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Committee on Obstetric Practice

The Society for Maternal-Fetal Medicine endorses this document. This Committee Opinion was developed by the American College of Obstetricians and Gynecologists' Committee on Obstetric Practice in collaboration with committee members Meredith L. Birsner, MD and Allison S. Bryant, MD, MPH.

Obstetric Management of Patients with Spinal Cord Injuries

ABSTRACT: Approximately 17,730 new spinal cord injuries (SCIs) occur per year in the United States. Effective rehabilitation and modern reproductive technology may increase the number of these patients considering pregnancy. Obstetrician–gynecologists and other obstetric care professionals who care for such patients should be familiar with problems related to SCIs that may occur throughout pregnancy and during the postpartum period. Autonomic dysreflexia (sometimes called autonomic hyperreflexia) is the most serious medical complication that occurs in women with SCIs and is found in 85% of patients with lesions at or above T6 level. It is important to avoid stimuli that can lead to autonomic dysreflexia, such as distension or manipulation of the vagina, bladder, urethra, or bowel. Women with SCIs may give birth vaginally. Although pain perception is impaired in women with SCIs at or above T10, neuraxial anesthesia is the treatment of choice to reduce the risk of autonomic dysreflexia because it blocks neurologic stimuli arising from the pelvic organs. Adequate anesthesia, spinal or epidural if possible, is needed for cesarean births in all patients with SCIs. In addition to routine postpartum care, obstetrician–gynecologists and other obstetric care professionals should ensure that perineal and cesarean wounds are examined appropriately because of concerns for delayed wound healing in patients with SCI. Depression, suicide, alcoholism, and a wide variety of other mental health problems all occur at higher rates in women with SCIs. Therefore, screening and treatment for postpartum depression and other maternal mental health disorders are especially important in this population.

Recommendations and Conclusions

The American College of Obstetricians and Gynecologists makes the following recommendations and conclusions:

- Women with spinal cord injuries (SCIs) who are considering pregnancy should have a prepregnancy evaluation.
- Pregnancy in women with SCIs should be managed by a multidisciplinary team approach involving specialists, which may include an obstetrician with experience in caring for women with disabilities, maternal-fetal medicine subspecialists, anesthesiologists, spinal rehabilitation physicians, nurses, physiotherapists, occupational therapists, lactation consultants, pediatricians, and neonatologists.
- Immediate treatment of autonomic dysreflexia, which is a life-threatening complication of SCIs and is most likely to arise during labor, involves repositioning the patient and removing or stopping any stimuli.
- Neuraxial anesthesia should be used to reduce the risk of autonomic dysreflexia.
- Anesthesiologists with expertise in obstetrics should be involved in the care of patients with SCIs, and consultation should take place well before labor and delivery.
- Hypertension may be treated with antihypertensive agents that have a rapid onset and short duration of action.

Introduction and Background

This Committee Opinion has been revised to include updated recommendations on prevention of urinary tract infections and recognition and management of autonomic dysreflexia and related hypertension in pregnant women with spinal cord injuries (SCIs). Approximately 17,730 new spinal cord injuries occur per year in the United States (1). Nearly half (47.6%) occur in persons between the ages of 16 and 30 years, and women comprise approximately 20% of injuries (2). Effective rehabilitation and modern reproductive technology may increase the number of these patients considering pregnancy.

Women with SCIs who are considering pregnancy should have a prepregnancy evaluation (3–6), and the risks and benefits related to having an SCI while pregnant should be discussed. Chronic medical conditions and the woman's adaptation to her disability should be addressed. Baseline pulmonary function and renal studies may be appropriate. Fertility in these patients usually is not affected (7, 8), and family planning should be discussed. Other components of prepregnancy counseling (see CO 762 on Prepregnancy Counseling) also should be addressed (9).

Obstetrician–gynecologists and other obstetric care professionals who care for such patients should be familiar with problems related to SCIs that may occur throughout pregnancy and during the postpartum period. Common complications affecting women with SCIs include urinary tract infections (UTIs), falls, pyelonephritis, hypertension, pneumonia, preeclampsia, and preterm labor (10). In one study, thrombosis (8%), urinary complications (59%), dysreflexia (27%), and worsened spasticity (22%) were the most common complications in pregnancy, and postpartum depression (35%) was the most common postpartum complication (8). Impairment-related complications include falls, wheelchair fit and stability problems, increased spasticity, bowel management difficulties, and skin integrity problems (11). Additional potential complications include anemia, deep vein thrombosis, pulmonary emboli, and unattended delivery. Women with SCIs are underrepresented in methodologic research and underserved in terms of clear clinical guidelines and evidence-based care in the perinatal phases of prepregnancy, pregnancy, labor and delivery, and postpartum (7). Pregnancy in women with SCIs should be managed by a multidisciplinary team approach involving specialists, which may include an obstetrician with experience in caring for women with disabilities, maternal-fetal medicine subspecialists, anesthesiologists, spinal rehabilitation physicians, nurses, physiotherapists, occupational therapists, lactation consultants, pediatricians, and neonatologists (5, 12).

