POLICY

2.1 The LPN certified in this Additional Competency will have first completed the following learning modules/activities prior to care for client on PN with established plan of care

2.1.1 Complete the required learning module and quiz (teaching and learning methods may vary e.g. classroom and/or self- study using paper module or on line).

2.1.2 Complete a skills checklist with a certified RN or certified LPN during simulation or during first PN care to ensure safety checks are followed appropriately.

2.1.3 Provide documentation of learning module quiz and skills checklist to educator/supervisor

2.2 The Dietitian must be consulted to determine the client's nutritional status and appropriate feeding route.

2.3 The most responsible physician will determine the need for PN and provide clinical supervision and monitoring of administration.

Note: *At RUH, a consult to the Nutrition Support Service (NSS) is required.*

2.4 PN orders will be written by the most responsible physician or designate using the "3-in1 Adult Parenteral Nutrition" order form (See Appendix A), "2-in-1 Adult Parenteral Nutrition" order form (See Appendix B) or the "Standardized Commercially Available Adult 3-in-1 Parenteral Nutrition" order form (See Appendix C). Orders must be written daily for new PN starts. Orders can remain active for several days once the client's electrolyte and fluid status stabilizes. See the bottom of the order set for the date the next PN re-order is required.

Note: *If the client is stabilized on PN, orders may be written once weekly on Thursdays.*

Note: *At RUH, NSS or (when unavailable) the unit Resident will write the orders.*

2.5 All PN formulations will be independently double checked as per the Regional High Alert Medication Policy.

2.6 PN Orders

2.6.1 Pharmacy must receive early notification (by 1100 hrs) for new PN starts.

2.6.2 Orders must be written and scanned to pharmacy before 1100 hours. Pharmacy may not have the resources to compound late orders. Alternatives to compounded PN include standardized commercially available PN or dextrose containing IV fluids.

2.6.3 The Dietitian may choose to use the standardized commercially available PN formulation when a client has a new indication for PN and it is after the 1100 hours deadline. In this case, the client may be transitioned to compounded PN the following day.

2.7 For all new PN clients an appropriate infusion line for administration must be in place. If the infusion line is peripheral, a 20 or 22 gauge IV should be inserted into the largest, straightest vein available. This will allow blood flow around the catheter therefore minimizing irritation to the vein.

2.8 When using a multiple lumen Central Venous Catheter (CVC), one lumen should be dedicated to PN administration.

Note: *PN exceeding 10% dextrose or an osmolarity of greater than 900 mOsm/L is administered through a central venous catheter.*

***Note**: No other IV solutions, medications, or blood products may be administered using the PN line (primary or secondary) or lumen. Replacement fluids must be infused separately.*

***Note:** No blood withdrawal or CVP monitoring should be done using the PN lumen.*

2.9 No additions may be made to the PN bag.

2.10 Administer PN at the ordered rate. The flow rate must not be increased to catch up if the infusion falls behind the ordered rate.

2.11 Peripheral PN may be infused through a central line until the current bag is completed then the formula must be changed to a central formulation.

***Note:** PN formulated for central use CANNOT be infused through a peripheral line.*

2.12 The most responsible physician or designate will be notified if there are any signs of inflammation or discharge at the CVC or IV entry site.

2.13 Clients requiring community PN on discharge may be referred to and supported by the Provincial PN program.

3. PROCEDURE

3.1 Pre-Administration

3.1.1 Supplies:

- PN solution and filter from Pharmacy
- Infusion pump tubing
- Alcohol 70% swab
- Infusion pump
- Clean gloves

***Note:** For 2-in-1 formulations, Pharmacy will send primary infusion pump tubing with inline 0.2 micron filter with the non-lipid bag.*
For 3-in-1 formulations a 1.2 micron filter placed close to the patient is required.

3.1.2 Change the PN bag, tubing and filter every 24 hours. Keep the PN bag refrigerated until 30 minutes prior to hanging.

