EVIDENCE-BASED APPROACHES TO NVP INCLUDING MANAGEMENT OF HG AND IV ONDANSETRON

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OUTLINE

1. Pathophysiology
Hormonal influences (hCG, estrogen, progesterone)
Gastrointestinal dysmotility
Genetic and environmental factors
Associated conditions (thyroid dysfunction, H. pylori)

2. Presentation and Diagnostic Criteria
Diagnostic features (weight loss, dehydration, ketonuria)
Clinical signs and lab abnormalities
Assessment tools (e.g., PUQE score)

3. Differentiation from Nausea and Vomiting in Pregnancy (NVP)
Severity and duration of symptoms
Functional impact on daily living
Presence of complications (electrolyte imbalance, ketonuria)
Differential diagnosis of nausea and vomiting in pregnancy

4. Maternal and Fetal Impact

Short-Term Maternal Impact
Dehydration, electrolyte imbalance, hospitalization
Nutritional deficiencies

Long-Term Maternal Impact
Mental health effects (depression, PTSD)
Recurrence in future pregnancies

Fetal/Neonatal Impact
Low birth weight, preterm delivery
Small for gestational age (SGA)
Potential long-term developmental effects

5. Management

Non Pharmacological
Pyridoxine (Vitamin B6)
Ginger
Acupuncture/Acupressure
CBT/Mindfulness
Nutrition support

Pharmacological options:
Doxylamine
Antihistamine (diphenhydramine, dimenhydrinate)
Acid reducing agents
Dopamine Antagonist (metochlopramide)
Serotonin Antagonist (Ondansetron)

Refractory
Glucocorticoids
Enteral and parenteral nutrition
Role of thromboprophylaxis

6. IV Therapy specific protocols
Hydration protocols
Electrolyte repletion
IV odansetron
dose, dilution, monitoring
Legal, ethical, and documentation considerations
Safety, contraindications, and monitoring responsibilities

7. Interprofessional Collaboration
Coordinating care
When to refer or escalate

8. Monitoring and Follow-Up
Clinical parameters:
    Weight, hydration, labs (electrolytes, ketones)
Ongoing symptom scoring (e.g., PUQE 24 Score)
Monitoring fetal growth and maternal mental health

CASE INTRODUCTION

First appointment:

- **Patient:** 32-year-old G3P2
- **History:** Severe nausea/vomiting in first two pregnancies, no formal HG diagnosis **
- **Current pregnancy:** At 5 weeks, calling to say she is already vomiting several times per day
- **Past management:** Conservative treatments not effective in previous pregnancies

** no formal HG diagnosis in previous pregnancies despite her being unable to function in basic daily functions, take care of her other child, and losing weight because her lab work was WNL and showed no electrolyte abnormalities and no ketosis

CASE INTRODUCTION

- **PUQE-24 Score = 12 (Moderate NVP)**
- Nausea: 24 hours/day
- Vomiting: 6 times/day
- Retching: 4 times/day
- Appointment had to be cut short, despite it being over the phone because she needed to throw up
- Despite only being 5 weeks pregnant, **already at moderate-severe range**

- **Actions Taken:**
  - GP referral for Diclectin prescription
  - Discussion of IV hydration

CASE INTRODUCTION

Second appointment: IV hydration approx. 7 weeks pregnant

- **Symptoms:** Diclectin not effective, still vomiting, unable to even keep water down
- **Observation:** Hair visibly matted, unable to shower or brush due to nausea triggers
- **Daily Function:** Family/friends providing all support, patient unable to cook or care for children
- **Screening:** PUQE-24 Score = **14 (Severe NVP/HG range)**

Action:

- Initiated IV hydration
- Referred to GP for further escalation and formal diagnosis

INTRODUCTION

Prevalence & Spectrum

- **Nausea and vomiting of pregnancy (NVP)** affects up to **70–80%** of pregnant women.
- **Hyperemesis Gravidarum (HG)** is the severe end of the spectrum, affecting **~1–3%** of pregnancies.

Feature	NVP	HG
Commonality	Very common (~80%)	Less common (~1–3%)
Onset	4–6 weeks gestation	4–6 weeks, peaks 9–13
Resolution	~90% resolve by 20 weeks	May persist beyond 20 weeks
Impact on ADLs	Mild to moderate	Severe functional impairment
Weight loss, dehydration	Absent or mild	Prominent

PATHOPHYSIOLOGY

Placenta makes Growth Differentiation Factor-15 (GDF15) has been identified as the key driver of HG. It rises sharply in early pregnancy and is the most likely precipitant of nausea and vomiting

- **Pathogenesis**: High GDF15 → GFRAL activation in brainstem emetic centers → intense nausea, vomiting, and taste aversions.
- **Exacerbating factors**: Hormonal changes and GI disturbances potentiate symptoms.
- **Genetic predisposition**: Genetic variations amplify both hormone expression and receptor sensitivity.
- **Complications**: Persistent vomiting leads to dehydration, electrolyte imbalance, ketoacidosis, nutrient deficiencies (notably thiamine), and further pathophysiologic stress.

PATHOPHYSIOLOGY

HG is biological, not psychological
This is important in understanding to improve care

Factor	Role in HG	Primary/Secondary
GDF15	Activates brainstem emetic center	**Primary**
β-hCG	Triggers transient hyperthyroidism; possible nausea	Secondary
Thyroid hormones	May worsen symptoms if thyrotoxicosis present	Secondary
Estrogen/Progesterone	Slow GI motility, possibly modulate GDF15 sensitivity	Secondary
GI Motility	Reduced motility contributes to symptom severity	Secondary

PRESENTATION AND DIAGNOSTIC CRITERIA FOR HG

Clinical Definition

- **Onset before 16 weeks' gestation**
- Symptoms include:
  - **Nausea and/or vomiting**, at least **one is severe**
  - **Inability to eat or drink normally**
  - **Substantial impairment** in daily functioning and activities of daily living

Supporting Features

- Signs of **dehydration** (e.g., dry mucous membranes, orthostatic hypotension)
- **Weight loss** (loss of >5% pre-pregnancy weight is common, though not strictly required)
- **Ketonuria** and electrolyte imbalance may be present—but **not required** for diagnosis

Diagnostic Approach

- **Timing**: Typically appears in the first trimester, onset often around **4–9 weeks**, before 16 weeks
- **Clinical diagnosis**: Based on symptoms and functional impairment.
- **Exclusion of other causes**:
  - Confirm intrauterine pregnancy (e.g., via ultrasound)
  - Rule out **trophoblastic disease**, multiple gestation, UTI, GI pathology, thyroid dysfunction etc.

PRESENTATION AND DIAGNOSTIC CRITERIA FOR HG

- Historically, definitions of HG were **not standardized** and often relied on **ketonuria**, such as the **Fairweather criteria** (1968).
- **Current evidence does not support ketonuria and electrolyte imbalance** as a reliable indicator of HG severity.

Windsor Definition (2021) – *Modern Consensus*

- **Mandatory features:**
- Nausea and/or vomiting (≥1 must be severe)
- Inability to eat or drink normally
- Significant impact on daily functioning
- Symptom onset **before 16 weeks gestation**
- **Contributory features (not required):**
  - Signs of dehydration
  - Weight loss of more than 5%

PRESENTATION AND DIAGNOSTIC CRITERIA FOR HG

Criteria	Fairweather (1968)	Windsor Definition (2021)
Purpose	Historical clinical criteria	Modern consensus for clinical diagnosis and research standardization
Vomiting	>3 episodes/day	Nausea and/or vomiting (≥1 must be severe)
Oral intake	Not specified	Inability to eat or drink normally
Functional impact	Not specified	Substantial impact on daily living
Weight loss	Yes	Not required but may be present
Ketonuria	Required	**Not required** – no correlation with severity
Electrolyte imbalance	Required	Not required
Dehydration	Volume depletion	May be present (contributory feature)
Onset	4–8 weeks gestation	Before 16 weeks gestation
Clinical relevance today	Outdated; overly restrictive	Widely accepted modern standard

PRESENTATION AND DIAGNOSTIC CRITERIA FOR HG

- Specific Bloodwork and Considerations for severe NVP and HG
  - Electrolytes (NA, K, Mg, Ca, Cl)
  - Liver Function (ALT, AST)
  - Kidney function (eGFR/creatinine, albumin)
  - CBC
  - Iron panel
  - Thiamine
  - TSH, free T4, free T3
  - Urinalysis (specific gravity, ketones)
- Physical exams:
  - Heart auscultation
  - Weight Monitoring

PRESENTATION AND DIAGNOSTIC CRITERIA

- PUQE-24 vs. Rhodes vs. HELP Score

PUQE-24 Score				
1. In the last 24 hours, for how long have you felt nauseated or sick to your stomach?				
Not at all (1)	1 hour or less (2)	2-3 hours (3)	4-6 hours (4)	More than 6 hours (5)
2. In the last 24 hours have you vomited or thrown-up?				
I did not vomit (1)	1-2 times (2)	3-4 times (3)	5-6 times (4)	7 or more times (5)
3. In the last 24 hours, how many times have you had retching or dry heaves without throwing up?				
None (1)	1-2 times (2)	3-4 times (3)	5-6 times (4)	7 or more times (5)

If your PUQE-24 score is:

- between 4 – 6, you have mild NVP
- between 7 – 12, you have moderate NVP
- ≥13, you have severe NVP (also known as HG).