Common Complications

Autonomic Dysreflexia

Autonomic dysreflexia (sometimes called autonomic hyperreflexia) is the most serious medical complication that occurs in women with SCIs and is found in 85% of patients with lesions at or above T6 level (13). It is a syndrome of massive, unbalanced reflex sympathetic discharge that occurs in patients with SCIs above the splanchnic sympathetic outflow (T5–T6). Below the injury, sensory nerves transmit impulses that stimulate sympathetic neurons located in the spinal cord, and the large, unopposed sympathetic outflow causes sudden elevation in blood pressure, piloerection, skin pallor, and severe vasoconstriction below the neurologic level (12). It also can occur in patients with incomplete transections. Afferent stimuli come from distention of a hollow viscus (eg, the bladder, bowel, or uterus) and from the skin below the level of the lesion or of the genital areas.

Signs and Symptoms

The inhibitory response from cerebral vasomotor centers causes vasodilation above the level of injury, with symptoms including pounding headache, flushing, nasal congestion, nausea, anxiety, malaise, and a prickling sensation in the skull; signs include sweating, blushing, skin blotching, piloerection, tremor, and nasal obstruction, as well as twitching and increased spasticity in all limbs (12). The most common sign is systemic hypertension, which is variable in severity but can be severe. Reactive sinus bradycardia is common during acute

Box 1. Differentiation of Preeclampsia from Autonomic Dysreflexia During Labor

Disorder	Onset	Hypertension	Symptoms	Laboratory	Urine Dipstick	Treatment
Preeclampsia	Variable	Mild or severe independent of uterine contractions	Independent of uterine contractions	Could see elevated creatinine or uric acid or liver functions, decreased platelets	Positive for protein	Intravenous magnesium sulfate
Autonomic dysreflexia	Acute	Mild or severe synchronous with uterine contractions	Synchronous with uterine contractions	Normal laboratory values	Positive for norepinephrine*	Remove offending stimulus; initiate acute anti-hypertensive therapy

*Not helpful in acute setting

Adapted from Pereira L. Obstetric management of the patient with spinal cord injury. Obstet Gynecol Surv 2003;58:678–87.

autonomic dysreflexia; however, patients can display sinus tachycardia or cardiac arrhythmias including atrial fibrillation, premature ventricular contractions, or atrioventricular conduction abnormalities (3). Uteroplacental vasoconstriction may result in fetal hypoxia and bradycardia (14). Clinically, autonomic dysreflexia may be difficult to distinguish from preeclampsia because hypertension, headache, clonus, and edema may be seen in both. A potential distinguishing factor is that the hypertension of autonomic dysreflexia occurs *during* contractions and resolves *between* them, whereas the hypertension of preeclampsia is unrelated to uterine contractions; additionally, proteinuria is not expected with autonomic dysreflexia (15) (Box 1). Results of routine laboratory studies (liver and kidney function tests) may be the key differential between the two disorders (16).

Management

Autonomic dysreflexia is most likely to arise during labor (3). It is important to avoid stimuli that can lead to autonomic dysreflexia, such as distension or manipulation of the vagina, bladder, urethra, or bowel. Examples of potential stimuli include tight clothing or constrictive devices, cervical examinations, obstructed catheters, fundal messages, and external uterine compression during an ultrasound exam. To the contrary, one small study

