

Slow Weight Gain And the Vicious Cycles That Keep it Going: Poor Appetite, Poor Feeding, Poor Production

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Declaration and Disclosure

NOTHING to declare:
I have NO affiliation with any person(s) or entities that could be perceived as having a bearing on my presentation of this subject.

2

Background: Clinical Observations

The slow-growing breastfed baby often behaves as if "content to starve."

--R. Illingworth, 1967

- *Sleepy and disinterested in feeding*
- May cue to feed but then fall asleep after a few suckles
- Hard for mothers to feed
- *Management challenge*

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3

Background: Literature review

Evidence base:

- Confused definitions
- Contradictory growth references
- Inadequate research and data

No solid physiologic rationale for intervention:

When?
Why?
How much?
What endpoint?

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4

Weight gain: the data

	<u>Old Guidelines</u>	<u>Evidence-based</u>
Initial weight loss	Up to 10%	Up to 7%
Begin regaining	By 7–10 days	By 3–4 days of age
Back to birth weight	By 2 (or 3!) weeks	By 2 to 7 days
Acceptable gain	20 g/day	30–45 g/day

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5

Background: Literature review

Long quoted minimum standards

- "Back to birthweight by 2 weeks"
- "20 gm/day" * (from 8 days to 112 days)

*5th %tile, for specific short periods Nelson et al, Early Hum Dev 1989

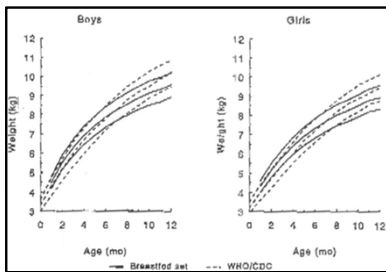
WHO data and new CDC/WHO charts show:

- All babies, all percentiles back to birthweight *before* 5-7 days of age
- Growth @ 50th %tile:
34 g/day (♀)
39 g/day (♂)
- Growth @ 1st %tile:
28 g/day (♀)
32 g/day (♂)

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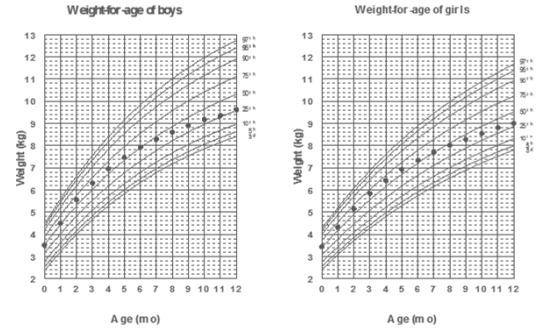
6

Growth of breastfed babies compared with 1977 reference data: Quartiles



Used with permission of the author: Dewey KG, et al. Growth of breast-fed infants deviates from current reference data: a pooled analysis of US, Canadian, and European data sets. WHO Working Group on Infant Growth. *Peds*. 1995 Sep;96(3 Pt 1):495-503.

Mean weight for age of infants BF ≥ 12 mo (pooled data from 7 studies), plotted against revised CDC growth chart (2000)



Used with the permission of the author: Dewey, K.G. Nutrition, growth and complementary feeding of the breastfed infant. *Ped Clinics N Amer*. 2001;48:87-104.

Differences in the growth patterns of breastfed and formula-fed infants

Breastfed infants

- Gain weight faster in the first two months
- Gain weight slower 3–12 mo
- Have similar or greater body fatness during the first 6 mo
- *Self-regulate* their energy intake at a level 13–19% lower than the amount consumed by FF infants

- Dewey KG, Heinig MJ, Nommsen LA, Pearson JM, Lonnerdal B. *Peds*. 1992 Jun;89(6 Pt 1):1035–41.
- World Health Organization Working Group on Infant Growth *Peds*. 1995 Sep;96(3 Pt 1):495–503.

Normal breastmilk intakes

Feeding 8–12 x / day

Day	Age	Average feed size	Total daily intake
1	0 days	7–10 ml	30–50 ml
2	1 day	15 ml	60–100 ml
3	2 days	30 ml	100–200 ml
4	3 days	45 ml	200–400 ml
5	4 days	45–60 ml	400–550 ml
6-14	1–2 weeks	45–75 ml	550–700 ml
	1 month		750 ml
	5 months		850 ml

Neville MC, Keller R, Seacat J, et al: Studies in human lactation: milk volumes in lactating women during the onset of lactation and full lactation. *Am J Clin Nutr* 48: 1375–86, 1988.