3.2 Administration

3.2.1 Check the PN order for the flow rate of the formulation.

3.2.1.1 Initiate PN therapy as ordered and do not adjust the rate of PN unless ordered.

***Note:** Initial PN therapy will be ordered to begin at a slow rate and will be gradually increased over 48-72 hours to the desired daily volume due to the relatively high dextrose load.*

Note: *In certain circumstances, (i.e. insulin dependent diabetics or unconscious clients) sudden discontinuation of PN should be followed by Dextrose 10% for 2-4 hours at 50 mls/hr as ordered by physician.*

3.2.1.2 Do not increase or decrease the rate of PN abruptly. If suspended, call for orders.

Note: *PN containing lipid can be weaned over 2 hours if necessary.*

3.2.2 Compare the PN label to the client's name, the ordered formulation and electrolyte additions (2 –in-1, 3-in-1 or standardized commercially available formulation) against the practitioner's order. Check the expiry date and the bag for presence of particulate matter or creaming. PN should not be infused if visual changes or precipitates are apparent.

Note: *All PN formulations require an independent double check of the PN formulation against the practitioner order.*

3.2.3 Rotate or agitate the bag prior to hanging to keep the 3-in-1 formulation or standardized commercially available formulation from settling (the standardized commercially available formulation will be activated by pharmacy and will arrive on the nursing unit as a single bag).

3.2.4 Perform hand hygiene.

3.2.5 Prime the tubing and filter (refer to instructions on the filter package)

Note: *All 3-in-1 formulations require a 1.2 micron filter placed closest to the client (See Appendix D).*

Note: *For 2-in-1 formulations, the non-lipid bag is hung on the primary line using pump tubing with inline 0.2 micron filter sent by Pharmacy. The lipid bag is hung on the secondary line. Connect the provided 1.2 micron filter to the pump tubing closest to the client (See Appendix E).*

Note: *For administering only the non-lipid formulation, the non-lipid bag is hung on the primary line using pump tubing with inline 0.2 micron filter sent by Pharmacy (See Appendix F). A 1.2 micron filter is not needed.*

3.2.6 Turn off existing PN line.

3.2.7 If administering PN via a CVC with a clamp, clamp the catheter to prevent air embolism and/or blood loss.

3.2.8 Perform hand hygiene. Don clean gloves.

3.2.9 Needleless adaptor must be scrubbed for 15 seconds using Alcohol 70% swab and friction in a twisting motion prior to accessing (let dry).

3.2.10 Disconnect old tubing, avoiding contamination of the central venous or IV catheter.

3.2.11 Connect new tubing and filter.

3.2.12 Check all connections.

3.2.13 Unclamp catheter and/or tubing if clamp in place.

3.2.14 Remove gloves. Perform hand hygiene.

3.2.15 Program the infusion pump and start PN infusion as ordered.

Note: All PN formulations require an independent double check at the pump.

Note: *Malnourished clients may have slower than normal rates of infusion to prevent refeeding syndrome (See Appendix G).*

Note: *Administering the lipid component of a 2-in-1 formulation at the incorrect rate may cause fat overload syndrome (See Appendix G).*

3.3 Monitoring

3.3.1 Weigh the client once a week and document the weight in kilograms on appropriate record.

3.3.2 Maintain accurate intake and output records.

3.3.3 Monitor lab work according to the Adult Blood Work Monitoring for PN form (See Appendix H).

3.3.4 Document date and time of tubing, filter and bag change on appropriate record.

4. REFERENCES

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Appendix A

Saskatoon Health Region

☐ RUH ☐ SCH ☐ SPH
☐ OTHER: _____

PATIENT IDENTIFICATION

3-in-1 ADULT PARENTERAL NUTRITION

ACTION: MAR | ICP | RED | RN

☒ Consult the Nutrition Support Service at RUH. Consult the dietitian at SPH or SCH.
☒ **NEW orders MUST be RECEIVED in Pharmacy NO LATER than 1100 hours or** the formulation from the previous day will be supplied.
☒ **Start Adult Blood work Monitoring for Parenteral Nutrition (Form #101758)**

Route of Administration
☐ CVC
☐ Peripheral IV

Primary diagnosis: _____
Indication for parenteral nutrition: _____

Height _____cm
Dosing Weight _____ kg

Select the base:

☐ **3-in-1 Standard Central**
Amino Acids (Travasol) 50 g/L
Dextrose 165 g/L
Lipid Emulsion (SMOF) 30 g/L
Total Calories 1061 Kcal/L

☐ **3-in-1 Intermediate Central**
Amino Acids (Travasol) 55 g/L
Dextrose 135 g/L
Lipid Emulsion (SMOF) 25 g/L
Total Calories 937 Kcal/L

☐ **3-in-1 Stress Central**
Amino Acids (Travasol) 63 g/L
Dextrose 100 g/L
Lipid Emulsion (SMOF) 30 g/L
Total Calories 892 Kcal/L