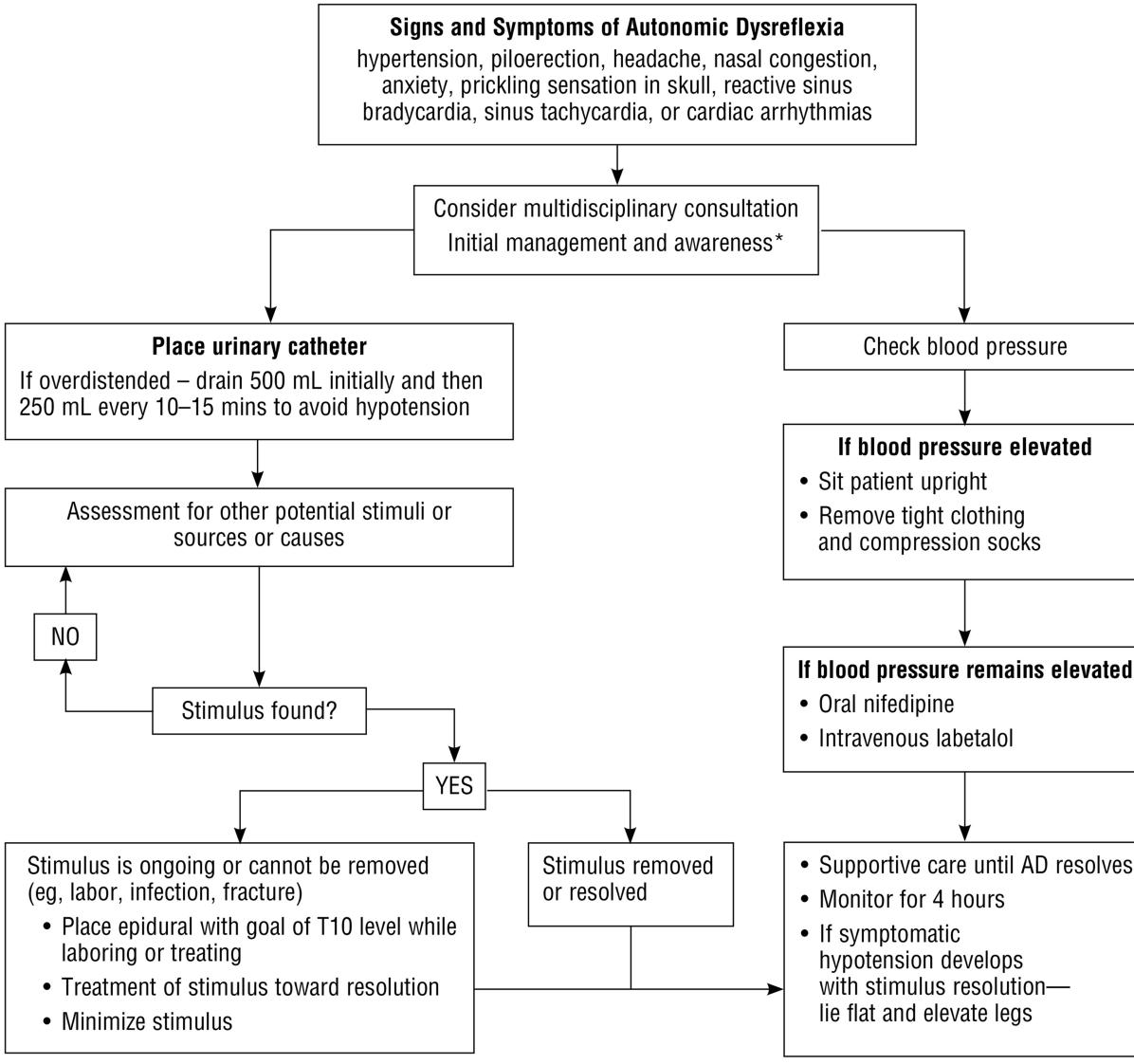

Figure 1. Initial Recognition and Management of Autonomic Dysreflexia. *Distended bladder is common in patients with SCIs and can lead to hypertension. Health care professionals should be aware that a urinary catheter may be needed and should regularly assess hypertension for patients with SCI. Modified from Thornburg LL, Clewell WH. Neurologic emergencies during pregnancy. In: Foley MR, Strong TJ Jr and Garite JT, editors. Obstetric intensive care manual. 5th ed. New York, NY: McGraw Hill Education; 2018. p. 243.

(17) concluded that there was no suggestion that the pressure of external fetal monitoring incited autonomic dysreflexia, and one study subject who underwent external cephalic version with epidural analgesia did not experience symptoms.

Immediate treatment of autonomic dysreflexia, which is a life-threatening complication of SCIs and is most likely to arise during labor, involves repositioning the patient and removing or stopping any stimuli (eg, loosen tight clothing or constrictive devices, stop an ongoing cervical examination, or relieve an obstructed catheter) (Figure 1). Because of the loss of peripheral vasoconstriction that follows SCI, placing the woman in an upright posture induces beneficial pooling of blood in the abdomen and lower extremity vessels, thereby causing reduction in arterial blood pressure (18).

