Improving the use of breastmilk in the neonatal unit: a care bundle approach

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Working together to reduce NEC and improve outcomes
The NEC care bundle

• Background to the project
• What is NEC?
• Developing the pathway (care bundle)
• Elements
• Practical application in care
• Findings
The east of England ODN

- 2 networks (NSC+Essex and B&H)
- 18 neonatal units (17)
- Delivery population 70 000
- Admissions 9750 (2012)
- 10% England
Background

- Developed to reduce NEC rates

- Clinical concern in EoE re ↑ NEC (2009)

- Care bundle approach – QI - not research
Background

“A group of evidence based interventions related to a disease or care process that, when executed together, result in better outcomes than when implemented individually”     (IHI, 2005)

• Encourage collaborative working, new insights into care; behavioural changes
Care Bundles

- Interventions (4 – 5 elements) evidence based, simple to implement – day to day
- Must fit in with local practice
- Already regarded as best practice
- Improve both clinical and organisational outcomes (regional / national)
What is NEC?

- Inflammatory disease of the bowel
- Prevalent in preterm and LBW babies
- Management – medical and/or surgery
- Long term morbidity, burden on the NHS.
What is NEC?

• Aetiology unknown – feeds, GA, BW, infection, gut flora.

• No national definition–incidence unknown. No national database

• Significant impact on families and staff. Important issue!
Background

• Regional representation of a MDT
• Scoped practices: variations in mgt NEC; feeding, milk kitchen standards

• Literature review – 16 contributory and preventative factors
• Case note reviews – 2009 NEC cases
Care bundle elements

1. Early promotion of expressing to enable use of Mother's own milk when feeding
2. Ongoing support for expressing and breastfeeding
3. Following a standardised enteral feeding guideline (SFR)
4. A standardised “clean” approach to the preparation of milk feeds using ANTT.
Implementation

• Implemented Jan 2011
• Local champions
• Monthly audit cycle of compliance
• Feeding practices (SFR)
• Results and updates published
Analysis

NDAU expertise sought March 2011

- Objective analysis of findings
- Comparator group

May 2011: UKNC-NEC study:
Validation studies – improved data collection and completeness
Early promotion of expressing and use of Mothers own milk when feeding. Day 0 – 9.

Care plan which prompted:

• The “Crucial Conversation” + excluding medication
• Information pack with:
  ✓ EoE breastfeeding leaflet
  ✓ Bliss booklet – Breastfeeding your premature baby
  ✓ Bliss leaflet – Comfort holding and Kangaroo care
  ✓ Expressing log, Local information, SW DVD, Poster
  ✓ Syringes (small), labels, collecting bottle

• Support to express within 4-6 hours of delivery
• Top Tips – consistent advice on expressing
• Pump hire
Ongoing support for expressing and breastfeeding - day 10 – discharge.

Care plan 2 which prompted:

- Bliss booklet – Breastfeeding your premature baby
- Bliss leaflet – Comfort holding and Kangaroo care
- Promotion of positive touch / supportive holding / kangaroo care
- Prompts re milk expressing and volumes
- Pump hire
- Any queries
- Diet, rest and sleep
Algorithm 1: Initiating and advancing enteral feeds.

This algorithm is to be used in conjunction with Algorithm 2 – choice of milk

### Step 1: First day of Feeding

- **High risk**
  - 10-20ml/kg/day 2 hourly trophic feeds
- **Moderate risk 28+1 – 31+6 wk**
  - 20ml/kg/day 2 hourly feeds*
- **Standard risk >32 wk**
  - 30-60ml/kg/day 3 hourly feeds

- **Step 2: Advance as indicated**
  - High risk
    - 10ml/kg twice in 24 hours as 1-2 hourly feeds
  - Moderate risk 28+1 – 31+6 wk
    - 15ml/kg twice in 24 hours as 2 hourly feeds
  - Standard risk >32 wk
    - 30ml/kg/day 3 hourly feeds

- **Step 3**
  - Continue to increase by 10ml/kg twice in 24 hrs until 180ml/kg as 1-2 hourly feeds.
  - Increase beyond 180ml/kg only after assessment of growth.
  - Continue increasing at this rate until full enteral volume achieved.

Commence feeding as close to birth as possible following individual clinical assessment.

Maintain trophic feeds in high risk infants as long as clinically indicated.

Infants can move between risk categories following individual clinical assessment.