☐ **3-in-1 Peripheral**
Amino Acids (Travasol) 30 g/L
Dextrose 70 g/L
Lipid Emulsion (SMOF) 35 g/L
Total Calories 708 Kcal/L

Order daily additions:

sodium _____ mEq/day
potassium _____ mEq/day
calcium _____ mEq/day
magnesium _____ mEq/day
phosphate _____ mmol/day
insulin HumuLIN R (Regular) _____ units/day
☒ **vitamin K** 150 mcg/day
☒ **multivitamins** 10 mL/day
☒ **trace elements (Micro+6)** 1 mL/day
☒ **maximize chloride unless alternative is selected**
☐ **equal chloride to acetate** (Approximate) ☐ **maximize acetate**

Optional Trace Elements (Order ONLY if required):
☐ *Do not use Micro+6 trace elements. Use Micro+4 Regular 5 mL/day*
☐ *Extra chromium* *mcg/day (Max 20 mcg/day)*
☐ *Extra copper* _____ *mg/day (Max 2.4 mg/day)*
☐ *Extra selenium* *mcg/day (Max 200 mcg/day)*
☐ *Extra zinc* _____ *mg/day (Max 15 mg/day)*

Order rate of administration: Requires a 1.2 micron filter connected to the end of the primary tubing.
☐ Continuous infusion _____ mL/h for 24 hours
☐ Cyclic infusion: mL/h for hours (from h to h) then
mL/h for hours (from h to h) then
_____ mL/h for _____ hours (from _____ h to _____ h)

A daily order is required for the first 7 days. PN can be reordered once a week on Thursdays for stable patients.
Order Date _____ ☐ **Review labs & reorder tomorrow** ☐ **Review labs & reorder on** _____ ☐ **Review labs & reorder every Thursday (default)**

Dietitian Name and Pager _____ **First day of PN was** _____

PRACTITIONER PRINTED NAME | PRACTITIONER SIGNATURE | DATE/TIME

Form #100020 10/17 Category: Orders **TPN3** Page 1 of 1

Appendix B

Saskatoon Health Region

☐ RUH ☐ SCH ☐ SPH
☐ OTHER: _____

PATIENT IDENTIFICATION

2-in-1 ADULT PARENTERAL NUTRITION
(LIPID infused separately)

ACTION: MAR | ICP | RECD | RN

☒ Consult the Nutrition Support Service at RUH. Consult the dietitian at SPH or SCH.
☒ **Daily orders MUST be RECEIVED in Pharmacy NO LATER than 1100 hours** or the formulation from the previous day will be supplied.
☒ **Start Adult Blood work Monitoring for Parenteral Nutrition (Form #101758)**

Route of Administration
☐ CVC (Not for peripheral IV administration)

Primary diagnosis: _____
Indication for parenteral nutrition: _____

Height _____ cm
Dosing Weight _____ kg

Select the base:

☐ **2-in-1 Basic Protein Central**
Amino Acids (Travasol) 50 g/L
Dextrose165 g/L
Total Calories 761 Kcal/L

☐ **2-in-1 Medium Protein Central**
Amino Acids (Travasol) 60 g/L
Dextrose 150 g/L
Total Calories 730 Kcal/L

☐ **2-in-1 High Protein Central***
Amino Acids (Travasol) 75 g/L
Dextrose 150 g/L
Total Calories 810 Kcal/L
****No electrolyte additions to High Protein Central***

Order daily additions: ***(*No electrolyte additions to High Protein Central)***

sodium _____ mEq/day
potassium _____ mEq/day
calcium _____ mEq/day
magnesium _____ mEq/day
phosphate _____ mmol/day
insulin HumuLIN R (Regular) _____ units/day
☒ **vitamin K** 150 mcg/day
☒ **multivitamins** 10mL/day
☒ **trace elements (Micro+6)** 1 mL/day
☒ **maximize chloride**
☐ equal chloride to acetate (Approx)
☐ maximize acetate

Optional Trace Elements (Order ONLY if required):
☐ *Do not use Micro+6 trace elements. Use Micro+4 Regular 5 mL/day*
☐ *Extra chromium _____ mcg/day (Max 20 mcg/day)*
☐ *Extra copper _____ mg/day (Max 2.4 mg/day)*
☐ *Extra selenium _____ mcg/day (Max 200 mcg/day)*
☐ *Extra zinc _____ mg/day (Max 15 mg/day)*

Order rate of administration for 2-in-1 base (non-lipid bag): Hung on the primary line with a 0.2 micron inline filter.