Very Different

Before lactogenesis

- Physiology:
- Evaluation
- Concerns
- Management

After lactogenesis

- Physiology
- Evaluation
- Concerns
- Management

Urine & stool output before lactogenesis

Day	Total daily intake	Urine &	Stool expectations
1	30–50 ml	1 wet	1-2 mec (black)
2	60–100 ml	2 wet	1-2 mec (brown)
3	100–200 ml	3 wet	2-4 stool (green)
4	200–400 ml	4 wet	2-4 stool (greenyellow)
5	400–550 ml	5 wet	3-4 stool (yellow)

Urine & stool output after lactogenesis

Within 24 hours of lactogenesis, regardless of age

- Minimum 6 to 8 wet diapers per 24 hours
- Minimum 3 to 4 yellow seedy stools per 24 hours
 - Can be every feed
 - A stool is defined as at least 15 gm

Less frequent stools RED FLAG

- **Abnormal until ~ 3–4 weeks**
- **Sign of poor intake**



Effective milk transfer (After lactogenesis)

Awakens self 8–14 times a day to nurse

Gets sufficient aqueous fraction (“foremilk”) to

- Meet thirst needs, adequate hydration
- Stop losing weight
- Wet at least 6–8 diapers/day

Is getting sufficient “cream” to

- Meet energy needs for activity, feeding, and growth
- Start gaining weight (200-300 gm/week)
- Have bright yellow stools at least 2–4/day

Ineffective milk transfer (After lactogenesis)

Very sleepy—sleeps through feedings if not awakened

- Takes a long time for parent to wake

May be meeting thirst but not energy needs

- Losing or gaining few oz/week
- Few or many damp diapers

Stools might be

- None
- Infrequent (< 2/day)
- Frequent but very scant
- Mucousy, brownish yellow, dark green, brown, or black

Classically cited medical causes for poor milk transfer

Maternal causes

- Thyroid issues
- Insufficient glandular tissue
- Sheehan's syndrome
- History of breast surgery
- Retained placental fragment
- Maternal illness
- Medications, smoking

Infant causes

- Ankyloglossia
- Jaundice
- Thyroid issues
- Infant illness, infection
- Classic galactosemia
- Neurologic disorders
- Other congenital problems
- Premature, SGA

Common causes for poor milk transfer

Maternal causes

- Separation from infant
- Clock scheduling, “rules”
- Delayed milk release:
 - Confidence issues
 - Worry, anxiety, distrust
 - Painful feeding
- Misunderstandings re feeding
- Fatigue, postpartum depression

Infant causes

- Separation from mother
- Clock scheduling, “rules”
- Delayed learning to feed
 - “Shoved” to breast,
 - Tight latch not corrected
 - Suckling not reinforced
- Vicious cycles:
 - sleepy baby, jaundice → infrequent feeds
- Prematurity, SGA

“Failure to thrive”: classic paediatric descriptions

Organic vs. “non-organic”

Model rarely applies to breastfeeding families

- Self-selection, decision to breastfeed
- Can devote time, energy and emotions to feeding without effective caloric transfer
- Frequent oxytocin
 - Releasing milk that baby's not drinking
 - Promotes parenting, bonding



Take what I say with a grain of salt

This is just my (educated) opinion

- Test the worthiness of what you hear against
 - Your own experience
 - Your observations
 - Your own reading and research
- I am not the final expert on anything



Homeostasis

The *inherent ability* or tendency of an organism or biological system to self-regulate its physiological processes to *maintain internal equilibrium* and physiological stability, despite variations in external conditions.

Involves monitoring functions, feedback functions, and the capacity to adapt physiologic processes.

Autocrine control isn't working?

Dewey et al: Breastfed infants self-regulate their energy intake to maintain ordinary growth

- Growth needs should drive appetite
- Appetite should control maternal production
- Maternal production and appetite should meet infant's growth needs

But with slow weight gain babies this isn't happening.

What's going wrong?

