Recommendations for the care of women with epilepsy

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ABSTRACT

The clinical care of women with epilepsy entails special considerations over the life span. Endogenous depression is more prevalent in persons with epilepsy than in the general population and may be unrecognized. Seizure frequency may be influenced by hormonal fluctuations, as reflected by catamenial patterns in up to 25% of women and by changes at menopause. Fertility is lower in women with epilepsy. These women should be evaluated for anovulatory cycles and particularly for polycystic ovary syndrome, with its attendant health risks. It is important to provide folate supplementation during the childbearing years and to evaluate bone health throughout life, providing calcium and vitamin D supplementation when indicated. Particular consideration is indicated before conception and during pregnancy to minimize both potential teratogenicity secondary to antiepileptic drugs (AEDs) and the risks that seizures pose to fetus and mother. At delivery, vitamin K is indicated. Some infants may need to be monitored for AED withdrawal, while others may require a perinatal team if malformations are identified in utero. Breast-feeding is possible, with sedation rarely being a problem. Recognition, evaluation, and management of these issues will minimize the negative impact of epilepsy and improve lifelong quality of life.

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The practical care of women with epilepsy should incorporate the science discussed earlier in this supplement with the art of caring for patients. Special considerations regarding treatment decisions and alterations occur at various stages of a woman's life and reproductive cycle. Some treatment decisions have long-term or lifelong consequences beyond the immediate therapeutic period **(Table 1)**. Building on the previous detailed reviews in this supplement, this article offers general recommendations on the management of women with epilepsy throughout the life span.

PSYCHOLOGICAL HEALTH

Depression has a lifetime prevalence of 40% to 60% in persons with epilepsy,[1] making it the most common psychiatric disorder in this population. Depression in persons with epilepsy appears to be primarily endogenous. Compared with their nonepileptic counterparts, epileptic persons with depression tend to exhibit fewer neurotic traits and more psychotic symptoms, such as delusions, paranoia, and persecutory auditory hallucinations.[2] Behavioral effects, including depression, anxiety, aggression, and psychosis, can be a consequence of:

- Seizure-related factors (eg, complex partial seizures of temporal lobe origin)
- Psychosocial factors, such as the stigma of epilepsy, decreased sexuality, fear of teratogenesis, and restriction of activities
- Adverse effects of antiepileptic drugs (AEDs)
- Other contributing risk factors, which may include genetic, endocrinologic, metabolic, or environmental factors.

The psychological status of women with epilepsy should be evaluated throughout their lives so that early treatment may be initiated and a psychological disorder will not further impair function and quality

TABLE 1
Long-term consequences of antiepileptic drugs

Consequences	Drugs implicated
Cosmetic consequences	
• Gingival hyperplasia	Phenytoin
• Hirsutism	Phenytoin
• Hair loss	Valproate
Connective tissue changes	Phenobarbital, phenytoin
Reduced bone density	Carbamazepine,* phenobarbital, phenytoin, primidone, valproate*
Weight gain	Carbamazepine, gabapentin, valproate

*Ongoing trials are evaluating this trend.

of life. Psychiatric comorbidity can be efficiently screened for with tools such as the Beck Depression Inventory, Profile of Mood States, and Cornell Dysthymia Scale. The many components of quality of life may be evaluated and measured by interview and by a shortened quality-of-life screening tool such as the 31-item Quality of Life in Epilepsy Inventory. Treatment approaches may include evaluation of AED choice; use of antidepressant, antianxiety, or other psychotropic medications; and referral for counseling or psychotherapy when appropriate.

PREPREGNANCY ISSUES

Assessment for catamenial epilepsy. During premenarche and menarche, a differentiation of seizure pattern associated with the menstrual cycle may become apparent for nearly 25% of women with epilepsy. Catamenial epilepsy is defined as a doubling of the baseline seizure frequency during hormonal changes in the menstrual cycle. Specific catamenial seizure patterns have been identified,[3] with an increase in seizure frequency at the following times:

- During perimenstrual days (pattern C1)
- At ovulation (pattern C2)
- In the setting of anovulation when the luteal phase is inadequate (pattern C3).