☐ Continuous infusion _____ mL/h for 24 hours
☐ Cyclic infusion: _____ mL/h for _____ hours (from _____ h to _____ h) then
_____ mL/h for _____ hours (from _____ h to _____ h) then
_____ mL/h for _____ hours (from _____ h to _____ h)

Select the IV lipid product (Check one): ☐ SMOFlipid 20% ☐ Clinoleic 20% ☐ No lipid required

Order rate of administration for lipid: Hung on the secondary line with a 1.2 micron filter connected to the end of the primary tubing
☐ Continuous infusion _____ mL/h
☐ Cyclic infusion _____ mL/h for _____ hours (Start at _____ h)

A daily order is required for the first 7 days. PN can be reordered once a week on Thursdays for stable patients.
Order Date _____ ☐**Review labs & reorder tomorrow** ☐ **Review labs & reorder on** _____ ☐ **Review labs & reorder every Thursday (default)**

Dietitian Name and Pager _____ **First day of PN was** _____

PRACTITIONER PRINTED NAME | PRACTITIONER SIGNATURE | DATE/TIME

Notice of confidentiality: Contains information that is time sensitive or confidential. Use, disclosure, copying or communication of the contents is prohibited. If you have received in error, notify the SHR Pharmacy Manager, Operations (306-655-8695).

Form #104020 10/17 Category: Orders **TPN2** Page 1 of 1

Appendix C

Saskatoon Health Region

☐ RUH ☐ SCH ☐ SPH
☐ OTHER: _____

PATIENT IDENTIFICATION

Standardized Commercially Available Adult 3-in-1 Parenteral Nutrition

ACTION			
MAR	ICP	REQ	RN

☒ Consult the Nutrition Support Service at RUH. Consult the dietitian at SPH or SCH.
☒ **Use for a new start parenteral nutrition order written between 1100h and 1700h**
☒ Discontinue this order when new orders are written
☒ Any change requires completion of a new order set (do not alter or edit completed orders)
☒ Start Adult Blood work Monitoring for Parenteral Nutrition (Form #101758)
☒ No additions will be made to the commercial base

Route of Administration
☐ CVC or PICC
☐ Peripheral IV

Primary diagnosis: _____
Indication for parenteral nutrition: _____

Height _____cm
Dosing Weight _____kg

☐ **Olimel 5.7% E Central**

Amino Acids	56.9 g/L
Dextrose	110 g/L
Lipid Emulsion (Clinoleic)	40 g/L
Total Calories	1070 Kcal/L

Administer through a central line (CVC or PICC)

Electrolyte Contents:

sodium	35 mEq/L
potassium	30 mEq/L
calcium	7 mEq/L
magnesium	8 mEq/L
phosphate	15 mmol/L

☐ **PeriOlimel 2.5% E Peripheral**

Amino Acids	25.3 g/L
Dextrose	75 g/L
Lipid Emulsion (Clinoleic)	30 g/L
Total Calories	700 Kcal/L

Administer through a peripheral line.

Electrolyte Contents:

sodium	21 mEq/L
potassium	16 mEq/L
calcium	4 mEq/L
magnesium	4.4 mEq/L
phosphate	8.5 mmol/L

Order rate of administration: All 3-in-1 parenteral nutrition requires a 1.2 micron filter placed closest to the patient

☐ Continuous infusion _____ mL/h for 24 hours

☐ Cyclic infusion: _____ mL/h for _____ hours (from _____ h to _____ h) then
_____ mL/h for _____ hours (from _____ h to _____ h) then
_____ mL/h for _____ hours (from _____ h to _____ h)