Pathophysiology of slow weight gain

Common scenarios that may interfere with normal autocrine control

- Poor grasp/suckling, poor milk transfer
- Painful feedings
- Clock feeding and/or separation of baby from mother
- Maternal mood issues
- Formula feeding without pumping

How slow weight gain begets slow weight gain



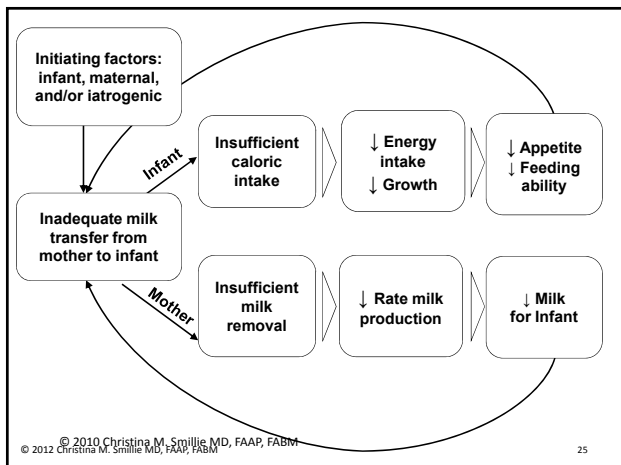
Underweight infant conserves energy (with/without dehydration) →

- Delayed or muted feeding behavior →
 - Fewer feeds
- Suckles only to high flow →
 - Drinks only lower fat milk
- Stops suckling with slower flow
 - Doesn't get as much hi-calorie cream
 - Or shallow ineffective suckling

How slow weight gain begets slow weight gain

Fewer feeds and poor milk transfer →

- Decreased energy for feeding
 - Vicious cycle
- Decreased milk removal
 - Slows rate of mother's milk production
 - Milk flow slows further
 - Less intake
 - Vicious cycle



Our theory of SWG

Observation:
The underweight baby is hard to feed
 Regardless of initial cause

- SWG baby acts anorectic, is “content to starve”
- Mother has to do all the work
 - No trustworthy self-regulation
 - Mother must awaken baby to feed, and keep awakening infant throughout the feed

26

Our theory of SWG

Theory:
This behavior is adaptive:
Infant is conserving energy

Observation:

- Feeding is flow-dependent
- Baby gets fast-flow aqueous fraction
- As flow slows, baby stops, falls asleep
- Baby leaves behind slower richer milk
- Mother’s milk production slows

27

Our theory of SWG

The HEALTHY breastfed infant

- *Self-regulates* energy intake
- Grows FASTER than CDC/NCHS curves in first 2 months of life

Dewey KG, Heinig MJ, Nommsen LA, Peerson JM, Lonnerdal B. *Peds.* 1992 Jun;89(6 Pt 1):1035–41

But we postulate, once underweight,
 Underweight breastfed infant is NOT “healthy”:

- *Must conserve energy*
- *Cannot self-regulate* intake to growth and energy needs
- Grows more slowly than either CDC/NCHS or WHO curves

28

Our theory of SWG

Regardless of initial cause, once baby is underweight
Feeding is compromised simply by being underweight

Theory:
Slow weight gain begets slow weight gain

29

Chronic early slow energy transfer

- Chronic ineffective shallow suckling
 - Infant oxytocin ↑ gastric CCK → false satiety
- Interference with hunger
 - ? ↓ Sensation of hunger (“Anorexia of starvation”)
 - ? ↓ Learning that food relieves hunger
 - Infant is “content to starve” (Woolridge)
- Decreased energy for learning
 - Can’t fix primary problem (oral grasp, suckling, etc.)
 - Until there’s more energy for learning
 - Need to catch up on weight first

30

Finally, on to management!

First days before lactogenesis
vs
After lactogenesis

Getting started: First few days

- Primary prevention
- Get oxytocin and prolactin receptors started
- Take advantage of naturally high prolactin
 - No need for galactagogues
 - Rare need to pump if baby has free access
- Except in rare instances, no such thing as a “supply” problem at this early hour

First couple days

Feeding opportunities:

- To speed the initiation of milk production
- For infant learning
- Not necessary for hydration

First 2–3 days

Normal volumes small

Colostrum in first days

- 7-10 ml/feed 1st day, 30–50 ml/day 1st day of life
- 30 ml/feed and 100-200 ml/day by day 3

Neville MC, Keller R, Seacat J, et al: Studies in human lactation: milk volumes in lactating women during the onset of lactation and full lactation. *Am J Clin Nutr* 48: 1375–86, 1988

First 2–3 days

Colostrum in first days

- Immune function
- Establish gut flora
- Laxative effect → mec stools → hunger
- Stabilizes blood sugar
- NOT for hydration or large caloric intake