Every woman with epilepsy should be objectively assessed for a catamenial pattern through the use of a monthly calendar recording both seizure occurrence and menstrual flow. Although there is no well-controlled, double-blind trial of any therapeutic modality to improve seizure control for women with catamenial epilepsy, several modalities have been reported to be useful for women with C1 and C2 patterns **(Table 2)**.[4–7]

TABLE 2
Management strategies for women with C1 or C2 patterns of catamenial epilepsy[6,7]*

1. Check total and free antiepileptic drug (AED) levels before and at the time of breakthrough. If they are decreased, give a bolus dose of the AED at the C1 or C2 period.
2. Give acetazolamide up to 1 g/day in divided doses as a burst at C1 or C2 period, replacing K^+ as necessary. (Panel† recommends discontinuing acetazolamide between menses to prevent rebound effects.)
3. Administer a benzodiazepine burst at C1 or C2 period[4,5]
4. Give oral contraceptives
   a. Depot medroxyprogesterone acetate (Depo-Provera), combined oral pill
   b. Progesterone lozenges[6,7]
      - Days 14–25: 100–200 mg three times daily
      - Days 26–27: 50–100 mg three times daily
      - Day 28: 50 mg three times daily
   c. Natural progesterone (Prometrium) 100–400 mg daily

* See also the article by Foldvary-Schaefer and colleagues in this supplement (pages S11–S18).

† At an experts roundtable meeting, "Epilepsy in Women: The Biological Basis for the Female Experience," New York, N.Y.; February 28, 2003.

Infertility and altered hormone cycling. Fertility is two to three times lower in women with epilepsy than in the general population, and these women are only one third as likely as their female siblings to become pregnant (see the article by Morrell and Montouris in this supplement). The causes may be multifactorial, as discussed by others[8–11] (see also the article by Foldvary-Schaefer and colleagues in this supplement).

The monthly diary described above may be useful in defining anovulatory cycles. Ovulation is normally characterized by a midluteal progesterone level of more than 3 to 5 ng/mL and/or by a morning body temperature elevation of more than 0.7°F in midcycle. Anovulatory cycles typically are irregular. Cycles that are shorter than 23 days or longer than 35 days, missed menses, or midcycle bleeding can be indicative of anovulation. Coordinating care with an obstetrician-gynecologist or endocrinologist is indicated if menstrual irregularity is noted.

Clinicians should be sensitive to any evidence of altered hormone cycling that suggests polycystic

TABLE 3
Polycystic ovaries vs polycystic ovary syndrome

Polycystic ovaries
8 to 10 cysts that are 4 to 10 mm in diameter in a peripheral distribution around the ovary

Polycystic ovary syndrome
- No requirement for presence of ovarian cysts
- Menstrual dysfunction:
  —Fewer than 6 to 9 menses per year
  —Cycles of < 23 days' or > 35 days' duration
- Hyperandrogenism: increased testosterone, hirsutism, acne, androgenic alopecia
- Obesity in truncal distribution
- Impaired glucose tolerance with insulin resistance
- Abnormal lipid profile

ovaries or polycystic ovary syndrome (PCOS) **(Table 3)**.[12] Women presenting with the PCOS phenotype **(Table 3)** should undergo further evaluation to minimize the long-term health risks through hormone therapy, diet, and exercise. Direct questioning about hair patterns is crucial, as many women use hair-removal and hair-growth products for cosmetic reasons and the androgenic alopecia or hirsutism that is often characteristic of PCOS may not be evident during the interview.

Folic acid supplementation. From preadolescence to menopause, women with epilepsy should be advised to take supplemental folic acid. Although no double-blind controlled trial has been done to document definitively a cause-and-effect relation between maternal folic acid deficiency and neural tube defects, the incidence of neural tube defects in the general US population has declined since mandatory folic acid fortification of enriched grain products went into effect.[13] For women with epilepsy taking drugs other than valproate, the dosage of supplemental folic acid is not clearly determined, but 2 to 4 mg/day is recommended. For women with epilepsy taking valproate, 4 mg/day is recommended.