Rhodes Index of Nausea, Vomiting, and Retching (RINVR)					
1. In the last ( ) hours, I threw up .... times	7 or more (4)	5 – 6 (3)	3 – 4 (2)	1 – 2 (1)	I did not throw up (0)
2. In the last ( ) hours, from retching and dry heaves, I have felt .... distress	No (0)	Mild (1)	Moderate (2)	Great (3)	Severe (4)
3. In the last ( ) hours, from vomiting or throwing up, I have felt ... distress	Severe (4)	Great (3)	Moderate (2)	Mild (1)	No (0)
4. In the last ( ) hours, i have felt nauseated of sick to my stomach	Not at all (0)	1 hour or less (1)	2 – 3 hours (2)	4-6 hours (3)	More than 6 hours (4)
5. In the last ( ) hours, from nausea/sickness to my stomach, I have felt .... distress	No (0)	Mild (1)	Moderate (2)	Great (3)	Severe (4)
6. In the last ( ) hours, each time I threw up, I producted a .... amount	Very large (3 cups or more) (4)	Large (2-3 cups) (3)	Moderate (1/2 – 2 cups) (2)	Small (up to ½ cups) (1)	I did not throw up (0)
7. In the last ( ) hours, I have felt nauseated or sick to my stomach .... times	7 or more (4)	5-6 (3)	3 – 4 (2)	1 – 2 (1)	No (0)
8. In the last ( ) hours, I have had periods or retching or dry heaves without bringing anything up .... times	No (0)	1 – 2 (1)	3-4 (2)	5 – 6 (3)	7 or more (4)
Total experience score : sum of all scores, total occurrence score : 1 + 4 + 6 + 7 + 8, total distress score : 2 + 3 + 5					

HELP (HyperEmesis Level Prediction) SCORE

Name: _____ Date: _____ Gestational Age: _____ SCORE: _____

TODAY'S Weight: _____ LAST WEEK'S Weight: _____ Change: _____% PREVIOUS SCORE: _____

Meds: ☐ Ondansetron ☐ Granisetron ☐ Diclegis ☐ Promethazine ☐ Metoclopramide ☐_____

Mark ONE box in EACH ROW that describes symptoms over the last 24 hours unless specified otherwise.

My nausea level most of the time:	0	1 (Mild)	2	3 (Moderate)	4	5 (Severe)
I average __ vomiting episodes/day:	0	1-2	3-5	6-8	9-12	13 or more
I retch/dry heave __ episodes daily:	0	1-2	3-5	6-8	9-12	13 or more
I am urinating/voiding:	Same	More often due to IV fluids; or light color	Slightly less often, and normal color	Once every 8 hours; or slightly dark yellow	Less than every 8 hours or darker	Rarely; dark or bloody; or foul smell
Nausea/vomiting severity 1 hour after meds OR after food/drink if no meds:	0 or No Meds	1 (Mild)	2	3 (Moderate)	4	5 (Severe)
Average number of hours I'm unable to work adequately at my job and/or at home due to being sick has been:	0	1-2 (hours are slightly less)	3-4 (can work part time)	5-7 (can only do a little work)	8-10 (can't care for family)	11+ (can't care for myself)
I have been coping with the nausea, vomiting and retching:	Nor-mal	Tired but mood is ok	Slightly less than normal	It's tolerable but difficult	Struggling: moody, emotional	Poorly: irritable depressed
Total amount I have been able to eat/ drink AND keep it down: Medium water bottle/large cup = 2 cups/500mL.	Same; no weight loss	Total of about 3 meals & 6+ cups fluid	Total of about 2 meals & some fluid	1 meal & few cups fluid; or only fluid or only food	Very little, <1 meal/minimal fluids; or frequent IV	Nothing goes or stays down, or daily **IV/TPN/NG**
My anti-nausea/vomiting meds stay down or are tolerated:	No meds	Always	Nearly always	Sometimes	Rarely	Never/**IV/SQ** (SubQ pump)
My symptoms compared to last week:	Great	Better	About Same	Worse	Much Worse	So Much Worse!!!
Weight loss over last 7 days: ___%	0%	1%	2%	3%	4%	5%
Number of Rx's for nausea/vomiting*	0	1	2	3	4	5+
	0 pts	**1 pt/answer**	**2 pts/answer**	**3 pts/answer**	**4 pts/answer**	**5 pts/answer**
TOTAL each column = (#answers in column) x (# points for each answer)	0	____	____	____	____	____
TOTAL for ALL columns: _____	**None/Mild ≤ 19**		**Moderate 20-32**		**Severe 33-60**	

Weight Loss % = (Amount lost ÷ Pre-pregnancy weight) x 100
(Weight loss calculation optional for home use)
* Number of Rx's = Number of Rx medications for HG (not doses)

HER Foundation

info@hyperemesis.org
www.hyperemesis.org
www.HelpHER.org

Support:
help@hyperemesis.org

HER Foundation
10117 SE Sunnyside Road F8
Clackamas, OR 97015 USA

Reprints:
www.hyperemesis.org/tools

DIFFERENTIATION FROM NVP AND HG

Key Differences:

- **Severity:** NVP is mild to moderate, while HG is severe and debilitating.
- **Impact on Daily Life:** NVP has minimal impact, while HG severely impairs daily activities.
- **Need for Medical Intervention:** NVP is typically managed with self-care measures, while HG often requires medical treatment and may necessitate hospitalization.
- **Weight Loss:** NVP usually does not involve significant weight loss, while HG is characterized by a loss of 5% or more of pre-pregnancy weight.
- **Dehydration:** NVP is not usually associated with dehydration, while HG can lead to significant dehydration and electrolyte imbalances.

DIFFERENTIAL DIAGNOSIS OF NAUSEA AND VOMITING

When symptoms are atypical in timing, severity, or response to treatment, consider:

- **Gastrointestinal:**
  - Gastroenteritis
  - Gastric ulcer
  - Cholecystitis
  - Hepatitis
  - Pancreatitis
- **Metabolic/Endocrine:**
  - Diabetic ketoacidosis
  - Hyperthyroidism (esp. gestational thyrotoxicosis)
- **Neurologic:**
  - Vestibular disorders
  - Migraine
- **Obstetric:**
  - Molar pregnancy
  - Multifetal gestation (↑ hCG)

SHORT TERM MATERNAL IMPACT

Dehydration & Electrolyte Imbalance

- **Dehydration**—especially during hyperemesis gravidarum (HG)—can lead to:
  - Increased ketones, elevated urine specific gravity, and blood urea nitrogen levels
  - Electrolyte imbalances such as low phosphate, magnesium, sodium, and potassium
- **Ketosis and dehydration** create a vicious cycle—worsening nausea, reducing medication efficacy, and increasing HG severity
- **Severe dehydration** may result in:
  - Decreased amniotic fluid (oligohydramnios), preterm labor, neural tube defects, or poor lactation

Nutritional Deficiencies

- Pregnancy-associated malnutrition can rapidly arise, especially after prolonged vomiting—leading to vitamin and mineral deficiencies.
  - **Vitamin deficiencies**—particularly in thiamine (Vitamin B1), vitamin D, and vitamin K—may result in neurological, hematologic, and bone formation complications such as Wernicke's encephalopathy and bone/bleeding disorders

Hospitalization & Clinical Sequelae

- Severe HG often necessitates **hospitalization due to dehydration, significant weight loss, and electrolyte disturbances**
- If left untreated, these acute issues can escalate to serious maternal consequences:
  - Neurological, renal, hepatic injury (e.g. Wernicke’s encephalopathy, acute renal failure)
  - Potential for **fetal loss** or maternal death, suicide

SHORT TERM MATERNAL IMPACT

Short-Term Maternal Impact	Description / Clinical Significance
Dehydration & Electrolyte Imbalance	Elevated ketones, skewed lab values (e.g., BUN, urine specific gravity), electrolyte disturbances—can cycle to worsen nausea and treatment resistance.
Nutritional Deficiencies	Rapid depletion of water-soluble vitamins (e.g., thiamin, vit K, D) → risk of neurological and coagulopathy complications.
Hospitalization & Complications	Severe HG may lead to hospital admission for dehydration and metabolic imbalances. Left unattended, it can cause organ injury and fetal/maternal loss.

