A more intensive dialysis schedule is recommended, with BUN levels targeted to <16 to 18 mmol/L. This is usually achieved by increasing the frequency of HD sessions to five to seven per week, or switching to long nightly HD sessions, targeting a weekly Kt/V of 6 to 8. The target prescription for potassium is 3.5 to 4 meq/L; for sodium, 130 to 135 meq/L; for bicarbonate, 25; and calcium, 2.5.

Anticoagulation
We recommend the minimum required dose of heparin. Aspirin can be used for pre-eclampsia prophylaxis but needs to be stopped in the last few weeks of pregnancy during plans for surgery.

Peritoneal dialysis
Intensifying PD as pregnancy progresses, by decreasing volumes and increasing the number of cycles, is sufficient for most patients. Supplemental HD can be used. Icodextrin can be used when the benefits outweigh the risks (pregnancy category C).

Anemia
Anemia, which is common in both pregnancy and ESRD, is compounded in pregnant women receiving HD, whereas PD offers some advantage. The use of erythropoiesis-stimulating agents (ESA) to treat anemia (pregnancy category C) is required. There are case reports of darbepoetin being successfully used in pregnancy, with no obvious side effects. ESA dosing may need to be (twofold to threefold) higher in these patients. Vitamin B12 and folate replenishments are recommended. If the woman is iron deficient, intravenous iron sacros (pregnancy category B) can be used. A target hemoglobin of 10 to 11 g/dL is ideal.

Bone mineral disease management
Svelvam, lanthanum, aluminum, cinacalcet, and paricalci- tol have not been well tested or established for use during pregnancy; but it is not anticipated that the woman will need these because of increased dialysis. There are case reports of successful outcomes with cinacalcet; however, more data are needed before recommendations can be made.

Phosphorus may need to be replenished, as may dialyz- able multivitamins (vitamin C, thiamine, riboflavin, niacin, vitamin B6). Although it is quite unlikely, if the patient has elevated phosphorus, she can be safely treated with calcium-based binders throughout the pregnancy. Limited data are available regarding the use of other binders.

Vitamin D deficiency should be addressed. Calcitriol has been used in pregnancy, with additional calcium supplementation of 1.5 to 2 grams daily. The developing fetus requires approximately 30 grams of calcium for development. Al- though hypocalcemia is a concern, the patient should also be monitored for hypercalcemia, which can cause restricted development of the fetal parathyroid gland.

Nutrition
The pregnant woman with ESRD needs proper nutrition to support fetal development and maintain weight gain. Most dietary restrictions are relaxed because of intensified dialysis. A target protein intake of 1.5 to 1.8 kg/kg of her prepregnancy weight per day + 20 g/day is recommended, with calories increased to 25 to 35 kcal/kg of pregnant weight per day.

Dry weight management
Dry weight management is complicated in most HD pa- tients. The complexity increases when pregnancy weight gain must be factored into this equation. Ultrafiltration goals are usually relaxed to accommodate for weight gain. However, a close watch on BP and physical signs and symptoms must be kept because these patients are at risk of overloading rapid- ly. About 1 kilogram gain in weight is expected in the first trimester, followed by about 0.5 kilograms per week in the second and third trimesters. Avoiding large fluid removal is of paramount importance to prevent compromised uterine blood flow.

Hypertension
Hypertension is commonly associated with both pregnancy and ESRD. Severe hypertension is a significant concern for
milk composition between pre-HD and post-HD samples suggest that breastfeeding after a dialysis session is preferable to breastfeeding beforehand. The authors of that study suggested that the mother discard milk pumped immediately before dialysis.

We could not find any data on women receiving PD; however, we assume that similar changes can be expected but without major variations because of the continuous nature of PD. Lactation-safe medications for hypertension and comorbid conditions will be needed; they include metyldopa, labetalol, and nifedipine. Metyldopa, though the best recommended for this period, does have the potential of causing further depression in the mothers, who are already in a high-stress situation. Angiotensin-converting enzyme inhibitors, including captopril and enalapril, are secreted in low amounts in breast milk and may be used if needed, with close assessment of neonates for hypotension. Aggressive ultralfiltration may reduce the milk supply. Avoiding heparin that contains the preservative benzyl alcohol is prudent because it is potentially toxic to at-risk infants.