Folic acid supplementation should begin at least 1 month before a planned conception. However, more than half of all pregnancies are unplanned, and women often do not realize that they are pregnant until the 6th week of pregnancy. Therefore, primary care physicians and/or neurologists should provide this critical preventive measure to all women with epilepsy who are of childbearing age (see the article by Yerby and colleagues in this supplement).

TABLE 4
Effect of antiepileptic drugs (AEDs) on hormonal contraceptive agents[14]

Enzyme-inducing AEDs	Enzyme-inhibiting AEDs	AEDs with no effect
Barbiturates	Felbamate	Ethosuximide
Carbamazepine	Valproate	Gabapentin
Oxcarbazepine		Lamotrigine
Phenytoin		Levetiracetam
Topiramate >200 mg/day		Tiagabine
		Zonisamide

Contraceptive efficacy. Birth control is an important part of the social and medical concerns of our patients with epilepsy. The efficacy of nonhormonal methods of contraception is not affected by AEDs or by epilepsy itself. Hormonal methods of contraception may be affected by AEDs, depending on the metabolic pathways involved in the breakdown of the birth control hormone (combined oral pill or progestin-only formulations given by injection or subcutaneous implant) **(Table 4)**. The AEDs that induce the hepatic cytochrome P450 system have been shown to induce the metabolism of the hormonal agents and may thereby increase the contraceptive failure rate of these agents.[14] It has been typically recommended that barrier methods of contraception be used concomitantly or that a higher estrogenic content (at least 50 µg of estradiol per pill) be prescribed. There is no definitive prospective study that clarifies this issue. The perceived increased overall health risk of formulations with a higher estrogen content may be "false" in that the estrogen is metabolized more quickly to a lower effective dose, thus avoiding the potential complications of high-dose estrogen therapy.

PREGNANCY

Pregnant women with epilepsy may be at greater risk for complications, difficult labor, and adverse outcomes than the general population, as discussed previously in this supplement. Prenatal counseling by the neurologist and the primary care physician in conjunction with the obstetrician-gynecologist can reassure the patient that 90% of women with epilepsy have successful pregnancies with healthy outcomes.

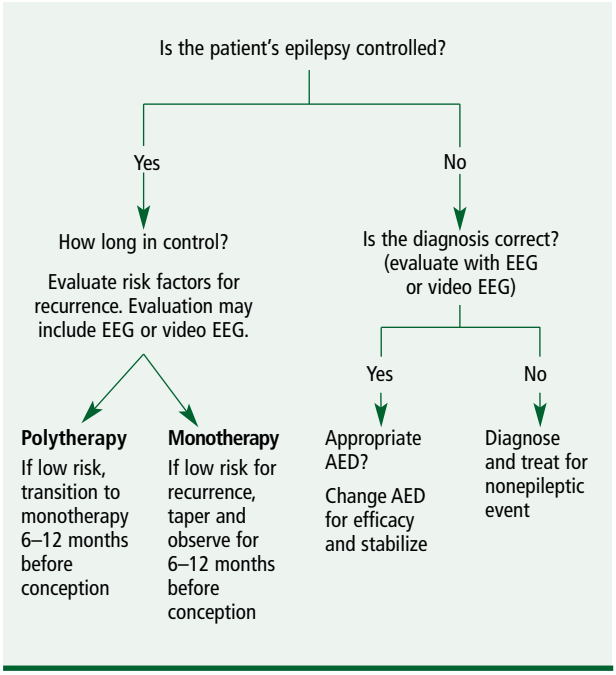

FIGURE 1. Prepregnancy evaluation for the use of antiepileptic drugs (AEDs).

Pregnancy is not the time to make a major medication change or discontinue a medication. For women with epilepsy who have plans of childbearing, recommendations for AED use should be addressed and any changes made in anticipation of the pregnancy. The primary care physician may wish to consult with the neurologist in this complex decision tree **(Figure 1)**. AED selection is a complicated decision based on seizure classification, epilepsy syndrome, and known or estimated teratogenic risk of the AED **(Table 5)**.[15,16] Other factors that may affect the outcome of the patient's pregnancy should be evaluated as well. These include maternal age, other medications that the woman is taking (including over-the-counter and herbal medications), smoking, alcohol use, nutritional habits, exercise, social support systems, and access to health care.