First 2–3 days

Skin to skin : Frequent feeding

- Separation interferes
- 8–12 feeds/day (≠ “Q 2–3 hrs”)
- Swaddling interferes with arousal
Franco et al *Pediatrics* 2005;115;1307-1311
- Swaddling + supplements interfere with weight gain
Bystrova et al *Early Hum Dev* 2007 Jan;83(1):29–39

First 2–3 days

If baby feeds poorly in first days

- Examine baby
- Treat baby, not numbers

First 2–3 days



If mother is uncomfortable or in pain

- Discomfort/pain are a GUIDE to maternal comfort
 - Toward more effective feedings
 - Toward promoting good infant weight gain
- Ointments, hydrogel treatments, nipple shields
 - DO NOT address this KEY ISSUE
 - Cause mothers to accept pain as “normal”
 - Interfere with effective feeding, good weight gain
- Help mother GET COMFORTABLE

First 2–3 days

In healthy infant, low intake in first days

- Does not effect immediate infant growth, energy, or blood glucose (WHO, ABM, AAP)
- Usually NOT an emergency

HOWEVER, persistent low intake in first days

- May delay onset of good milk production
- May delay maternal/infant learning about feeding
- Can aggravate hyperbilirubinemia
- Can lead to slow weight gain

If baby feeds poorly in days before lactogenesis

Management

- Keep mother and baby TOGETHER
 - for optimal biobehavioral interaction
 - to decrease excess energy utilization
- Lots of skin on skin promotes ↑ infant feeding



Increasing weight gain *After* the first week

Slow growth after lactogenesis: the problem

Break the vicious cycles

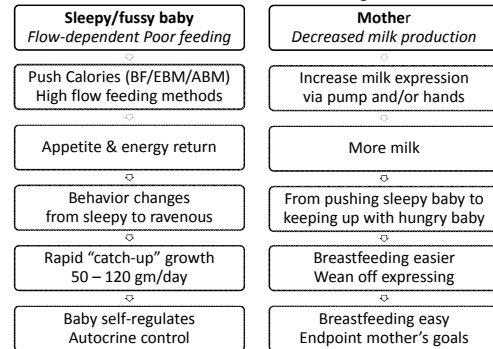
1. Feed the baby
2. Increase rate of milk production
3. Address primary problem
 - If still present (ankyloglossia, etc.)
 - Issues with suckling, etc., may need to wait until infant's weight is “caught up”
4. Take care of mom: Sleep, support, mood

Address the primary problem

- Maternal confidence, mood issues, etc.
- Infant ankyloglossia
- Maternal sore nipples (injury or infection)
- Infant suckling issues
 - Often complicated by maternal confidence issues
 - Usually quite difficult before baby “caught up”
 - ✓ Lower energy: trouble learning
 - Increasing flow helps baby feedback

Break the vicious cycles

Intervention and counseling



Management of slow weight gain

Feed the baby!

- Sleepy baby—
Needs to be pushed to increase intake
- Vicious cycle will continue until baby has
 - ↑ appetite for feeding
 - ↑ energy for milk transfer
- At first, mother is doing all the work
- Later, baby’s appetite and energy kick in

Management of slow weight gain

Feed the baby!

- Vicious cycle will continue until ↑energy for transfer
- Baby at breast ≠ breastfeeding
 - May need electronic scale to demonstrate this to family
 - Underweight baby often transfers < ½ oz per hour
- To get baby’s attention, need faster flow:
 - Breast compression when at breast
 - Supplement/alternative feeding
 - Until baby willing to sustain nursing with slower flow

Management of slow weight gain

Needs to “catch up”

- To “expected weight for age,” not simply to birthweight
 - To be able to transfer milk well at breast
 - To be able to fix any primary feeding issues
- *Breastfed babies gain faster than current growth charts, not slower! 200-300 gm a week is AVERAGE for first months*
- Will need to gain MORE than 35–45 g/day to catch up

Management of slow weight gain

Needs to gain MORE than 33–45 g/day to catch up

- When underweight babies well supplemented, they *can gain 50 to 150 gm/day*
- The more behind, the more rapid the weight gain
- The younger identified, the more rapid weight gain
- *The quicker caught up, the sooner off supplement*
- Weight gain slows as infant approaches “expected weight”
- Expected weight as guesstimate, moving target

Management of slow weight gain

“Caught up” to “expected weight”?

