Appendix H.3 — Evidence to Decision: Breastmilk and Breastfeeding

EtD 42a. Should sequential breastmilk expression vs. double breastmilk expression be used for mothers of preterm infants?

POPULATION:	Mothers of preterm infants
INTERVENTION:	Sequential breastmilk expression
COMPARISON:	Double breastmilk expression
MAIN OUTCOMES:	**Critical outcomes** Breastmilk supply/volume Fully breastfed or breastmilk feeding at hospital discharge Necrotising enterocolitis Mortality Neurodevelopmental impairment Sepsis: proven or suspected Time to full enteral feeds **Important but not critical** Adverse effects Faltering growth/body composition Duration of initial hospital stay Bronchopulmonary dysplasia Retinopathy of prematurity Anaemia of prematurity Cost: cost of intervention, cost of neonatal care and life-long cost **Less important for decision making** Time to full sucking feeds
SETTING:	Neonatal care
PERSPECTIVE:	Clinical recommendation- patient perspective
BACKGROUND:	Breastmilk is the optimal source of nutrition for preterm infants, providing essential nutrients, immune protection and developmental benefits. However, many mothers of preterm infants face challenges in establishing and maintaining milk supply, particularly when direct breastfeeding is not immediately possible. Effective breastmilk expression strategies are critical for ensuring sufficient milk production and supporting breastfeeding or breastmilk feeding at discharge. The volume of breastmilk produced in the first 1 to 2 weeks may be a predictor of breastfeeding success. Insufficient expression frequency and volume may contribute to decreased milk production and early cessation of breastmilk feeding. The volume of breastmilk available for enteral feeding in the first two weeks after birth is an important determinant of how quickly parenteral nutrition can stop which reduces the risk of sepsis and whether the infant receives infant formula which increases the risk of necrotising enterocolitis. Additionally, double pumping (using an electric breast pump to express milk from both breasts simultaneously) may be more effective than single or sequential pumping. Understanding the evidence and whether it supports these practices and beliefs is essential to optimising milk production, minimising feeding related morbidity and mortality, and

	supporting breastfeeding success for mothers of preterm infants.
CONFLICT OF INTERESTS:	None

Assessment

Desirable Effects

How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	**Double pumping** [1-5] **Breastmilk supply/volume**: RCT: Milk yield higher with double pump vs. sequential expression [Critical]. **Desirable effects for Māori** No additional evidence available	**Double pumping** [1,2] Infants <1,500 gm and <32 weeks' gestation. [3] Overall mean infant birthweight was 1535 g (1610 g in the sequential group, and 1460 g in the simultaneous group); mean gestational age was 29.97 weeks (sequential 29.9, simultaneous 30.2). [4] Gestational ages of the infants varied between 25 to 38 weeks (31.9±3.8) and their birthweights were within 760 and 3200 grams (1554.8±663.6). [5] Cohort analysis within a RCT. Babies <34 weeks' admitted to Neonatal Intensive Care Unit (NICU).

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)	
				Risk with breastmilk expression (double,)	Risk difference with breastmilk expression (sequential,)