Seizure control is the goal. The primary goal is to maintain good seizure control throughout pregnancy, particularly for tonic-clonic seizures, which can injure the mother and the fetus via hypoxia, acidosis, and blunt trauma. These factors place the fetus at greater risk for developmental problems, stillbirth, or spontaneous abortion, and they outweigh the risk of AED exposure. Medication compliance should be stressed, and free (when appropriate and available) and total drug levels should be monitored monthly and maintained at levels that provided optimum control for the patient before pregnancy. If a seizure occurs, is self-limited, and is typical for the patient, an evaluation of provocative factors (sleep deprivation, illness, drug level) may suffice. If the seizure is atypical for the patient (eg, a new seizure type), prolonged, or secondarily generalized, a reevaluation may be indicated that includes imaging. In the event of a generalized seizure, preeclampsia must be ruled out through serial blood pressure readings and urinalysis for glucose and ketones.

Seizures during labor. If a seizure occurs during labor or delivery, eclampsia must be ruled out as causative. Only 1% to 2% of women with epilepsy have a seizure during labor.[17] AEDs should be continued throughout labor; however, absorption may be delayed and intravenous administration may be called for if it is feasible. If a parenteral form of the patient's AED is not available, a buccal or intravenous benzodiazepine, intravenous fosphenytoin, or intravenous valproate may be used emergently. Emergency intravenous therapy with a benzodiazepine, fosphenytoin, or valproate, according to standard protocols, may be used for a prolonged seizure or status epilepticus. Fetal bradycardia and increased uterine contractility have been demonstrated during a single partial seizure with secondary generalization.[18] Lorazepam used for seizures during labor and delivery has been anecdotally reported to reduce fetal heart rate, although this decrease may have been due to the seizure itself.[17]

Monitoring fetal status. The patient's neurologist, primary care physician, and obstetrician should be in consultation throughout the pregnancy. The fetal status should be monitored regularly. Most obstetricians perform early ultrasonography at 12 weeks and measure maternal serum alpha fetoprotein at 16 weeks. High-level anatomic ultrasonography should be performed at 16 to 18 weeks to detect neural tube defects as well as skeletal, cardiac, and facial abnormalities. Repeated high-definition ultrasonography may be necessary at or before 22 weeks to fully evaluate the fetus for facial and cardiac deformities. Despite advances in diagnostic resolution, parents must be counseled that no prenatal testing is 100% accurate for detecting fetal anomalies. If there are specific indications, such as metabolic or chromosomal concerns, amniocentesis or other special studies may be performed. Subsequent ultrasonographic examinations for fetal growth and condition may be performed as the obstetrician deems necessary.

TABLE 5
Teratogenic profile of antiepileptic drugs[15,16]

Antiepileptic drug	Use (seizure types)	Major malformations	FDA pregnancy category	Panel opinion*
Carbamazepine	Partial, tonic-clonic	Facial, spina bifida, cardiac	D	Caution
Ethosuximide	Absence	No specific	C	Safe
Felbamate	Partial, tonic-clonic, absence, myoclonic	Unknown	C	Unknown
Gabapentin	Partial, tonic-clonic	Unknown	C	Unknown†
Lamotrigine	Partial, tonic-clonic, absence, myoclonic, atonic	Unknown	C	Safe?‡
Levetiracetam	Partial, tonic-clonic, ?absence, myoclonic	Unknown	C	Unknown
Oxcarbazepine	Partial, tonic-clonic	Unknown	C	Unknown†
Phenobarbital	Partial, tonic-clonic, ?myoclonic	Cleft palate, heart	D	Caution
Phenytoin	Partial, tonic-clonic	Cleft palate, heart	D	Caution
Tiagabine	Partial, tonic-clonic	Unknown	C	Unknown
Topiramate	Partial, tonic-clonic, myoclonic, atonic	Unknown	C	Unknown†
Valproate	Partial, tonic-clonic, absence, myoclonic, atonic	Spina bifida	D	Caution
Zonisamide	Partial, tonic-clonic, myoclonic, ?absence, atonic	Unknown	C	Unknown†

* At an experts roundtable meeting, "Epilepsy in Women: The Biological Basis for the Female Experience," New York, N.Y.; February 28, 2003. Panel opinion is based on clinical experience and does not imply results from a scientific controlled study, which is unavailable at this time.