LONG TERM MATERNAL IMPACT

Persistent Nutritional Sequelae from Deficiencies

- Prolonged vomiting and malnutrition often lead to enduring deficiencies in **iron, B12, folate, vitamin D, and thiamine**—resulting in ongoing fatigue, compromised immune function, and prolonged physical recovery.

Neurological Risks

- **Wernicke's encephalopathy** from untreated thiamine deficiency can result in permanent cognitive damage—memory impairment, ataxia, and neuropathy.

Psychological & Psychiatric Morbidity

- **Depression During Pregnancy:** Women with HG exhibit markedly higher rates of depression—**49% vs. 6%** in controls
- **Postpartum Depression:** At 6 weeks postpartum, **29%** of HG survivors have depression compared to **7%** of controls
- **Long-Term Mood Disorders:** Up to **35%** of women with HG reported mild depression, **26% moderate**, and **18% severe**, several years after their HG experience
- **PTSD:** Approximately **18%** of HG survivors meet full PTSD criteria, and **~50%** experience significant trauma symptoms lasting beyond pregnancy

Long-Term Emotional & Functional Burden

- A follow-up 4–5 years postpartum shows many HG survivors continue to experience **depression, anxiety, and PTSD symptoms**, long after the physical illness has resolved
- **Social and life impacts** include job loss, strained relationships, persistent emotional trauma, and avoidance of future pregnancies

Daily Functioning & Family Impact

- Long-lasting exhaustion and emotional depletion impair **maternal-infant bonding**, **return to work**, and day-to-day resilience.
- HG-related trauma influences a lot – such as anything that triggers nausea is typically avoided

Risk of Recurrence

- HG recurrence risk in future pregnancies can be **up to 81%**, depending on severity in the first pregnancy
- Women with prior **severe HG requiring hospitalization** have the **highest recurrence risk**.
- Fear of recurrence is a major factor in women choosing to limit family size or avoid subsequent pregnancies.

LONG-TERM MATERNAL IMPACT

Long term maternal impact	Long-Term Consequences	Supporting Evidence
Persistent Malnutrition & Weight Loss	Increased risk of prolonged physical debility, delayed postpartum recovery, and **postpartum depression**	The HER Foundation notes that weight loss >15% of pre-pregnancy weight significantly heightens risk of long-term maternal health issues and PPD
Neurological Complications (e.g., Wernicke's Encephalopathy)	Permanent cognitive impairment if thiamine deficiency is not treated promptly	HG may lead to nutritional deficiencies including thiamine; untreated, this can result in Wernicke's encephalopathy
Psychological Morbidity	Elevated rates of **depression**, **post-traumatic stress disorder**, and suicidal ideation; in some cases, pregnancy termination	HG is linked to substantial psychological distress, including PTSD and ideation; some patients have terminated pregnancies due to severity
Long-Term Reduced Maternal Well-Being	Chronic physical and mental health sequelae, including fatigue & emotional trauma lingering beyond postpartum	Qualitative reports and HER Foundation resources emphasize lasting debility and mental health burden in affected individuals

FETAL AND INFANT IMPACT OF HG

Growth & Development

- **Low Birth Weight (LBW):** Infants of HG pregnancies are **3.4x more likely** to be born underweight (<2,500 g)
- **Small for Gestational Age (SGA):** Risk increased by **28–32%** compared to non-HG pregnancies
- **Preterm Birth (<37 weeks):** Incidence increased by **15–22%**, particularly in severe or untreated cases.

Micronutrient Depletion

- **Iron & Copper:** Fetal storage occurs in the **third trimester**. If maternal status is low, neonatal anemia and poor neurodevelopment outcomes are more likely.
- **Vitamin B12:** Maternal deficiency associated with a **2–3x higher risk** of neural tube defects and impaired infant neurodevelopment.
- **Folic acid:** Essential for DNA synthesis; deficiency linked to **70% of neural tube defects** preventable with adequate supplementation.
- **Thiamine:** Severe deficiency in HG can lead to impaired fetal brain development; risk is highest if maternal vomiting persists beyond 20 weeks.

Neonatal & Childhood Outcomes

- **NICU Admission:** HG pregnancies carry a **20–30% higher likelihood** of neonatal intensive care admission
- **Neurodevelopment:** Long-term studies show children born to moms with severe HG have a **53% increased risk** of neurodevelopmental disorders
- **Emotional & Behavioral Disorders:** Increased risk of anxiety and ADHD symptoms later in childhood.

Mortality Risks

- **Miscarriage:** Severe HG associated with **up to 15% risk** in some studies, particularly when maternal weight loss exceeds 10% pre-pregnancy weight.
- **Stillbirth:** Slight but measurable increase in severe, prolonged cases; risk reduction seen with aggressive maternal hydration/nutrition support.

FETAL AND INFANT IMPACT OF HG

Fetal and infant impact	Impact	Key Stats
Growth & Development	Low Birth Weight, SGA, Preterm Birth	LBW **3.4×** higher; SGA **28–32%** ↑; Preterm **15–22%** ↑
Micronutrient Depletion	Iron, Copper, B12, Folate, Thiamine deficiencies	Folate prevents **70% NTDs**; B12 deficiency **2–3×** ↑ NTD risk
Neonatal Outcomes	NICU admissions, early complications	NICU admission **20–30%** ↑
Neurodevelopment	Cognitive, emotional, behavioral risks	Child neurodevelopmental disorders **53%** ↑
Mortality	Miscarriage, stillbirth risk	Miscarriage up to **15%** in severe cases

NON PHARMACOLOGICAL MANAGEMENT FOR NVP

1)Pyridoxine (Vitamin B6)

Dose / administration

- Typical used dose: **10–25 mg orally 3–4×/day** (30–100 mg/day). Some trials used **25 mg every 8 hours**; total doses up to **200 mg/day** have been reported but are unnecessary for most patients. when monotherapy insufficient.

Evidence & effect size

- Multiple randomized trials and meta-analyses show **modest but clinically meaningful reductions** in validated nausea scores (Rhodes/PUQE24) with pyridoxine vs placebo or control. Cochrane/other reviews conclude pyridoxine is an **effective first-line option**. One early RCT used 25 mg q8h and showed improvement versus placebo.

Safety

- Well tolerated at recommended doses. Rare neuropathy has been reported with **chronic very high doses (>200–300 mg/day)**; avoid routine megadoses. Safe in pregnancy at usual doses.

Practical takeaway: Expect *modest but reliable* reduction in nausea intensity; often used as first-line (30–100 mg/day typical; 10–25 mg TID common in trials).

2) Ginger (Zingiber officinale)

Dose / administration

- Trial dosing commonly **~1 g/day** (examples: 250 mg ×4/day, or 500 mg ×2/day) for ≥4 days; dosing ranges in trials 170 mg → 1.5 g/day.

Evidence & effect size

- Systematic reviews / meta-analyses indicate ginger **reduces nausea scores** and in one study **stops vomiting in ~1/3 of women by 6 days**; overall effect modest across trials. Subgroup analyses often support **~1 g/day** for benefit. **Cochrane notes evidence is limited but supportive.**

Safety / cautions

- Generally considered safe in pregnancy at trial doses (≤1 g/day). Caution with anticoagulant therapy (may increase bleeding risk) or gallstones; avoid very high doses. Regulatory reviews recommend using clinical judgment and avoiding untested concentrated herbal extracts

Practical takeaway: Expect *small–moderate reduction in nausea scores* with ~1 g/day; effect on vomiting frequency is less consistent. Safe at trial doses with usual pregnancy cautions.

NON PHARMACOLOGICAL MANAGEMENT IN NVP

3) Acupuncture / Acupressure (PC-6 / Neiguan point)

Dose / administration

- Common, pragmatic approach: **wrist acupressure bands** (stimulating P6) worn continuously for several days; acupuncture performed in 1–3 sessions or serially depending on response. Trials varied in frequency; several used daily stimulation for ≥3 days.

Evidence & effect size

- Systematic reviews find **PC6 stimulation (acupressure/acustimulation) may reduce nausea severity** but effects on vomiting are inconsistent. Cochrane and subsequent trials report modest benefit; evidence quality variable. Acupuncture trials overall mixed, but about a **32% relative reduction** in nausea incidence in pooled trial data. Evidence quality is variable but results are consistent enough to support use

Safety

- Low risk when performed by trained practitioners. Avoid in patients with bleeding diathesis or over infection sites. Wrist bands are inexpensive, patient-acceptable, and low-risk.

4) Psychological Interventions — CBT / Mindfulness / Psychotherapy

Dose / administration

- Formats include **brief CBT (6–8 sessions), problem-solving therapy, or mindfulness-based approaches**, delivered weekly or biweekly alongside medical care.