Breastmilk supply/volume: RCT: Sequential vs. double pump assessed with: Milk weight (g)	36 (1 RCT)	⨁◯◯◯ Very low[a,b,c]	-	Milk yield higher with double pump vs. sequential expression (88 g; 95%CI 79 - 97 vs. 51 g; 95%CI 46-56; *P*< 0.01).	
Breastmilk supply/volume: RCT: Sequential vs. double pump assessed with: Milk weight (g)	48 (2 RCTs)	⨁⨁◯◯ Low[a,f]	-	Pilot study n=9 Mean daily milk yield in the sequential single group ranged from a low of 158.4 gm on day 3 to a high of 505.8 g on day 20. The mean daily milk yield in the double pump group ranged from a low of 41.4 g on day 3 to a high of 741 g on day 41. The overall mean milk yield for the 40 days in the sequential single and double pump groups was 395.2 (SD 270.9) and 445.3 (SD 188.9) g, respectively. RCT n=39 Milk weight change was higher for double pump than sequential groups between weeks 2 and 5 (P=0.049).	
Breastmilk supply/volume: Cohort: Sequential vs. double pump assessed with: Total amount of milk expressed (mL)	62 (1 non-randomised study)	⨁◯◯◯ Very low[d,e,f]	-	Although there was a tendency to obtain higher amounts of milk per day with simultaneous breast expression, no statistical difference was observed on any day between the two study groups. However, mothers in the simultaneous expression group achieved similar amounts of milk in shorter time periods. Time spent for each expression period was significantly lower in the simultaneous breast expression group.	
Breastmilk supply/volume: Cohort within RCT: Sequential vs. double pump assessed with: Milk weight (g/day) first 10 days	62 (1 non-randomised study)	⨁◯◯◯ Very low[a,f]	-	Double pumping was a significant predictor of 10-day milk weight; (109 (31–186, p=0.007) g/day more for double pumping) Sequential: n=42 median 147 (25th/75th centile 78, 275) mL/day Double: n=20 median 288 (25th/75th centile 168, 386) mL/day	
Breastmilk supply/volume: Cohort within RCT: Sequential vs. double pump assessed with: Total milk weight (mL/day) during infant stay in NICU	47 (1 non-randomised study)	⨁◯◯◯ Very low[a,f]	-	Double pumping was a significant predictor of milk volume expressed prior to infant discharge from neonatal intensive care. Sequential: n=35 median 220 (25th/75th centile 112, 349) mL/day Double: n=12 median 561 (25th/75th centile 202, 708) mL/day	
Necrotising enterocolitis - not measured	-	-	-	-	-
Mortality - not measured	-	-	-	-	-
Neurodevelopmental impairment - not measured	-	-	-	-	-
Sepsis: proven or suspected - not measured	-	-	-	-	-
Time to full enteral feeds - not measured	-	-	-	-	-
Adverse effects - not measured	-	-	-	-	-
Faltering growth/body composition - not measured	-	-	-	-	-
Duration of initial hospital stay - not measured	-	-	-	-	-
Bronchopulmonary dysplasia - not measured	-	-	-	-	-
Retinopathy of prematurity - not measured	-	-	-	-	-
Anaemia of prematurity - not measured	-	-	-	-	-

Cost: cost of intervention, cost of neonatal care and life-long cost - not measured	-	-	-	-	-
Time to full sucking feeds - not measured	-	-	-	-	-

a. Downgraded one level for concerns for risk of bias
b. Downgraded one level for indirectness as evidence is only reported in a single study
c. Downgraded one level for indirectness as population was not generalisable, no very preterm infants were included
d. Downgraded two levels for serious concerns for risk of bias including inadequate information on confounding factors
e. Downgraded one level for indirectness as this study included critically ill neonates and included term infants
f. Downgraded one level for imprecision due to small sample numbers

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know	No undesirable effects were reported. **Undesirable effects for Māori** No additional evidence available	

Certainty of evidence

What is the overall certainty of the evidence of effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
● Very low ○ Low ○ Moderate ○ High ○ No included studies	Low to very low certainty of evidence overall. **Certainty of evidence for Māori** No additional evidence available	

Outcomes	Importance	Certainty of the evidence (GRADE)
Breastmilk supply/volume: RCT: Sequential vs. double pump assessed with: Milk weight (g)	CRITICAL	⨁◯◯◯ Very low
Breastmilk supply/volume: RCT: Sequential vs. double pump assessed with: Milk weight (g)	CRITICAL	⨁⨁◯◯ Low