Guestimate:

What would baby weigh by now, if:

- Baby had been back to birth weight by 5–7 days
- And then gained 30–45 gm/day since then, or since lowest point?

Best judge is baby’s behavior

1. Underweight: Very sleepy, poor transfer, needs to be pushed
2. Catching up: very hungry, gaining fast, improved breastfeeding
3. Caught up on weight: no longer crazy hungry, feeds well, sleeps well

1. Feed the baby!

- Feed what?
 - Breastmilk
 - Fractionated breastmilk (creamier)
 - Formula
- How much?
 - Powers & others: “extra” 50 cc/kg/day”
- Rationale for **much more**
 - 30 to 100 cc extra *per feed*
 - in addition to breastfeeding & pumping/expression

Study Protocol

Baby	Mother
Push Calories (BF/EBM/ABM)	Increase milk expression via pump and/or hands
Awake to feed; breast compression	Expression & compression
Q 2 ½ to 3 h/daytime Q 3 to 4 h/night	With/after most daytime feeds
+ 30-90 cc/feed = 400 -700 cc/day EBM/ABM	Prioritize maternal sleep
Until baby’s appetite takes over	Galactogogues

1. Feed the baby!

When to give supplement?

- Most recommend supplementing **AFTER** feeds
 - To “stimulate” oxytocin & prolactin”
 - But thirsty or sleepy baby stops suckling as flow slows
 - Poor alveolar emptying
 - Baby then satiated at bottle
- **Supplementing BEFORE** feeds more physiologic
 - Thirst met quickly by bottle
 - Baby then has energy/interest to nurse better at breast
 - Satiated at breast



1. Feed the baby!

“Pre-feeding” during catch-up phase, OR NOT

- Trial and error, 30-100 cc per feed
- Bottle feed → breastfeed → pump OR WHATEVER WORKS

After baby has caught up on weight, (then prefeed?)

- Gradually decrease ac supplements by ~ 10-20 cc
- Decreasing total daily supplement by ~ 50 to 150 cc every ~ 1–2 days

“Caught up” to what? –Guestimate:

- Back to birthweight by 10 days
- Gained 30–45 gm/day then, or since nadir

2. Increase rate of milk production

“Any breast that can make milk can make more milk”

A whole separate talk

Empower the mother to increase the rate of milk production

Confidence boosting measures

Of pumps and hands

- Hands on pumping
- Hand expression
- Express smarter, not harder
- Interrupted pumping
- “Cluster” pumping/hand expression
- And/or day of pumping like crazy

3. Address the primary problem

- Maternal confidence, mood issues, etc.
- Infant ankyloglossia
- Maternal sore nipples
- Infant feeding issues: IBCLC help
 - Often complicated by maternal confidence issues
 - Usually quite difficult before baby “caught up”
 - Lower energy: trouble learning
 - Increasing flow helps baby feedback

3. Address the primary problem

- Primary problem of later slow weight gain is often simply early slow weight gain
“Slow weight gain begets slow weight gain.”
- Once a baby is underweight, mother’s milk production has slowed down—
as RESULT,
NOT cause
of baby’s slow growth

4. Take care of mom

The mother is doing all the work
baby’s not doing his job

Getting enough sleep

- Solid 4-hour stretch at the beginning of her night
- Stagger bedtimes
- Mother skips one whole feed—
no pumping, nursing or feeding

Support

Careful counseling is KEY

Mother can misunderstand the need for
Supplemental feeding & increasing production

Rate of production has slowed

Because of slow weight gain, not vice versa

Mother’s misunderstanding can sabotage plan

- Some will quit breastfeeding
- Others will refuse to supplement

Not enough to tell her to supplement & rent a pump

- Family needs thoughtful explanation & education
- If you aren’t an LC, REFER to a Lactation consultant

Four take-home messages

1. Healthy breastfed infants grow FASTER than artificially fed infants in the first couple months of life. Two weeks is LATE to be back to birthweight.
2. The management of feeding problems before lactogenesis is quite different from the management of feeding problems after lactogenesis.
3. Common causes of slow weight gain include painful feeds, early separation of mother and baby, scheduled feeds, prematurity, and supplementing without pumping.
4. Slow weight gain can be seen as a self-perpetuating vicious cycle, of depressed infant appetite, ineffective feeding, and slowed rate of milk production.