† Sufficient data not yet available. See discussion by Yerby and colleagues on page S33 of this supplement.

‡ See discussion on pages S54–S55 of this article.

Vitamin K supplementation. In infants whose mothers take enzyme-inducing AEDs, a hemorrhagic syndrome resulting from a deficiency of the vitamin K–dependent clotting factors II, VII, IX, and X may occur with bleeding internally, intracranially, and in subcutaneous tissues[17] (see also the article by Yerby and colleagues in this supplement). Despite normal maternal coagulation measures, the infant cannot absorb orally administered vitamin K at birth because of the sterile environment in the gut. The fetus relies on vitamin K transported across the placenta to protect against hemorrhage associated with labor and delivery. Giving the mother supplemental vitamin K, 10 mg/day, during the last month of pregnancy, beginning at week 36, permits adequate transplacental supplementation for the infant. Although this syndrome is not known to occur with use of the newer, non-enzyme-inducing AEDs, it is prudent to give every woman with epilepsy supplemental vitamin K for the final 4 weeks of pregnancy. Intravenous vitamin K can be given to the neonate at birth if the mother has not received vitamin K. The infant must receive fresh frozen plasma intravenously in the event of any hemorrhage, which can have a catastrophic outcome.

AED withdrawal in the infant. The infant has been exposed to the mother's AEDs throughout the pregnancy. Fetal metabolism of AEDs is limited. After birth, the infant's AED level will decrease according to the infant's serum level and metabolism (neonatal serum AED levels are comparable to the maternal free or unbound level). There may be a withdrawal syndrome, with lethargy, irritability, and feeding difficulties, particularly when the infant has been exposed to phenobarbital, phenytoin, benzodiazepines, or narcotic anesthetics. A severe withdrawal syndrome may require treatment with sedation or intensive care nursery observation.

Breast-feeding and postnatal AED kinetics. Breast-feeding is recommended for infants of women with epilepsy. AEDs are excreted in breast milk in inverse proportion to their protein binding **(Table 6)**. Sedation beyond that normally seen with feeding is rare except with phenobarbital. A suggestion to feed

TABLE 6
Pharmacokinetic profile of antiepileptic drugs*

Antiepileptic drug	Half-life (hr)	Protein binding (%)	Serum level (μg/mL)	Free level available?
Carbamazepine	5–12	75	6–12	Yes†
Ethosuximide	25–60	0	50–100	
Felbamate	13–30	25	30–100	
Gabapentin	5–7	0	4–16	
Lamotrigine	15–29–60‡	55	4–20	
Levetiracetam	7–8	0	< 40?	
Oxcarbazepine	8–10§	40	10–35	
Phenobarbital	70–90	45–60	15–40	
Phenytoin	7–42	90	10–20	Yes
Tiagabine	5–9	96	—¶	
Topiramate	20–24	10	2–25	
Valproate	8–12	85–95	50–150	Yes
Zonisamide	60	40–60	10–40	

* Data compiled and adapted from references 15 and 16.
† Measure carbamazepine epoxide also.
‡ Polytherapy vs monotherapy vs with valproate.
§ Used as monotherapy.
¶ Not clinically meaningful.

by breast for half of each feeding and then feed by formula has been useful; this still supplies the infant with the maternal immunoglobulins and preserves the important mother-infant bonding experience.

For most AEDs, the pharmacokinetics in the mother will return to prepregnancy levels within 10 to 14 days after delivery. This will require a downward titration of AEDs if they were increased during the pregnancy. AED levels should be measured 1 and 3 days and 2 weeks postpartum. Toxicity will result if doses are not reduced. Dosages may need to be decreased because of the emergence of side effects and toxic symptoms, especially with the new-generation AEDs, for which determination of drug levels sometimes requires up to a week of laboratory processing. Lamotrigine has recently been observed, on the basis of clinical symptomatology, to return to prepregnancy kinetics within the first 3 postpartum days (oral communication from G.D. Montouris, February 28, 2003).