This order is only active for 1 day

Dietitian Name and Pager _____ **Date/Time** _____

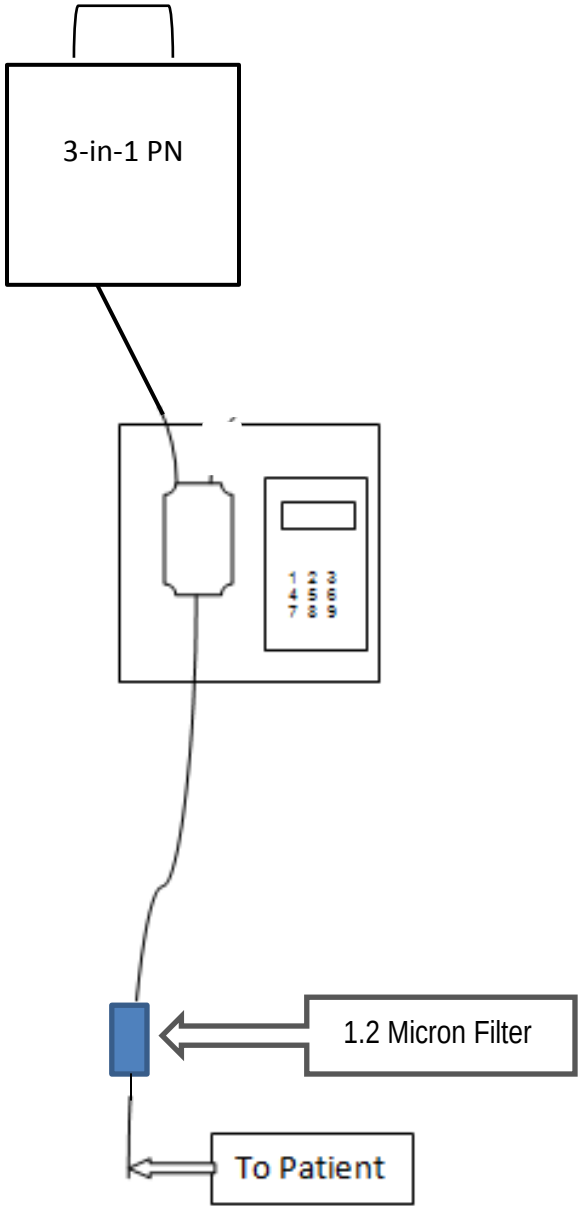
PRACTITIONER PRINTED NAME | PRACTITIONER SIGNATURE | DATE/TIME

Notice of confidentiality: Contains information that is time sensitive or confidential. Use, disclosure, copying or communication of the contents is prohibited. If you have received in error, notify the SHR Pharmacy Manager, Operations (306-655-8696).