Evidence & effect size

- RCTs show **psychotherapy** improves nausea/vomiting scores and psychological distress vs medical therapy alone; effect sizes in trials **~0.4–0.7** (small-to-moderate). One RCT reported persistent improvement at 1 month and reductions in anxiety/depression scores. Systematic reviews note limited but promising data and call for higher-quality trials.

Mechanism / role

- Reduces symptom perception, decreases treatment distress, improves coping and adherence to nutrition plans — useful adjunct when psychological distress or poor coping amplify symptoms.

Safety

- Low risk; ideally offered by therapists experienced in perinatal mental health. Consider telehealth options for access.

Practical takeaway: Expect *improved symptom perception, coping and reduced distress* — helpful adjunct especially when psychological distress amplifies symptoms

NON PHARMACOLOGICAL MANAGEMENT IN NVP

5) Nutrition Support (Dietary strategies)

Oral / dietary

- Small, frequent meals; avoid triggers; bland high-carbohydrate snacks; separate fluids from solids; ginger candies/lozenges. Evidence for specific diets is limited but recommended as first step.

Enteral / tube feeding for HG

- When oral intake insufficient but GI tract usable → **enteral feeding (NG/PEG)** preferred over parenteral nutrition (better outcomes, lower infection risk). Enteral repletion addresses macro- and micro-nutrients.

Parenteral (IV/TPN)

- Indicated when enteral feeding not tolerated (persistent vomiting despite treatment), or risk of aspiration. Use **standard PN/IV multivitamin solutions** and follow safety protocols.
- **Thiamine** is critical: give **thiamine 200–500 mg IV q8h (or at least 100 mg IV daily)** on admission for prolonged vomiting and **before** glucose-containing fluids or PN to prevent Wernicke encephalopathy. Initiate IV multivitamin when IV nutrition started.

Evidence & outcomes

- Enteral feeding preferred; PN used as last resort. Early repletion (vitamins, electrolytes, fluids) shortens hospitalization and prevents severe complications (Wernicke's, electrolyte-related arrhythmia). Guidelines recommend routine thiamine in admitted patients.

Safety

- PN risks: catheter infection, metabolic derangements; use with obstetric oversight and dietitian/nutrition support team. Monitor electrolytes, glucose, liver function, and fetal/uterine status.

IMPORTANT NOTE

1. Conservative (or "wait-and-see") approaches aren't enough

- There's an emphasis that **nausea and vomiting—even for just a few weeks—lead to significant nutritional deficiencies**, which then worsen symptoms and delay recovery. **If nutrients are not proactively replaced**, serious health complications and prolonged recovery are likely. **Delays in effective treatment can lead to pregnancy termination**

2. Delays in effective treatment can impact the pregnancy

- Patients who do not receive timely, adequate treatment are more likely to experience pregnancy loss or opt for termination of a wanted pregnancy—often due to **physical debility**, inability to care for themselves or their families, and **compassion fatigue from uninformed or indifferent providers**. This underlines that conservative management may do more harm than good if HG is severe.

3. Better outcomes with aggressive and early management

- Recommend **proactive care, early transition to non-oral medications**, and rehydration and nutritional support. Evidence does not support conservative wait-and-see approaches because **delaying effective treatment increases risks for both mother and baby**.

PHARMACOLOGICAL MANAGEMENT IN NVP AND HG

1. Doxylamine (± Pyridoxine)

- **Dose/Protocol:** 10 mg doxylamine + 10 mg pyridoxine, up to 4 times daily (commonly available as Diclectin®/Diclegis® in Canada/US).
- **Efficacy:** Randomized controlled trials (RCTs) show **~70% improvement in symptoms**, with reduction in nausea/vomiting scores vs placebo
- **Safety:** Category A (safest rating) in pregnancy; extensive safety data over decades with **no increased risk of congenital malformations**.
- **Risks/Side Effects:** Mild drowsiness, dry mouth.

2. Antihistamines (Diphenhydramine, Dimenhydrinate)

- **Diphenhydramine Dose:** 25–50 mg orally or IV every 4–6 hours.
- **Dimenhydrinate Dose:** 50–100 mg orally every 4–6 hours, max 400 mg/day.
- **Efficacy:** Effective in **50–70% of women**; widely used first-line agents
- **Safety:** Large cohort studies show **no significant teratogenic risk**; considered safe in pregnancy.
- **Risks:** Sedation, anticholinergic effects (dry mouth, urinary retention).

PHARMACOLOGICAL MANAGEMENT IN NVP AND HG

3. Acid-Reducing Agents (H2 Blockers, PPIs)

- **Famotidine Dose:** 20 mg BID (commonly used).
- **Omeprazole Dose:** 20 mg daily.
- **Efficacy:** Beneficial for women with reflux, which often worsens nausea/vomiting; improves **overall symptom burden by 40–50% when added to standard therapy**
- **Safety:** Both H2 blockers and PPIs considered **safe in pregnancy**; no significant association with major malformations in meta-analyses.
- **Risks:** Headache, mild diarrhea/constipation; rare hypomagnesemia with chronic PPI use.

4. Dopamine Antagonist (Metoclopramide)

- **Dose:** 5–10 mg orally, IV, or IM every 6–8 hours.
- **Efficacy:** Studies show **60–70% improvement** in nausea/vomiting; particularly effective in women not responding to antihistamines.
- **Safety:** Large registry studies show **no increased risk of congenital anomalies**
- **Risks:** Extrapyramidal symptoms (0.2–0.5%), akathisia, fatigue; risk increases with prolonged use.

PHARMACOLOGICAL MANAGEMENT IN NVP AND HG

5. Serotonin Antagonist (Ondansetron)

- **Dose:** 4–8 mg orally or IV every 8 hours.
- **Efficacy:** One of the most effective treatments — **symptom relief in 70–80% of women**; decreases vomiting episodes significantly
- **Safety:** Data mixed — some studies show a **slight increase in oral clefts (~0.03% absolute increase)**, while others show no association. Large 2018 JAMA study: **no increased risk of cardiac malformations**.
- **Risks:** Constipation, headache, rare QT prolongation (monitor if prolonged use or concurrent risk factors).

PHARMACOLOGICAL MANAGEMENT IN NVP AND HG

- **Most women with NVP** are managed with **first-line** measures (dietary measures, pyridoxine ± doxylamine).
- **~10–30%** of women with clinically significant NVP will require **prescription antiemetics** beyond simple conservative measures.
- Among women who develop **hyperemesis gravidarum (HG)** and require emergency/hospital care, **escalation to second/third-line agents is common**: **up to 80%** will receive ondansetron during hospital care or at discharge
- **Hospitalized HG patients**: **~40–60%** are receiving IV antiemetics and enteric nutrition and up to **45% discharged on ondansetron** after admission

PHARMACOLOGICAL MANAGEMENT OF HG – STEPWISE APPROACH

First-Line

- **(Safest, most studied)**
- **Pyridoxine (Vitamin B6)** 10–25 mg orally q8h.
- **Doxylamine + Pyridoxine** (Diclectin®/Diclegis®): 10 mg doxylamine + 10 mg pyridoxine, up to 4x/day.
  - **Efficacy:** ~70% improvement (Koren et al.).
  - **Safety:** Category A; no ↑ risk of birth defects.

Second-Line

- **(If inadequate relief with first-line or more severe HG)**
- **Antihistamines** (diphenhydramine 25–50 mg q4–6h; dimenhydrinate 50–100 mg q4–6h).
  - **Efficacy:** 50–70% response.
  - **Safety:** Safe in pregnancy, mild sedation.
- **Dopamine antagonist (Metoclopramide 5–10 mg q6–8h PO/IV/IM).**
  - **Efficacy:** 60–70% symptom improvement.
  - **Safety:** Large registry studies confirm no ↑ malformations.
  - **Risks:** EPS (0.2–0.5%), akathisia, fatigue.
- **Acid-Reducing Agents** (famotidine 20 mg BID, omeprazole 20 mg daily).
  - **Use:** Helpful if reflux/gastritis worsens NVP.
  - **Efficacy:** ~40–50% symptom burden reduction when added.

Third-Line

- **(Severe/refractory HG, usually hospital-based care)**
- **Serotonin antagonist (Ondansetron 4–8 mg PO/IV q8h).**
  - **Efficacy:** 70–80% response, most effective for vomiting.
  - **Safety:** Mostly safe; large studies show no ↑ cardiac risk, possible small ↑ oral clefts (~0.03% absolute risk).
  - **Risks:** Constipation, headache, QT prolongation.
- **Corticosteroids** (e.g., methylprednisolone) are sometimes used for **severe, refractory HG** after 10 weeks gestation — but generally considered **fourth-line** due to potential risks (small ↑ cleft palate if used earlier).