Breastmilk supply/volume: Cohort: Sequential vs. double pump assessed with: Total amount of milk expressed (mL)	CRITICAL	⨁◯◯◯ Very low
Breastmilk supply/volume: Cohort within RCT: Sequential vs. double pump assessed with: Milk weight (g/day) first 10 days	CRITICAL	⨁◯◯◯ Very low
Breastmilk supply/volume: Cohort within RCT: Sequential vs. double pump assessed with: Total milk weight (mL/day) during infant stay in NICU	CRITICAL	⨁◯◯◯ Very low
Necrotising enterocolitis - not measured	CRITICAL	-
Mortality - not measured	CRITICAL	-
Neurodevelopmental impairment - not measured	CRITICAL	-
Sepsis: proven or suspected - not measured	CRITICAL	-
Time to full enteral feeds - not measured	CRITICAL	-
Adverse effects - not measured	IMPORTANT	-
Faltering growth/body composition - not measured	IMPORTANT	-
Duration of initial hospital stay - not measured	IMPORTANT	-
Bronchopulmonary dysplasia - not measured	IMPORTANT	-
Retinopathy of prematurity - not measured	IMPORTANT	-
Anaemia of prematurity - not measured	IMPORTANT	-
Cost: cost of intervention, cost of neonatal care and life-long cost - not measured	IMPORTANT	-
Time to full sucking feeds - not measured	NOT IMPORTANT	-

a. Downgraded one level for concerns for risk of bias
b. Downgraded one level for inconsistency as evidence is only reported in a single study
c. Downgraded one level for indirectness as no very preterm infants were included
d. Downgraded one level as evidence is based on a single study
e. Downgraded one level as both RCTs are from the same research group with one being a pilot and one the full study.
f. Downgraded two levels for serious concerns for risk of bias including inadequate information on confounding factors
g. Downgraded one level as this study included critically ill neonates and included term infants
h. Downgraded one level as standard deviations are wide suggesting imprecision
i. Downgraded one level as there is substantive variation around the median value suggesting imprecision

Values

Is there important uncertainty about or variability in how much people value the main outcomes?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Important uncertainty	Possibly important uncertainty or variability.	

or variability ● Possibly important uncertainty or variability ○ Probably no important uncertainty or variability ○ No important uncertainty or variability	Values for Māori No additional evidence available.	

Balance of effects

Does the balance between desirable and undesirable effects favour the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Favours the comparison ● Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ○ Don't know	**Double versus sequential pumping - low certainty evidence** Increased milk yield **Double versus sequential pumping - very low certainty evidence** Increased milk yield **Balance of effects for Māori** No additional evidence	

Resources required

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies	Access to breast pumps Prenatal educational resources Access to breastfeeding support specialist and staff **Resourcing for Māori** No additional evidence available	

○ Don't know		

Certainty of evidence of required resources

What is the certainty of the evidence of resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Very low ○ Low ● Moderate ○ High ○ No included studies	The costs are reasonably certain. **Certainty of evidence of the required costs for Māori** No additional evidence available.	

Cost effectiveness

Does the cost-effectiveness of the intervention favour the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Favours the comparison ○ Probably favours the comparison ○ Does not favour either the intervention or the comparison ○ Probably favours the intervention ○ Favours the intervention ○ Varies ● No included studies	No studies reported on the cost-effectiveness of breastmilk expression for mothers of preterm infants. **Cost effectiveness for Māori** No additional evidence available	

Equity

What would be the impact on health equity?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Reduced ● Probably reduced	**Equity for Māori** Māori mothers of preterm pēpi Māori face systemic barriers that affect their ability to establish and	

○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	maintain breastfeeding. Early and frequent breastmilk expression is vital to improving milk supply and long-term breastfeeding success, yet pēpi Māori are less likely to be exclusively breastfed at discharge. Delayed or infrequent expression may worsen these outcomes and reinforce existing inequities. Given the impact of colonisation on health systems and whānau support, structured support for early and consistent expression can empower wāhine Māori. Prioritising these practices in neonatal care may enhance breastfeeding rates and promote culturally responsive care for whānau Māori with preterm pēpi. **Equity for Pacific families** Pacific mothers may face barriers to early and frequent milk expression due to limited support, inconsistent staff engagement or lack of culturally aligned guidance. Although Pacific infants had high rates of transition to mother's own milk only, 22% still received alternative nutrition by day three, suggesting gaps in consistent breastfeeding support. Delayed or less frequent breastmilk expression may contribute to reduced supply and interrupted feeding progress. Equity requires respectful education and proactive lactation support that affirms Pacific values and promotes confidence in maintaining milk supply from birth. **Equity for underrepresented groups** Mothers from migrant, rural or low-income backgrounds may experience delays in accessing pumps, lactation advice or culturally appropriate care. These barriers can reduce early expression and long-term supply. Equity demands timely resources, interpreter services and individualised support to ensure all mothers can establish and maintain breastmilk feeding. Promoting early and frequent expression can improve outcomes by creating more equitable opportunities for breastfeeding success. Ensuring access to equipment, culturally appropriate education and staff support across all neonatal settings is essential to closing the gap in feeding disparities.	