TABLE 7
Tips for new mothers who have epilepsy

- Routines are disrupted. That's normal, but *take your medication*.
- Nap when the baby naps.
- Have someone else bring the baby to you for night feedings if breast-feeding; if bottle-feeding, have someone else do the night feedings to minimize sleep deprivation.
- The baby should not sleep in bed with you, in case of seizure.
- Change diapers with the baby in a safe position, eg, strapped onto a sturdy changing table, on a wide bed, in the crib, or on the floor. Have diaper stations on each floor of the house.
- Bathe the baby only when someone else is there to help.
- Strap the baby in a stroller when transporting, to prevent drop injuries or falling on top of the baby.

Advice for new mothers. Some practical counseling for the epileptic woman who will soon have a newborn infant is important. Like any new mother, she will be stressed and sleep-deprived. These factors may predispose her to seizure exacerbation. Caring for the infant at this time may be of even more concern. Some practical guidance is outlined in **Table 7**.

TERATOGENICITY AND DEVELOPMENTAL EFFECTS

To date, there is no prospective, controlled, comparative trial that indicates which AED is safest during pregnancy. Overall, infants of women with epilepsy have a reported rate of congenital major malformation between 4% and 6%, about twice that of the general population. This increased risk is especially high for women who require AED polytherapy, have refractory epilepsy, or require high serum drug levels for seizure control. This suggests that optimal maternal seizure control, monotherapy, and avoiding high peak serum levels (ie, dividing the total daily dose into multiple smaller doses with lower postabsorptive peaks) would be safer for infants. Reports from the North American Pregnancy Registry suggest a higher risk of congenital abnormality with phenobarbital and valproate use[17] (see also the article by Yerby and colleagues in this supplement).

The new AEDs marketed since 1992 have not had enough reported outcomes to yield sufficient

TABLE 8
Recommendations for the use of antiepileptic drugs (AEDs) in pregnancy

- Use monotherapy with an AED chosen for the syndrome or seizure type.
- Use the lowest dose or drug level needed for optimal control.
- Avoid high peak levels by spreading out the total daily dose into multiple smaller doses.
- There is some evidence that extended-release preparations may be safer in pregancy.[23]
- Take total and free levels (if available) of the drug monthly at trough times.

TABLE 9
Risk factors for early osteopenia and secondary osteoporosis[24]

- Inadequate nutrition, especially deficient calcium intake
- Weight < 127 lb
- Inadequate weight-bearing exercise
- Neuromuscular impairment
- Institutionalized or wheelchair/bed-bound status
- Treatment with phenobarbital, primidone, phenytoin, carbamazepine*, or valproate*
- Smoking
- Excessive alcohol intake
- Prolonged steroid therapy
- Menopause
- Fair complexion, or Asian or northern European ancestry

* Studies are being completed.

data for safety in pregnancy. However, the prospective Lamotrigine Pregnancy Registry has registered 337 first-trimester exposures to lamotrigine monotherapy. There were 293 live births, with a 2.4% incidence of major malformation among the live births. In order to detect a twofold to threefold increase in the incidence of major birth defects over the general population, 300 monotherapy exposures are needed. The registry reports 212 births with polytherapy use and 12 major defects (5.6%), with the highest incidence of defects (7 of 41 live births) being among infants exposed to valproate as part of the polytherapy.[19] This suggests that polytherapy with lamotrigine and valproate should be avoided, if possible. While other newer AEDs have fewer reported pregnancy exposures, data on the use of some other newer AEDs in pregnancy are starting to accumulate, as detailed in the article by Yerby and colleagues in this supplement.

The effect of AEDs on infant neurodevelopment has not been well studied, as discussed by Meador and Zupanc in this supplement. Most children of women with epilepsy are born normal. The incidence and magnitude of AED effects on infant cognitive development in humans are not clearly known.[20]

General recommendations for AED use in pregnancy are outlined in **Table 8**.