PHARMACOLOGICAL MANAGEMENT

Line of Therapy	Drug/Class	Dose	Efficacy	Safety / Notes
First-Line	Pyridoxine (B6), Doxylamine + B6	10–25 mg TID / 10+10 mg up to QID	~70%	Safest, Cat A
Second-Line	Antihistamines (diphenhydramine, dimenhydrinate)	25–50 mg q4–6h / 50–100 mg q4–6h	50–70%	Sedation, safe
	Metoclopramide	5–10 mg q6–8h	60–70%	EPS risk, safe in large cohorts
	Acid reducers (famotidine, omeprazole)	20 mg BID / 20 mg daily	40–50% added benefit	Safe, useful if reflux
Third-Line	Ondansetron	4–8 mg q8h	70–80%	Possible ↑ oral clefts, monitor QT
Fourth-Line	Corticosteroids	Methylprednisolone taper	For refractory HG	Avoid <10 wks GA

REFRACTORY NVP/HG

Glucocorticoids

- Consider when symptoms persist despite 2–3 lines of therapy.
- Methylprednisolone: 16 mg PO/IV q8h × 3 days → taper over 2 weeks if effective.
- Avoid before 10 wks GA (risk of oral clefts).

Enteral Nutrition (NG/NJ, PEG-J)

- Indicated if weight loss >5–10% or persistent malnutrition.
- NJ tube preferred to reduce aspiration risk.
- Shown to improve weight gain, pregnancy outcomes.

Parenteral Nutrition (TPN)

- Reserved for severe cases where enteral not tolerated.
- High complication risk: catheter infections (up to 25%), thrombosis.
- Requires multidisciplinary care (OB, nutrition, internal medicine).

Thromboprophylaxis

- HG → ↑ risk of VTE (dehydration, immobility, central lines).
- LMWH prophylaxis recommended for hospitalized patients or those on TPN/central access.

BRIDGING THE GAP

- **Lack of timely care:** In Ontario, most pregnant patients are not formally referred to an OB until **20–24 weeks gestation**. For those with severe NVP or HG, that's an entire first trimester — and much of the second — without specialist oversight.
- **ER is not a solution:** Patients experiencing relentless vomiting are often advised to go to the emergency room for IV hydration or antiemetics. But the ER is the last place they want to be:
  - Long waits, stressful environment, exposure to illness.
  - Symptoms can feel dismissed or minimized.

BRIDGING THE GAP

- **Real-life burden:** Many are **second- or third-time mothers**. With each pregnancy, symptoms often worsen, and these women are desperate to function — to **show up for school drop-offs, sports games, or family events** for their older children.
- **The opportunity for NDs:**
  - Naturopathic doctors are uniquely positioned to **fill this early-care gap**.
  - We can offer **timely assessment**, initiate supportive therapies (nutrient repletion, IV fluids/nutrients when safe), and **communicate with circle-of-care providers** to ensure coordinated management.
  - Early support may reduce ER visits, prevent complications, and give moms back some quality of life during a vulnerable time.

IV SPECIFIC PROTOCOLS - HYDRATION

Normal Saline (0.9% NaCl)
Composition: Sodium 154 mEq/L, Chloride 154 mEq/L

Best Use:

- **Simple hypovolemic dehydration** (vomiting, diarrhea)
- **Hyponatremia or when sodium supplementation is needed**
- **When chloride load is not a concern**
- **Compatible with most medications**

Considerations:

- Large volumes can cause **hyperchloremic metabolic acidosis** over time.
- Preferred if patient needs **sodium chloride replacement only**.

Lactated Ringer's (LR)
Composition: Sodium 130 mEq/L, Chloride 109 mEq/L, Potassium 4 mEq/L, Calcium 3 mEq/L, Lactate 28 mEq/L

Best Use:

- **Hypovolemia with electrolyte loss beyond sodium** (vomiting, burns, trauma)
- **Mild acidosis** (lactate metabolized to bicarbonate)
- **Surgical, obstetric, or trauma patients** needing balanced electrolytes

Considerations:

- Contains **potassium**: caution in **hyperkalemia** or severe renal impairment.
- Not ideal if patient requires **medications that interact with calcium**.

IV SPECIFIC PROTOCOLS – HYDRATION + VITAMINS/MINERALS

Solution	Dose (mg/ml)	Volume (mL)	mOsm
Ascorbic acid	500	10	58.00
Selenium	0.2	1	0.09
Zinc chloride	10	2	0.62
5-MTHF	1	5	0.035
B Complex 100	206	2	3.46
Methylcobalamin	1000	2	0.62
Dexpanthenol (B5)	250	1	0.85
Pyridoxine (B6)	100	3	3.33
Calcium chloride	100	2	4.08
Magnesium chloride	200	4	16.00
Sodium Bicarb 8.4%	84	2	4.00
Normal Saline	250	250	77.50

Totals: Volume **284 mL** · mOsm **168.585**
Final Osmolarity: ≈ 593.61 mOsm/L

This is a **hypertonic IV mixture** (> 500 mOsm/L). Infusion should be **slow and monitored** to reduce vein irritation/phlebitis risk.

Provides **hydration + vitamins/minerals** often depleted in HG (vitamin C, B complex, folate, magnesium, zinc, selenium).

Includes **electrolytes** (potassium, calcium, magnesium) and **antiemetic support vitamins** (B6, B5, folate, Vitamin C).

Can add potassium 2mEq

IV SPECIFIC PROTOCOLS - ONDANSETRON

Indication (when to use IV)

- Acute severe vomiting where oral route is not tolerated or rapid control required; hospital-based HG care; rescue therapy after other agents inadequate. Use as part of multi-modal care (fluids, electrolytes, thiamine).

IV dosing (practical hospital protocol)

- **Typical ED : 4 mg IV** bolus every **6–8 hours PRN** (many centers use 4 mg q6–8h).
- **Alternative (used in some hospitals):** 4–8 mg IV q8h.
- **Maximum single IV dose: Do not give >16 mg as a single IV dose** (dose-dependent QT risk). **Avoid single IV doses above 16 mg.**

How to give — step-by-step

- **Baseline checks** before IV ondansetron: ECG if patient has cardiac disease, bradycardia, or taking QT-prolonging meds; serum **K^+, Mg^{2+}, Ca^{2+}** and correct any abnormalities (hypokalemia/hypomagnesemia ↑ QT risk).
- IV administration: **4 mg undiluted IV push** may be given **over at least 30 seconds** (preferably over **2–5 minutes**). For doses >4 mg, dilute per product label (e.g., in 50 mL NS/D5W and infuse over 15-20 minutes depending on hospital protocol).
- Repeat dosing PRN (e.g., q6–8h). Reassess after 1 dose; if inadequate, consider combination therapy (metoclopramide, antihistamine) or move to continuous antiemetic strategy + nutrition support.

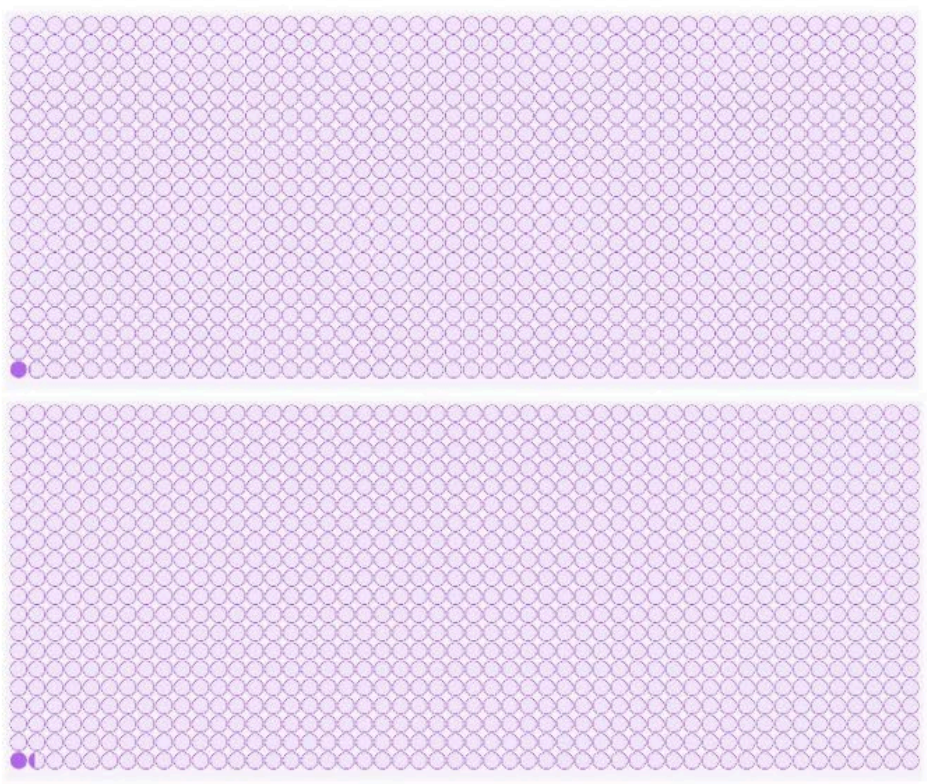
Monitoring & safety (inpatient)

- **ECG:** baseline ECG in patients with risk factors; repeat ECG if symptomatic (palpitations, syncope) or using high cumulative dose. Correct electrolytes first.
- **Adverse effects:** constipation, headache, dizziness, rare allergic reaction, extrapyramidal events (rare). Monitor for **QTc prolongation / torsades**.
- **Severe hepatic impairment:** limit total daily IV dose (≤8 mg/day). Consult pharmacy for dosing in severe liver disease.