**Emotional support**

Through all this, it is evident that mothers with ERD face multiple extremely stressful challenges. Difficulty in conception, difficulty in maintaining pregnancy, and the need to care for a child by a patient who is already struggling for her own survival on dialysis require major coping skills. Postpartum depression should be expected. The role of follow-up emotional supportive care and mental health counseling cannot be emphasized enough. However, data are strikingly lacking in this area.

**Suggested reading**


**Table 1. An overview of pregnancy-related hormones**

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Normal secretion in pregnancy</th>
<th>Status during HD</th>
<th>Status during PD</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCG</td>
<td>Elevated with pregnancy</td>
<td>Elevated with dialysis</td>
<td>Elevated with dialysis</td>
<td>Development of anchoring villi during pregnancy (establishment and maintenance)</td>
</tr>
<tr>
<td>TSH</td>
<td>Elevated T3, T4, result in lower TSH values</td>
<td>No significant change; both 10% increase or decrease have been reported</td>
<td>Despite large T3B loss; no major change noted; however, early thyroid failure has been noted in nonpregnant PD patients warranting follow-up</td>
<td>Increased T3, T4 to maintain increased metabolic demands of pregnancy</td>
</tr>
<tr>
<td>Prolactin</td>
<td>Anterior pituitary hormone, increases throughout pregnancy</td>
<td>ND</td>
<td>ND</td>
<td>Increases during pregnancy to lactation</td>
</tr>
<tr>
<td>Progesterone</td>
<td>Up to 10 weeks secreted from the corpus luteum, then by placenta</td>
<td>ND</td>
<td>ND</td>
<td>Prepares endometrium, required for implantation, suppresses maternal rejection of trophoblast, prevents preterm labor; postpartum fall was noted in one case report</td>
</tr>
<tr>
<td>Human placental lactogen</td>
<td>Produced and secreted by the syncytiotrophoblast of the placenta</td>
<td>Data unavailable; considered ND</td>
<td>Data unavailable; considered ND</td>
<td>Promotes fetal growth</td>
</tr>
<tr>
<td>FSH</td>
<td>Together with LH, the gonadotropins stimulate ovarian follicle and help further the pregnancy cascade hormones</td>
<td>Data unavailable; considered ND</td>
<td>Data unavailable; considered ND</td>
<td>Maturation of primordial cells</td>
</tr>
<tr>
<td>LH</td>
<td>Data unavailable; considered ND</td>
<td>Data unavailable; considered ND</td>
<td>Data unavailable; considered ND</td>
<td></td>
</tr>
<tr>
<td>Estradiol</td>
<td>Gradual suppression</td>
<td>Gradual suppression</td>
<td>Gradual suppression</td>
<td>Promotes uterine blood flow, myometrial growth, stimulates breast growth</td>
</tr>
<tr>
<td>ACTH</td>
<td>ND, but a significant increase is noted after dialysis likely due to stress of dialysis</td>
<td>Not as high as HD</td>
<td>Parturition and the “let down” response during lactation</td>
<td></td>
</tr>
<tr>
<td>Oxytocin</td>
<td>Postpittuitary hormone, concentrations rise continuously until parturition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADH</td>
<td>Postpittuitary, metabolic clearance rate of ADH increases in second trimester due to vasopressinase released by the placenta</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ACTH = adrenocorticotropic hormone; ADH = antidiuretic hormone; FSH = follicle-stimulating hormone; HCG = human chorionic gonadotropin; HD = hemodialysis; LH = luteinizing hormone; PD = peritoneal dialysis; T3B = T4-binding globulin; TSH = thyroid stimulating hormone.