Evaluation of Standardised Parenteral Nutrition for Neonates at Kwong Wah Hospital

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Introduction

• Standardised parenteral nutrition (SPN) is an alternative approach to individualised PN (IPN) in neonates
  • Safe and effective
  • Huge cost-savings
  • Reduction in medication errors
• Not established in HK for neonates

Objectives

• Evaluate the safe and effectiveness in delivering SPN to neonates at KWH

Method – 6 SPN regimens for Dr to choose

<table>
<thead>
<tr>
<th>Amino acid/ Dextrose Solution</th>
<th>Fat Emulsion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starter PN</td>
<td></td>
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<tr>
<td>Standardised Preterm PN</td>
<td></td>
</tr>
<tr>
<td>Restricted Fluid Preterm PN</td>
<td></td>
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<tr>
<td>Peripheral Preterm PN</td>
<td></td>
</tr>
<tr>
<td>7.5% Dextrose Preterm PN</td>
<td>Individualised</td>
</tr>
<tr>
<td>Term PN</td>
<td></td>
</tr>
<tr>
<td>IPN Individualised</td>
<td></td>
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</tbody>
</table>
Study Population
(Period: 16 Nov 2016 to 16 Jan 2017)

Total PN cases*
N=20

SPN Group
N=19

IPN Group
N=1

Success
N=16 (84%)

Preterm SPN
N=12 (75%)
GA 32 week (1.46)#

Term SPN
N=4 (25%)
GA 38.6 week (2.29)#

Failure
N=3 (16%)
GA 25.3 week (1.79)#

Success: Used SPN for the whole duration
Failure: Switched from SPN to IPN

*All PN refers to AA/DEX solution only, #values in median (IQR)

<table>
<thead>
<tr>
<th>Failure Case</th>
<th>GA (weeks)</th>
<th>Birth Weight (kg)</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (switched on D4)</td>
<td>23.9</td>
<td>0.62</td>
<td>high serum sodium (155mmol/L) due to dehydration</td>
</tr>
<tr>
<td>2. (switched on D10)</td>
<td>27.4</td>
<td>1.12</td>
<td>Mild Hyponatraemia (131mmol/L)</td>
</tr>
<tr>
<td>3. (switched on D8)</td>
<td>25.3</td>
<td>0.61</td>
<td>inadequate calories</td>
</tr>
</tbody>
</table>
Median Daily Caloric Intake

Calories (kcal/kg/day)

Day of PN

Preterm SPN +/- EN
Term SPN +/- EN

Range for PRETERM neonates*
Range for TERM neonates*

Median(IQR)

KWH vs Bolisetty et al. (GA <32weeks)

KWH, GA 27.4wk (4.18), N=6
Bolisetty et al., GA 29wk (2), N=85

*ESPGHAN guidelines 2005

Bolisetty et al. BMC Pediatrics 2014, 14:309
Median Daily Protein Intake

Protein intake (g/kg/day) vs. Day of PN

Max PN protein for PRETERM neonates*
Min PN protein for ALL neonates*
Max PN protein for TERM neonates*

KWH vs Bolisetty et al. (GA<32weeks)

KWH, GA 27.4wk (4.18), N=6
Bolisetty et al., GA29wk(2), N=85

*ESPGHAN guidelines 2005
Median Daily Serum Na

- Preterm SPN +/- EN
- Term PN +/- EN

- Normal Serum Na
- Mild hypernatremia
- Moderate hypernatremia
- Mild hyponatremia
- Moderate hyponatremia

Add High Na SPN to new formula

Changed to IPN
Median Daily pH and HCO₃

- Median Daily pH and HCO₃ levels for Preterm and Term SPN, with and without EN.

- Normal pH and HCO₃ ranges are indicated.

- Changes in pH and HCO₃ levels between Preterm and Term SPN conditions.

- Recommendation to switch to Term SPN and reduce acetate in the formula.

- Median daily pH and HCO₃ levels shown over the course of PN.
Improvement of processing time of IPN vs SPN

**Processing steps**
- Dr prescribes PN
- Paed Pharmacist reviews order
- Dispenser transcribes order to compounding program
- Aseptic pharmacist verifies transcribed order
- Compound TPN
- Aseptic pharmacist checks final product

**IPN processing Time**
- 5-10mins
- 5-20mins
- 10-20mins
- 5-10mins
- 5mins
- <5mins

**SPN processing Time**
- <5mins
- <5mins
- 5-10mins
- No change in practice
- No change in practice
- No change in practice

**Faster**
- Electronic order with built-in nutrition monitoring and safety measures
- One-Click order generation, reduce transcription and calculation error and time
- Preset formulas in the form of barcodes for quick compounding and improves safety
- Batch production, readily available, quality assurance, time and cost-saving
Summary

- SPN was successfully used in majority (84%) of neonates.
- SPN can be safely administered and delivered adequate nutrition to the majority.
- Enhancement programs are in progress at Kwong Wah Hospital to improve the formulations, monitoring nutritional parameters and logistics in ordering and preparation of SPN.
- We believe SPN is the future direction in PN for neonates.