Contraindications & drug interactions

- **Absolute / strong cautions:** congenital long QT syndrome, concurrent class IA/III antiarrhythmics or other QT-prolonging drugs unless ECG/electrolytes safe. Avoid coadministration with apomorphine.
- **Serotonergic agents:** monitor for serotonin syndrome when combined with SSRIs/SNRIs, tramadol, or MAOI exposure.

IV SPECIFIC PROTOCOLS - ONDANSETRON



Oral clefts - unexposed to Zofran
11/10,000 pregnancies

Oral clefts - exposed to Zofran
14/10,000 pregnancies

Graphic of Huybrechts' data (Huybrechts et al., JAMA (2018)) created by Brian Cleary PhD, Irish Medicines in Pregnancy Service, Rotunda Hospital/Royal College of Surgeons in Ireland.

https://www.hyperemesis.org/wp-content/uploads/2020/05/Zofran-statement-Update-2023.pdf

INTERPROFESSIONAL CARE

Why Interprofessional Care Matters
HG needs multi-system approach: nutrition, hydration, mental health, and obstetric monitoring

Naturopathic care can fill gaps in early or ongoing symptom management, but **coordination prevents fragmented care**.
Evidence supports **collaborative care improving maternal outcomes** and reducing complications.

Key Providers to Coordinate With
Medical Providers: OB/GYN, family physicians, maternal-fetal medicine specialists
Allied Health: Midwives, Dietitians, mental health providers, pharmacists

WHEN TO COMMUNICATE/ESCALATE

Red Flags:
Dehydration
Electrolyte imbalances
Inability to tolerate oral intake
Weight loss >5% of pre-pregnancy body weight

Treatment Response:
Symptoms worsening or not improving with supportive interventions

Psychosocial Concerns:
Anxiety, depression, or risk of isolation impacting maternal health

Additional Considerations:
Many patients see their GP for **only 7-10 minutes every 4 weeks**, so the severity or impact of HG may not be recognized.
Encourage patients to **communicate the functional impact** (e.g., inability to work, care for themselves or family, or maintain nutrition) not just the symptom, so their healthcare provider fully understands the burden.

INTERPROFESSIONAL CARE

To: Dr. [Last Name]
[Clinic/Hospital Name]
[Address]

Re: Urgent Referral – [Patient Name], DOB: [MM/DD/YYYY]

Dear Dr. [Last Name],
I am referring our mutual patient, **[Patient Name]**, back to your care urgently due to persistent and worsening hyperemesis gravidarum symptoms.

Clinical Summary:
Gestational age: [X weeks]
Symptoms: Persistent vomiting, inability to tolerate oral intake, weight loss, dehydration
Interventions to date: Supportive naturopathic care including dietary adjustments and hydration; patient received **IV ondansetron 2× in clinic with excellent symptomatic relief**.

Current concerns: Symptoms are recurring without consistent prescription support, ongoing risk of dehydration and electrolyte imbalance.

Reason for Urgent Referral:
Patient requires **ongoing, consistent medical management including prescription antiemetics, fluid support, and laboratory monitoring**. We are returning care to you for further assessment and to establish a sustainable treatment plan.
Please see the patient at your earliest availability. I am happy to provide a detailed summary of treatments and doses provided.

Thank you for your prompt attention.
Sincerely,
[Your Name, ND]
[Clinic Name]
[Contact Information]

CHARTING

History / Risks:
Gravidity/parity noted.
Past obstetric history: [e.g., HG in prior pregnancies, worsening with each pregnancy].
Past medical history: [screen for cardiac disease, QT prolongation, hepatic impairment].
Medications: [list].
Allergies: [list].
Exam / Clinical Assessment:
General appearance: [alert, fatigued, dehydrated signs].
Vitals: [HR, BP, Temp].
Weight: [kg].
PUQE score: [score].
Labs reviewed if available (electrolytes, renal, LFTs).

MONITORING AND FOLLOW UP

Clinical Parameters for Monitoring HG

Key Indicators:
Weight: Monitor weekly; weight loss >5% of pre-pregnancy weight indicates severe HG.
Hydration: Assess urine output, skin turgor, and mucous membranes.
Laboratory Tests: Check electrolytes (Na+, K+, Cl-), ketones in urine, and renal function.

Tools to Use:
HELP Score: Quantifies symptom severity and treatment response.
Scoring: Higher scores indicate more severe HG.
Frequency: Administer weekly to monitor changes.

PUQE-24 Score: Assesses nausea and vomiting severity over 24 hours
Scoring: Mild (4–6), Moderate (7–12), Severe (13–15).
Usage: Useful for initial assessment and follow-up.

MONITORING AND FOLLOW UP

Maternal and Fetal Health

Fetal Growth – done through Ob/midwives
Ultrasound: Conduct at 18–20 weeks and as needed thereafter.
Fundal Height: Measure at each visit to assess growth.
Doppler Flow Studies: Consider if intrauterine growth restriction is suspected.

Maternal Mental Health:
Screening: Use tools like the Edinburgh Postnatal Depression Scale (EPDS).
Frequency: Assess at each visit, especially if symptoms of depression or anxiety are present.
Support: Provide referrals to mental health professionals as needed.

POSTPARTUM SUPPORT

Recovery Timeline:
Postpartum recovery from HG typically takes an average of 4–6 months. However, if the illness was severe or prolonged, it may take a few years.

Common Postpartum Issues Include:
GI dysbiosis imbalance (infection, Helicobacter pylori)
Stomach ulcers or damage
Throat damage
Tooth damage (loss of enamel or cavities)
Low bone density (due to malnutrition)
Gallbladder sludge or stones
Malnutrition
Depression/anxiety or trauma
Muscle loss (atrophy) and weakness
Food aversions and residual nausea

POSTPARTUM SUPPORT

Mental Health Considerations:

Women who have had HG are at a higher risk for Perinatal Mood and Anxiety Disorders (PMADs), including depression and anxiety.
The trauma of HG may manifest as anxiety, depression, or even post-traumatic stress disorder (PTSD), affecting daily life and parenting

CASE PRESENTATION

Short-Term Outcomes
After hydration IV: temporary improvement, relief lasted 3–5 days
Allowed attendance at important family function/her kids' school play

At 14 weeks:

- 8 lb weight loss
- Still unable to shower/brush hair without nausea
- Labs WNL despite severity
- Escalated care to GP for home Ivs/ondansetron pump (which was approved)

CASE PRESENTATION

Long-Term Outcomes

With in-home IV + ondansetron: able to continue pregnancy to term

Outcome: Healthy baby delivered at term
Postpartum: Patient reports ongoing **PTSD symptoms**
- Scents, songs, and places trigger nausea years later
- Daily function impacted by trauma of HG experience

CASE PRESENTATION

Key Takeaways from Case

Early onset, severe vomiting should not be dismissed as “normal”
Labs may remain normal despite clinically significant HG
PUQE-24 scoring and functional assessment give a more accurate picture of severity
Family support is essential but insufficient without medical intervention
Integrative, collaborative care (ND + MD + home supports) allowed safe continuation of pregnancy
Psychological sequelae (e.g., PTSD) must be recognized and addressed postpartum

FINAL THOUGHTS – WE CAN DO BETTER

Severe nausea and vomiting is not "just morning sickness."
HG is a serious medical condition with potential maternal and fetal complications.

Old diagnostic thresholds are outdated—weight loss, dehydration, and electrolyte imbalances should prompt active intervention
Early, coordinated care for the mom and baby's health, prevents complications, and improves outcomes.

Your role matters: Listen, validate, and escalate care when needed.