Acceptability

Is the intervention acceptable to key interest-holders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	While early, frequent breastmilk expression is clinically recommended to support milk supply for preterm infants, acceptability will vary across mothers and families depending on a range of personal, cultural and systemic factors. **Emotional readiness**: Parents of preterm infants are often under intense emotional stress. Some may feel overwhelmed by the expectation to express milk frequently and early, especially in the first hours after birth. **Physical discomfort or health**: Breastmilk expression—especially with a pump—can be physically uncomfortable. Some mothers recovering from a complicated birth or surgery may not feel able to express immediately. **Time and capacity**: Sequential expression is time intensive. Mothers caring for	

	other children, managing work or without consistent support may struggle to commit to a strict schedule. **Acceptability for Māori** No additional evidence was available	

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Both pumping methods are probably feasible. **Feasibility for Māori** No additional evidence available.	Huang *et al* [6] reported on an implementation project to promote early, frequent and effective breastmilk expression. Breastmilk expression within 6 hours of birth of preterm infants (<37 weeks') increased from 23% to 87%. Compliance of expression for 8–12 times daily in the first 48 h after delivery also experienced dramatic improvement from 0 to 50%. The volume of breastmilk expression in the first 24 hours increased from 2.10 +/- 5.45 to 7.72 +/-17.19 mL on average. In the following 24 h, the volume improved from 7.08 +/-12.98 to 43.77 +/-80.86 mL.

Summary of judgements

	JUDGEMENT						
DESIRABLE EFFECTS	**Trivial**	Small	Moderate	Large		Varies	Don't know
UNDESIRABLE EFFECTS	Trivial	**Small**	Moderate	Large		Varies	Don't know
CERTAINTY OF EVIDENCE	**Very low**	Low	Moderate	High			No included studies
VALUES	Important uncertainty or variability	**Possibly important uncertainty or variability**	Probably no important uncertainty or variability	No important uncertainty or variability			
BALANCE OF EFFECTS	Favours the comparison	**Probably favours the comparison**	Does not favour either the intervention or the comparison	Probably favours the intervention	Favours the intervention	Varies	Don't know

	JUDGEMENT						
RESOURCES REQUIRED	Large costs	Moderate costs	**Negligible costs and savings**	Moderate savings	Large savings	Varies	Don't know
CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES	Very low	Low	**Moderate**	High			No included studies
COST EFFECTIVENESS	Favours the comparison	Probably favours the comparison	Does not favour either the intervention or the comparison	Probably favours the intervention	Favours the intervention	Varies	**No included studies**
EQUITY	Reduced	**Probably reduced**	Probably no impact	Probably increased	Increased	Varies	Don't know
ACCEPTABILITY	No	Probably no	**Probably yes**	Yes		Varies	Don't know
FEASIBILITY	No	Probably no	**Probably yes**	Yes		Varies	Don't know

Type of recommendation

Strong recommendation against the intervention	**Conditional recommendation against the intervention**	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

References

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3. Jones, E.; Dimmock, P.W.; Spencer, A. A randomised controlled trial to compare methods of milk expression after preterm delivery. *Archives of Disease in Childhood - Fetal and Neonatal Edition* **2001**, *85*, F91-95, doi:10.1136/fn.85.2.f91.
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5. Fewtrell, M.S.; Kennedy, K.; Ahluwalia, J.S.; Nicholl, R.; Lucas, A.; Burton, P. Predictors of expressed breast milk volume in mothers expressing milk for their preterm infant. *Arch Dis Child Fetal Neonatal Ed* **2016**, *101*, F502-f506, doi:10.1136/archdischild-2015-308321.

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Back to question list