**High risk** defined as:
- <28 weeks gestation
- < 1000g birth weight
- Preterm SGA infant (<2nd percentile and <34 weeks gestation)
- Absent or reversed end diastolic flow in infants <34 weeks
- Unstable /hypotensive ventilated neonates
- Re-establishment of feeds following NEC
- Perinatal hypoxia-ischaemia with significant organ dysfunction.
- Congenital gut malformations (eg gastoschisis)

**Caution should be taken initiating feeds in the following subgroups. The decision to manage as “high risk” is at clinician's discretion.**
- Severe SGA infants (<0.4th percentile and >34 weeks gestation)
- Indomethacin or Ibuprofen for PDA
- Complex congenital cardiac disease
- Dexamethasone treatment
- Polycythaemic infants
# ANTT approach to feed preparation

**Action required**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1.</td>
<td>Hair has been tied back and there is strict adherence to local Trust uniform policy.</td>
</tr>
<tr>
<td>2.</td>
<td>Hands have been washed following correct hand hygiene technique.</td>
</tr>
</tbody>
</table>
| 3. | A separate area for the preparation of the feed has been allocated and cleaned according to local policy:  
*The separate area can include the milk kitchen counter or a separate stainless steel trolley.* |
| 4. | Single use sterile receptacles, syringes and bungs have been collected ready for use. Labels have been prepared. |
| 6. | A clean disposable apron is being worn. |
| 7. | Hands have been decontaminated immediately prior to feed preparation using the correct hand hygiene technique. |
| 8. | Feed and any additives have been prepared using aseptic non touch technique. |
| 9. | Non sterile gloves have been worn throughout the preparation of the feed. |
| 10. | A maximum of four hours worth of feed was prepared in each container. Up to 24 hours of feeds were prepared and stored in the refrigerator. |
| 11. | Each patient’s milk is stored in a separate container, marked with their details and the time of milk preparation. |
| 13. | Gloves, aprons and equipment used for feed preparation have been discarded after use according to local policy. |
| 14. | Following milk preparation hands have been washed following correct hand hygiene technique. |
| 15. | Compliance chart and audit form have been completed. |
Antenatal period

Midwives, Neonatologists, Neonatal nurses

Breastfeeding leaflet
Discussion re feeding

Care plan day 0 – 9

Neonatal nurses
Lactation specialists
Comm MW

Follow a standardised feeding regimen (SFR)

Neonatal nurses who prepare feeds

Follow a double checking prompt when preparing milk feeds

DELIVERY

Breastfeeding leaflet
Discussion re feeding

Care plan day 10 to discharge
KC
BF support

Neonatologists, ANNP’s, neonatal nurses

Neonatal nurses
Midwives on PNW
Lactation specialists

Neonatologists

Discharge home
Aims - regional

Primary aim:

**To reduce the incidence of NEC** – (statistical challenge)

**Association between bundle and NEC**
Secondary aims

• Measure compliance with elements

Ascertain impact on:

• Breastmilk use at DC

• Use of maternal milk during the neonatal inpatient stay

• Parent satisfaction (Picker)

• Developmental outcomes (Bayley's)

• Parenteral Nutrition use
Evaluating outcomes
Quality Improvement : Research
QI : Research

• QI: no unifying model of what constitutes good QI system
  (*Implementation science*)
• Time lag in which improvements occur
• Complexity of HC environment/professional inter working
• Multi factorial interactions to improve outcomes

• Assessing improvements is not easy – what can be defined as success?
• Central problem - establishing causal link between improvement strategy and HC outcomes.
Selecting outcomes
- complex interventions with multiple clinical endpoints via multiple pathways – how to define success
  - ultimate aim = reduce NEC, practical aim = increase maternal breast milk (MBM) feeding

Adequate data
- before, during and after intervention
- additional data collection a burden
  - extracted data from National Neonatal Research Database

Suitable “control” comparison
- what would have happened without the intervention?
Regional Findings
Findings

Regional compliance of all care bundle elements year 1
## Use of E/DBM as first feed

<table>
<thead>
<tr>
<th>Unit level &amp; risk category</th>
<th>4 months post implementation</th>
<th>12 months post implementation</th>
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<tbody>
<tr>
<td>Level 3 – High</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Level 3 - Moderate</td>
<td>76%</td>
<td>91%</td>
</tr>
<tr>
<td>Level 3 - Standard</td>
<td>35%</td>
<td>60%</td>
</tr>
<tr>
<td>Level 2 - High</td>
<td>67%</td>
<td>70%</td>
</tr>
<tr>
<td>Level 2 - Moderate</td>
<td>58%</td>
<td>67%</td>
</tr>
<tr>
<td>Level 2 - Standard</td>
<td>38%</td>
<td>19%</td>
</tr>
<tr>
<td>Level 1 - High</td>
<td>73%</td>
<td>100%</td>
</tr>
<tr>
<td>Level 1 - Moderate</td>
<td>69%</td>
<td>83%</td>
</tr>
<tr>
<td>Level 1 - Standard</td>
<td>37%</td>
<td>32%</td>
</tr>
</tbody>
</table>
Feeding rates at discharge to home: regional results per quarter
Feeding rates at discharge to home: regional results per quarter