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IV CONSIDERATIONS IN PREGNANCY AND LACTATION

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OUTLINE

- Physiological demands of pregnancy and lactation
  - Nutrient demands
  - Oral supplement limitations
- Role of IV nutrients in pregnancy
  - Management of common pregnancy symptoms
  - Nutrient roles in fetal development
- Risks and contraindications
  - Pregnancy-specific concerns
  - Contraindicated nutrients and dosages
- Clinical considerations
  - Screening and lab work
  - Monitoring and follow-up
  - Communication with OBs/midwives
- Safe formula guidelines and osmolarity, including sample IV formulas
  - Trimester specific adjustments
  - Key nutrients: B12, magnesium folate, Vitamin C, Calcium
  - Sample formulas
  - Osmolarity considerations
- IV nutrient therapy during lactation
  - Nutrient depletion and recovery postpartum
  - Impact on milk supply and maternal well-being

PHYSIOLOGICAL DEMANDS OF PREGNANCY AND LACTATION

IV nutrients are incredibly safe in pregnancy and breastfeeding moms

They are typically in a nutritionally depleted state

Nutritional status during pregnancy and breastfeeding is critical for mom and baby's health, but also for that of future generations

Hydration: Blood volume increases by 30-50%, adequate hydration supports plasma expansion and fetal perfusion

PHYSIOLOGICAL DEMANDS OF PREGNANCY AND LACTATION

Nutrient	RDA, Adult Non-Pregnant Women	EAR, Pregnancy	RDA, Pregnancy	UL, Pregnancy	Justifications
Vitamin A (µg/day)	700	550	770	3000	Regulation of genome expression and in cell differentiation
Vitamin D (µg/day)	15	10	15	100	Mineralization of the fetal skeleton and decreased risk of hypocalcemia accidents and symptomatic osteomalacia
Vitamin E (mg/day)	15	12	15	1000	–
Vitamin K (µg/day)	90	–	90	none	–
Vitamin B1 (mg/day)	1.1	1.2	1.4	none	–
Vitamin B2 (mg/day)	1.1	1.2	1.4	none	–
Vitamin B3 (mg/day)	14	14	18	35	–
Vitamin B6 (mg/day)	1.3	1.6	1.9	100	Relieve nausea in early pregnancy
Vitamin B9 (µg/day)	400	520	600	1000	Decreases the risk of spina bifida and other neural tube defects
Vitamin B12 (mg/day)	2.4	2.2	2.6	none	–
Vitamin C (mg/day)	75	70	85	2000	–
Calcium (mg/day)	1000	800	1000	2500	Mineralization of the fetal skeleton Prevents pre-eclampsia
Iodine (µg/day)	150	160	220	1100	Maintenance of thyroid homeostasis
Iron (mg/day)	18	22	27	45	Decreases the risk of having a low birth weight or a premature baby
Magnesium (mg/day)	320	290	350	350	Involvement in the occurrence of hypertensive disorders, gestational diabetes mellitus, preterm labor, or intrauterine growth retardation
Phosphorus (mg/day)	700	580	700	3500	–
Selenium (µg/day)	55	49	60	400	–
Zinc (mg/day)	8	9.5	11	40	Involvement in cell division, protein synthesis and growth, nucleic acid metabolism

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PHYSIOLOGICAL DEMANDS OF PREGNANCY AND LACTATION

Oral Supplement Limitations:

- Nausea and vomiting (NVP/HG)
  - Oral tolerance of supplements often reduced; adherence is poor in women with moderate–severe NVP (Fejzo et al., 2019)
- Absorption challenges
  - Especially those with GI concerns. IBD, celiac
  - Delayed gastric emptying and reflux can impact absorption
- Adherence issues
  - Forgetfulness
  - Large or hard to swallow tablets, unpleasant taste or smell
  - GI Side effects: NVP/HG, reflux

Management of common pregnancy symptoms

ROLE OF IV

Symptom / Clinical Concern	IV Nutrients / Support	Mechanism / Evidence-Based Role
Nausea & vomiting (HG)	Thiamine (B1), B-complex, folate/folic acid, electrolytes, hydration, Vitamin B6, Ascorbic acid	Prevent Wernicke's encephalopathy; replenish B-vitamin stores depleted by vomiting; support energy metabolism
Fatigue / low energy	B-complex, magnesium, iron, minerals	Correct deficiencies contributing to fatigue; coenzymes for energy metabolism; improve hemoglobin and red blood cell function
Dizziness / hypotension / dehydration	Isotonic fluids, electrolytes (Na^+, K^+, Mg^{2+}, Ca^{2+})	Restore circulating volume and maintain perfusion for mother and fetus; correct electrolyte imbalances
Poor oral intake / malnutrition	Vitamins and minerals, amino acids	Deliver essential nutrients when oral supplementation is insufficient; support fetal growth and maternal tissue expansion
Immune support / infection risk	Vitamin C, zinc, selenium	Antioxidant and immune function support; reduces oxidative stress during pregnancy; selenium supports thyroid function
Oxidative stress / inflammation	Vitamin C, Selenium	Antioxidants protect maternal and fetal cells; reduce oxidative damage associated with HG and nutrient depletion
Micronutrient deficiencies	Iron, vitamin B12, folate	Support red blood cell production, DNA synthesis, and fetal neural development
Bone health / cramps	Calcium, magnesium	Maintain maternal bone density; reduce muscle cramps; support fetal skeletal development

ROLE OF IV NUTRIENTS

Role of nutrients in fetal development

Nutrient (IV)	Key Roles in Fetal Development	Evidence / Notes
Thiamine (B1)	Neural tube development, energy metabolism	Prevents Wernicke's encephalopathy in HG; cofactor in carbohydrate metabolism
Folate (B9)	DNA synthesis, cell division, neural tube formation	Critical for neural tube closure; prevents NTDs
Vitamin B12	DNA synthesis, red blood cell formation, nervous system development	Deficiency linked to megaloblastic anemia and neurodevelopmental delay
Iron	Hemoglobin synthesis, oxygen delivery to fetus	Supports fetal growth; prevents maternal anemia
Magnesium	Enzyme cofactor, muscle and nerve function, reduces uterine irritability	Deficiency associated with preterm contractions and fetal growth restriction
Calcium	Skeletal mineralization, cardiac and neuromuscular function	Supports fetal bone formation
Vitamin C	Antioxidant, collagen formation, immune function	Supports fetal tissue growth and protects against oxidative stress
Zinc	Cell growth, immune function, DNA synthesis	Deficiency linked to IUGR and preterm birth
Selenium	Antioxidant, thyroid hormone metabolism	Supports fetal thyroid and neurodevelopment; prevents oxidative damage
Amino acids	Protein synthesis, organogenesis, CNS development	Provide essential substrates when oral intake is inadequate;

RISKS AND CONTRAINDICATIONS

Extremely unlikely that an overdose happens if you follow typical/accepted doses and administration guidelines

Why?

Because they are typically in a nutritionally depleted state

Stay within typical and reasonable doses for most nutrients

Nutrient / Electrolyte	Role in Fetal Development	Pregnancy Considerations / Dosing	Maternal/Fetal Risks
Iron	Hemoglobin synthesis; fetal iron stores	First trimester – lack of safety data. Fetal storage peaks in **third trimester**; **omit** if maternal replete; if deficient, higher doses until repletion	Iron overload, oxidative stress
Copper	Enzyme cofactor, fetal development	Fetal storage peaks in **third trimester**; if maternal replete, keep **1–2 mg or omit**; if deficient, higher doses until repletion	Overload may be toxic
Calcium	Skeletal development, neuromuscular function	Dose to tolerance; monitor for hypercalcemia	Rapid IV bolus can **stimulate uterine contractions**
Magnesium	Muscle and nerve function; possible uterine relaxation	Dose to tolerance; maintain **Mg:Ca ratio 1:1 or 2:1**	Overdose → hypotension, neuromuscular weakness
Potassium	Electrolyte balance, neuromuscular function	Either **omit from IV formula** or ≤2 mEq per 250 mL IV	Overdose → arrhythmias; caution with renal impairment
Vitamin A (preformed)	Tissue and organ development	Avoid. Can be teratogenic	Teratogenic: craniofacial, cardiac, CNS malformations
Vitamin D	Bone development, calcium metabolism	Avoid high-dose (>10,000 IU/day)	Hypercalcemia, fetal hypercalcemia
Vitamin E	Antioxidant, tissue protection	Avoid	Increased bleeding risk, uncertain fetal safety
Selenium	Antioxidant, thyroid function	Avoid >400 mcg/day	Selenosis, fetal risk
Zinc	DNA synthesis, immune support	Avoid chronic high doses	Copper deficiency, possible fetal growth issues
Vitamin C	Antioxidant, collagen synthesis	Safe at therapeutic IV doses	High doses → maternal oxalate nephropathy; no abortifacient effect has been shown in studies but theoretic risk
Amino acids (glycine, taurine, mixed amino acids)	Protein synthesis, CNS development	Safe in standard formulations; avoid high-dose	Hypersensitivity rare, safety for individual amino acids not established.

RISKS AND CONTRAINDICATIONS

Fetal storage of trace elements happens in third trimester, specifically for copper and iron

If mom is replete with iron and copper, keep doses low or keep out of formulas. Copper less than 1-2mg, and iron less than 50-100mg.

If they are deficient, then you can administer higher doses until repletion

Calcium, magnesium and potassium are possibly contractile, dose to tolerance.