EPILEPSY IN MENOPAUSE

Seizure frequency in menopause is not predictable for any one individual.[21] Although most women report no change and some may experience a reduction in seizure frequency, the frequency may worsen in 30% to 40%. As metabolism changes with age, attention must be given to hepatic and renal function and to medications added by other physicians that may alter the levels of AEDs or affect the seizure threshold. Hormone replacement therapy can be given to most women with epilepsy without a change in their epilepsy. For all women with epilepsy, attention should be given to bone health throughout the life span, as addressed below.

BONE HEALTH

Maintaining bone health is a concern throughout life for all women. Up to 10% of women with epilepsy experience premature bone demineralization, particularly if they take AEDs that induce the hepatic cytochrome P450 enzyme system. Our understanding of this system continues to evolve, as does the complex nature of the interactions[22] (see also the article by Pack and colleagues in this supplement).

Women with epilepsy and their physicians should be alert to risk factors that may make them more susceptible to secondary osteoporosis even at an early age **(Table 9)**. Screening with dual-energy x-ray absorptiometry (DXA) scans of the spine or hip should be obtained in at-risk women and be repeated every 2 years or if a fracture occurs. Women should be counseled about adequate calcium intake, and a dietary history should be obtained. Supplementation with calcium and vitamin D

TABLE 10
Daily calcium requirements for women*†

Age or other relevant factors	Daily mg calcium‡ (in divided doses)
Adolescent	1,300
20–50 years	1,000
Lactating mother	1,200–1,500
Premenopausal or menopausal not on HRT	1,200–1,500
Premenopausal or menopausal on HRT	1,000
>65 years	1,200–1,500

* Data adapted from reference 24.
† Daily intake of 400 IU vitamin D is also required.
‡ 8 oz of milk provides 300 mg calcium.
HRT = hormone replacement therapy.

TABLE 11
Medical causes of secondary osteoporosis[24]

Medications	Endocrine disorders	Other diseases
• Glucocorticoids • Antiepileptic drugs • Thyroxine • GnRH agonists • Immuno-suppressants • Heparin	• Hyperparathyroidism • Hyperthyroidism • Cushing's syndrome • Diabetes mellitus type 1	• Muliple myeloma • Chronic renal failure • Mastocytosis

GnRH = gonadotropin-releasing hormone

TABLE 12
Treatments for osteoporosis*

Calcium plus vitamin D
Bisphosphonates: alendronate and risedronate
Estrogen
Selective estrogen receptor modulators: raloxifene
Calcitonin

* Treatment beyond calcium and vitamin D supplementation is not usually given unless there are vertebral fractures or dual energy x-ray absorptiometry T scores less than –2.5.

should be prescribed to meet daily needs, and the daily requirement should be taken as two or three divided doses to ensure optimal absorption and utilization **(Table 10)**. Prevention, early detection, and aggressive treatment are important for preventing secondary complications that can reduce both quality of life and the overall life span. Women who have abnormal DXA scans should be evaluated for other diseases **(Table 11)** by their primary care physician or endocrinologist, as this may warrant additional treatment **(Table 12)**.

CONCLUSIONS

Care of the woman with epilepsy should involve a comprehensive assessment of overall health to identify any impairment of physiologic function that may be an effect of the epilepsy itself or its treatment. Thorough patient interviews are helpful in identifying symptoms that may warrant further investigation. These interviews should also include life goals and family planning. Patients should be counseled about appropriate birth control and planned conception, high-risk obstetric care, and risks to mother and child relative to seizure type and medications.

Throughout the life span, the woman with epilepsy is at risk for altered endocrine functioning that may present as irregular hormone cycling, infertility, decreased bone density, or altered glucose metabolism. Research is under way to identify the pathophysiology of the clinical manifestations observed in many women with epilepsy. Unfortunately, as with many disease processes, there is a cascade of negative effects that may occur as a result of the initial disease-related disturbance. Thorough evaluation, early identification, and appropriate treatment throughout a woman's life span are imperative to minimize the negative impact on overall health and to optimize quality of life.

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