Data Missing
Formula
Mixed
Breast

---|---|---|---|---|---|---|---|---|---|---|---|---|---
28.8% | 30.8% | 32.5% | 34.1% | 32.1% | 34.4% | 31.0% | 40.5% | 37.8% | 38.6% | 39.4% | 40.1% | 41.2% | 44.2%
Findings - NDAU
Population

161/166 NNU in England contribute to National Neonatal Research Database (NNRD)

17 neonatal units in the EoE

Data from January 2009 to December 2012

Babies born ≤ 32+6 weeks GA
Interrupted time series

QI intervention implemented
Interrupted time series

QI intervention implemented

“interrupted”: change point when intervention is introduced
Interrupted time series

"time series": data points close together in time are similar
Interrupted time series
Interrupted time series

- Test step change
- Test trend change
Exclusive MBM at discharge, EoE only

Percentage of babies fed exclusively MBM at discharge in the EoE by month of discharge
Exclusive MBM at discharge, EoE only

Percentage of babies fed exclusively MBM at discharge in the EoE by month of discharge

No evidence of step change

No evidence of trend change
Exclusive MBM at discharge, EoE only ‘09 –’12

Already a pattern of improvement in the EoE!
No statistical evidence that rates of MBM at discharge in EoE improved faster following introduction of the care bundle beyond the **pre-existing pattern** of improvement.
Percentage of babies exclusively receiving MBM in EoE :Uk at discharge:  2009 - 2012.
The trend in EoE was statistically significantly improved compared to the trend in the rest of the UK.
Exclusive MBM at discharge, EoE compared to UKNC 4 yr

The trend in EoE was statistically significantly improved compared to the trend in the rest of the UK.
Percentage of care days with MBM: EoE only
Percentage of care days with MBM: EoE only

- No significant step change
- Significant improvement in trend, $p=0.03$
% of care days where the infant was fed some mother’s milk. Both regions showed a significant trend change after introduction of the care bundle in Feb 2011!
EBM use (2012) compared to the national average (all babies)

*Excludes babies who died and missing data (NDAU and EoE SEND)
** Data from first 2 SEND days – babies 24+ to 47+ hours old

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<thead>
<tr>
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<th>National</th>
<th>East of England</th>
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<tbody>
<tr>
<td>Mothers milk given at any stage of the neonatal stay*</td>
<td>70%</td>
<td>77.6%</td>
</tr>
<tr>
<td>Babies receiving their first feed (any enteral feed) within the first 2 calendar days **</td>
<td>83%</td>
<td>86%</td>
</tr>
<tr>
<td>Receiving any breast milk at discharge</td>
<td>61%</td>
<td>66%</td>
</tr>
</tbody>
</table>
Key messages from NDAU analysis

Breastmilk at discharge

• Prior to care bundle implementation – already a pattern of improvement (regardless of exclusive or mixed feeding at DC)

• No evidence that rates of breastfeeding at discharge in East of England (EoE) improved following introduction of the care bundle beyond the pre-existing pattern of improvement
Key messages from NDAU analysis

Daily feeding of mother’s own milk

• Following introduction of the care bundle, there was a significant improvement in the trend for monthly % of care days where the infant was fed mother’s milk.

• However the same pattern was observed in the rest of the UKNC (with no statistically significant difference between the two regions) so the improvement cannot be solely attributable to the bundle.
Key messages from NDAU analysis

• Exclusive breastfeeding rates in the EoE region improved significantly faster than the rest of the UK Neonatal Collaborative (UKNC) which remained after adjustment for confounders.

• Exclusive breast feeding can be held to represent the most stringent marker of success.
Annual surgical NEC cases in the EoE as a % of annual admissions (1st only), by GA for infants born ≤32+6 weeks gestation. (95% confidence intervals).

There was a significant reduction in surgical NEC from 2009 to 2010 (p=0.006) but no subsequent year-on-year change.

A more detailed trend analysis was not possible due to low numbers.
Monthly % of care days where PN was given. Significant increase in PN use in both regions before the bundle was introduced and a significant step change at the point of introduction. After the bundle was introduced, trends in the two regions diverged but were not statistically significant.
Conclusions

Notable improvements in MBM outcomes in the East of England over whole study period

- Exclusive MBM at discharge increased faster in the EoE compared to the rest of the UKNC
- Significant improvements in MBM use during stay after bundle was introduced
- Other breastfeeding initiatives underway during this time may play a role
Conclusions

↑ data collection
↑ compliance with feeding guideline
↑ consistency of advice
↑ milk preparation standards
↑ KC
↑ Culture of change
↑ team / MDT working
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