Form #104114 07/16 Category: Orders **TPNCOM** Page 1 of 1

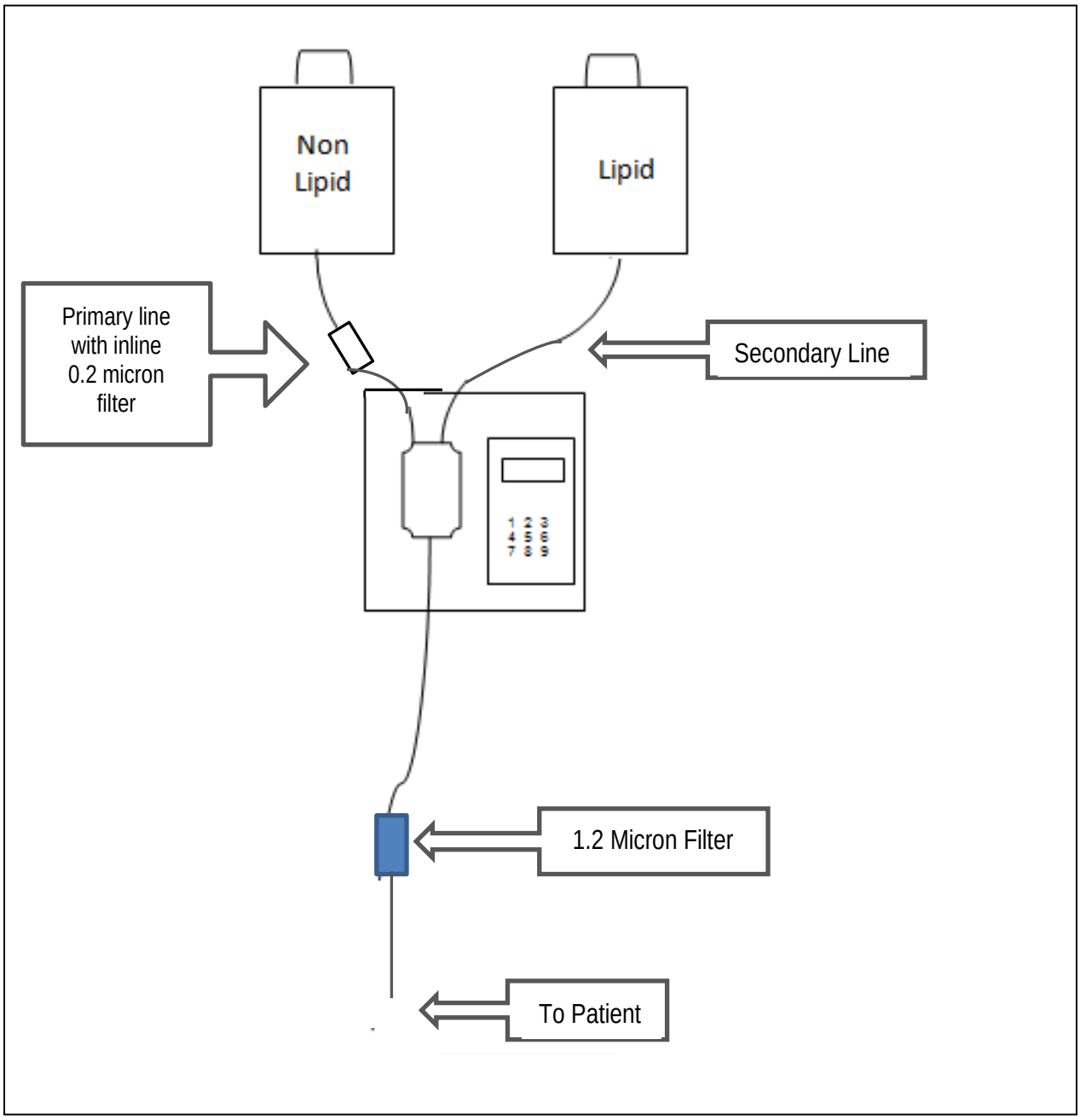
Appendix D

Instructions for the Administration of 3 in 1 PN
(compounded formulation or the standardized commercially available formulation)