Mg:Ca ratio of 1:1 or 2:1 is well tolerated

Potassium – either omit from formula or no more than 2mEq per 250ml IV

CLINICAL CONSIDERATIONS

Maternal safety:

- Hemodynamic stability. Monitor vitals pre and post infusion (risk of hypo/hypertension, tachycardia and arrhythmias)
- Fluid overload. Avoid rapid infusions and shifts in electrolytes. Pregnant patients are more susceptible to pulmonary edema, especially those with pre-eclampsia and cardiac conditions
- Infection control: strict aseptic technique to reduce phlebitis and infection risk
- Continuous monitoring during infusion for adverse reactions (swelling, chest tightness, dizziness, IV site irritation)
- Extreme caution in patients with high-risk pregnancies (pre-eclampsia, diabetes, renal or cardiac disease, or intrauterine growth restriction)

CLINICAL CONSIDERATIONS

Fetal/Baby Safety:

- Amniotic fluid dynamic: excess or insufficient fluid can impact oligohydramnios or polyhydramnios. Is it appropriate to drip an IV if amniotic fluid levels aren't WNL? Probably not.
- Nutrient safety. Avoid teratogenic exposures. Steer clear of Vitamin A, Vitamin E, high dose selenium or copper, or non-indicated nutrients/drugs. Verify that everything is pregnancy-compatible
- Nutrient safety. Caution with components that alter uterine tone such as potassium, magnesium sulfate, calcium

COMMUNICATION WITH CIRCLE OF CARE

Key Principles for Collaboration:

Transparency:

- Proactively share treatment details, including formulation, dosing, and frequency of IV drips.

Evidence-Informed Practice:

- Highlight safety data, rationale for use (e.g., addressing dehydration, nutritional gaps), and reference guidelines when available.

Shared Decision-Making:

- Emphasize that the patient's care is coordinated and aligned with her OB/midwife's plan.

Respect Scope & Expertise:

- Acknowledge the OB/midwife's primary role in pregnancy care and invite feedback or contraindication concerns.

Streamlined Communication:

- Provide concise written updates (fax/email/secure portal)

COMMUNICATION WITH CIRCLE OF CARE

To: [OB/Midwife Name]
[Practice/Clinic Name]

Re: [Patient Name, DOB]

Dear [OB/Midwife Name],

I am writing to update you on our mutual patient, [Patient Name, DOB]. She has been receiving vitamin/nutrient IV therapy at our clinic to support hydration and nutritional status in the context of [nausea/vomiting, dehydration, or other concerns].

Protocol Summary:

Formulation: [insert components]

Frequency: [e.g., once weekly]

Monitoring: Vitals and tolerance are assessed at each visit.

Therapies are pregnancy-appropriate, evidence-informed, and adjusted as needed. We remain mindful of interactions with her prescribed medications and your ongoing care plan. I value your role as the primary provider for [Patient Name]'s pregnancy and welcome any feedback or contraindications you feel are important. Please don't hesitate to reach me at [phone/email] with any concerns.

Thank you for your collaboration in ensuring [Patient Name]'s care is safe and well-coordinated.

Warm regards,
[Your Full Name, Credentials]
[Your Clinic Name]
[Your Contact Information]

SAFE FORMULA GUIDELINES

Recommended to keep solutions Isotonic or only slightly hypertonic

1. Protects Maternal and Fetal Circulation

- Hypertonic solutions (high osmolarity) can **draw water out of cells**, potentially causing maternal and fetal cell dehydration or vascular irritation.
- Hypotonic solutions (low osmolarity) can **push water into cells**, risking maternal and fetal cell swelling.
- Isotonic solutions maintain **stable intravascular volume**, ensuring consistent uteroplacental blood flow.

2. Reduces Risk of Electrolyte Imbalances

- Pregnancy already alters electrolyte dynamics: plasma volume increases ~30–50%, sodium and water balance shifts, and kidney function changes.
- Isotonic fluids help **prevent sudden shifts** that could lead to hyponatremia, hypernatremia, or edema.

3. Minimizes Uteroplacental Stress

- Abrupt fluid shifts (from hypotonic or hypertonic IVs) can affect **placental perfusion**.
- Maintaining isotonicity keeps **fetal oxygenation and nutrient delivery steady**.

4. Venous and Tissue Safety

- Isotonic solutions are less irritating to veins, lowering the risk of **phlebitis** or local tissue damage, which is important for frequent or prolonged IV therapy.

SAFE FORMULA GUIDELINES

Prenatal Wellness IV (general support, all trimesters)

- **Carrier:** 100-250 mL 0.9% NaCl or Lactated Ringer's
- **B100 Complex (B1, B2, B3, B5, B6):** standard 1 mL mix
- **Vitamin B12 (methylcobalamin):** 1 mg
- **Folate (5-MTHF):** 1-5 mg
- **Vitamin C**:** 2-5g
- **Magnesium sulfate/chloride:** 200-800 mg
- **Calcium chloride:** 100-400mg
- **Zinc chloride:** 1 mg

**omit if trying to stay as isotonic as possible

SAFE FORMULA GUIDELINES

First Trimester (0–13 weeks)
Main Focus: Early fetal organ formation + supporting maternal adaptation
Folate (5-MTHF): Most critical here → neural tube closes by week 6.
B12: Needed alongside folate for DNA synthesis and neurological development.
B6: Nausea support (common in early pregnancy).
Vitamin C: Antioxidant, supports immune system during early immune shifts.
Magnesium: Helps reduce uterine irritability, supports energy.

Second Trimester (14–27 weeks)
Main Focus: Rapid fetal growth + blood volume expansion
Iron: Demand rises significantly → maternal anemia risk increases.
B vitamins (esp. B12, Folate): Support expanding blood cells.
Calcium: Begins to matter more → fetal skeletal growth accelerates.
Magnesium: Reduces leg cramps, supports muscle relaxation.
Zinc & Selenium: Trace minerals for immune and thyroid support.

Third Trimester (28 weeks–delivery)
Main Focus: Preparing for birth + maximizing fetal reserves
Iron: Highest need → prevent late-pregnancy anemia (critical for delivery).
Calcium & Magnesium (balance): For maternal BP regulation, preeclampsia prevention, muscle/nerve balance.
Vitamin C: Collagen synthesis (placenta, membranes), antioxidant defense.
B Complex & B12: Energy metabolism for mom, nervous system development for baby

RISKS AND CONTRAINDICATIONS - LACTATION

- Vitamin C levels in breast milk increases, and might predispose babies to a higher risk of kidney stones. However **use of intravenous (IV) vitamin C has not been studied in breastfeeding women**
- Mothers of babies with poor kidney function and G6PD deficiency should avoid taking excessive doses of vitamin C.

GOAL OF IVS IN POSTPARTUM

- **Maternal Recovery:** Rebuilding blood, tissues, hormones, and immune balance requires high nutrient availability.
- **Breastfeeding Quality:** Nutrient-rich breast milk depends on maternal stores (esp. B vitamins, iodine, selenium, vitamin D).
- **Mental Health:** Iron, B vitamins, vitamin D, magnesium → all linked to mood and postpartum depression risk.
- **Future Pregnancies:** Depleted women entering another pregnancy face higher risks of complications (anemia, preeclampsia, growth restriction).

POSTPARTUM SUPPORT

Breastfeeding & Milk Quality

- Breast milk composition partly reflects **maternal nutrient status**. Some nutrients remain stable regardless of intake, but others vary widely:
- **Directly affected by maternal stores/intake:**
  - **B vitamins (B1, B2, B6, B12, folate):** low maternal status = low milk levels → infant irritability, poor growth, delayed neurodevelopment.
  - **Vitamin D:** breast milk usually deficient unless mom is supplemented → infant rickets risk.
  - **Selenium:** essential for infant thyroid function, brain development.
- **Stable in milk but at maternal expense:**
  - **Calcium & Iron:** milk levels remain adequate, but mom's bones and iron stores get depleted → maternal anemia, bone loss, higher fracture risk later.

POSTPARTUM SUPPORT

Maternal Physical Health

- **Iron depletion:** anemia → fatigue, dizziness, poor healing, higher infection risk.
- **Calcium + Vitamin D depletion:** bone mineral loss → risk of osteopenia/osteoporosis, dental problems.
- **Magnesium depletion:** worsens stress, poor sleep, higher BP.
- **Zinc & Vitamin C depletion:** impaired wound healing (perineal tears, C-section recovery), weaker immunity.

Maternal Mental Health

- **Iron & B12 deficiency:** linked to postpartum depression, poor cognition, “brain fog.”
- **Vitamin D deficiency:** strong evidence for association with postpartum mood disorders.
- **Magnesium deficiency:** contributes to anxiety, insomnia, poor stress resilience.

Long-Term Maternal Outcomes

- Repeated pregnancies without repletion can lead to **chronic depletion cycles** → higher risks of cardiovascular disease, osteoporosis, thyroid dysfunction, and mental health disorders later in life.

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