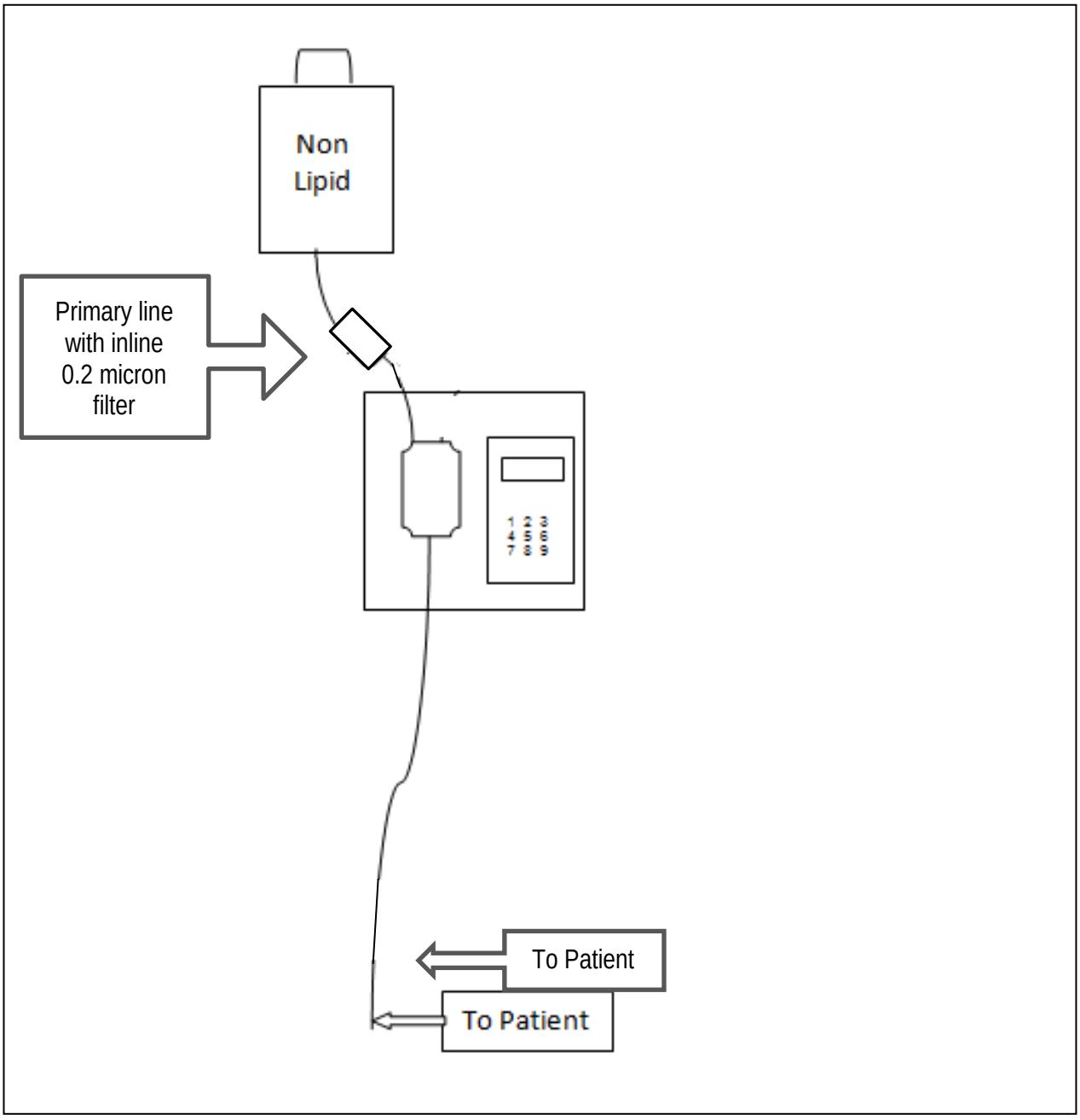
Appendix E

Special Instructions for the Administration of 2 in 1 PN



Appendix F

Special Instructions for the Administration of Non-Lipid PN Only



Appendix G

Fat Overload Syndrome

Fat overload syndrome is a complication due to parenteral lipids being infused faster than indicated and can cause the following:

Hyperlipidemia	Fever	Fat Infiltration
Hepatomegaly (may have jaundice)	Splenomegaly	Anemia
Leukopenia	Thrombocytopenia	Coagulation Disorders
Hemolysis	Reticulocytosis	Abnormal Liver Function Test
Coma		

Refeeding Syndrome

Refeeding syndrome is a fluid and electrolyte imbalance after nutritional support such as intravenous fluid, enteral tube feeding or oral intake has started on a malnourished client. This will cause:

- Hypokalemia
- Hypophosphatemia
- Hypomagnesemia

This in turn can cause:

CNS: Weakness Altered mental state Seizure Paresthesia Paralysis Tetany	**GI:** Nausea and vomiting Anorexia Constipation/diarrhea Abdominal pain Vitamin deficiency Low albumin/prealbumin	**Hematologic:** Bleeding Infection Anemia Thrombocytopenia Platelet dysfunction
CVS: Hypotension Dysrhythmias	**GU:** Edema Elevated BUN & Creatinine	**Metabolic:** Metabolic alkalosis/acidosis
Respiratory: Hypoxia	**Musculoskeletal:** Myalgia	

Appendix H

SASKATOON HEALTH REGION
Saskatoon, Saskatchewan
❑ RUH ❑ SCH ❑ SPH Other _____

Patient Label
NAME: _____
HSN: _____
D.O.B.: _____

ADULT BLOODWORK MONITORING FOR PN

Page 1 of 2

	WEEK ONE					WEEK TWO		
DATE								
DAY OF PN	1	2	3	4	6	Mon	Weds	Fri
PANEL A	X			X*		X		
PANEL B		X	X				X	
PANEL C					X			X

	WEEK THREE		WEEK FOUR		WEEK FIVE	
DATE						
DAY OF PN	Mon	Thurs	Mon	Thurs	Mon	Thurs
PANEL A	X				X	
PANEL B		X		X		X
PANEL D			X			

PANEL A includes:	PANEL B includes:	PANEL C includes:	PANEL D includes:
Hematology: CBC, INR **Chemistry:** Lytes7 Prealbumin C-Reactive Protein Phosphate Magnesium Ionized Calcium Triglycerides AST, ALT, ALP, GGT Direct & Total Bilirubin *** On Day 4 of week one do not order Prealbumin and C-reactive protein**	**Chemistry:** Lytes7 Phosphate Magnesium	**Chemistry:** Lytes7 Phosphate Magnesium Ionized Calcium Triglycerides	Panel A <u>plus</u> Zinc Selenium Iron TIBC Ferritin *Drawn every 4 weeks starting on the Monday of Week 4
	Physician's Signature: _____		

Form #101758 04/2016 Category: Flow Sheets