Because autonomic dysreflexia is most likely to occur during labor, delivery at a Level III and IV maternal care facility may be considered, when possible, for a patient with SCI. However, autonomic dysreflexia may occur at any facility, and consultation with the appropriate specialists should occur antenatally. Neuraxial anesthesia should be used to reduce the risk of autonomic dysreflexia. Although neuraxial anesthesia can be technically difficult to administer in patients with SCIs, consideration should be given to the planned placement in early labor of an intravenous line and an epidural catheter or spinal catheter (19). Although pain perception is impaired in women with SCIs at or above T10, neuraxial anesthesia is the treatment of choice to reduce the risk of autonomic dysreflexia because it blocks neurologic stimuli arising from the pelvic organs (14). Not only is anesthesia necessary for the pregnant patient with spinal cord injury, it may be life-saving (20). Anesthesiologists with expertise in obstetrics should be involved in the care of patients with SCIs, and consultation should take place well before labor and delivery (14). A multidisciplinary team in a unit capable of intensive hemodynamic monitoring should deliver these patients (3).

If autonomic dysreflexia occurs before a neuraxial anesthetic is available or occurs despite neuraxial anesthesia, hypertension may be treated with antihypertensive agents that have a rapid onset and short duration of action (14) (Figure 1). Delay in therapy can result in serious complications such as hypertensive encephalopathy, cerebrovascular accidents, intraventricular hemorrhage, retinal hemorrhage, and death (3). If there is evidence of autonomic dysreflexia during the second stage of labor, delivery can be expedited by forceps or vacuum-assisted delivery with adequate anesthesia. If autonomic dysreflexia during labor cannot be controlled, cesarean birth may be necessary. The rate of cesarean birth in women with SCIs is high, as high as 68% in one study (5) and 69% in another (10). Adequate anesthesia, spinal or epidural if possible, is needed for cesarean births in all patients with SCIs.

Urinary Tract Infections

Virtually all patients with SCIs suffer from neurogenic lower urinary tract dysfunction, and various bladder evacuation modes include indwelling catheters, intermittent self-catheterization, Credé maneuver (extrinsic manual compression on the bladder), and spontaneous voiding (21). Urinary tract infections and pyelonephritis are the most common reason for hospitalization of women with SCIs during pregnancy (10).

Although asymptomatic bacteriuria and urinary tract infection are not specifically defined for women with SCIs, general definitions should apply: *asymptomatic bacteriuria* is defined as the presence of one or more species of bacteria growing in the urine at specified quantitative counts (10^5 or more colony-forming units) in the absence of signs or symptoms attributable to urinary tract infection, and *urinary tract infection* is defined as substantial urinary bacterial growth in the presence of symptoms such as dysuria, urinary urgency, fever, foul-smelling urine, or urinary incontinence. However, it should be acknowledged that symptoms of urinary tract infection may not be typical among women with SCIs (22) and may include autonomic dysreflexia and increased spasticity.

There is a paucity of controlled trials involving urinary tract management for pregnant women with SCI; therefore, evidence-based recommendations on urinary tract management do not currently exist. A prospective study of prophylactic weekly oral cyclic antibiotics (amoxicillin, cefixime, and nitrofurantoin) in six pregnant women with SCIs demonstrated a reduction in frequency of UTIs during pregnancy without obstetric complications (23), but the small sample size of this study precludes using it as the basis of broad recommendations for management.

Asymptomatic bacteriuria is prevalent among individuals with SCI, and rates as high as 50–100% have been noted (24). Incomplete bladder emptying, neurogenic bladder, urinary diversions, and indwelling catheters contribute to this risk. Although screening for asymptomatic bacteriuria among nonpregnant individuals with SCIs is not of demonstrated efficacy (22), screening at least once in early pregnancy is recommended for *all* pregnant women by the U.S. Preventative Services Task Force and the Infectious Disease Society of America (22, 25). These recommendations have been endorsed by the American College of Obstetricians and Gynecologists and should be followed, although some experts advocate for more frequent assessment for asymptomatic bacteriuria in pregnant patients with SCIs (8).

A systematic review suggested that the lowest UTI rate was described in women using the Credé maneuver but acknowledged that the optimal mode of bladder evacuation in pregnancy cannot be determined based on limited available evidence (21). The same review highlighted that although there is a paucity of data on the *prevention* of UTI, *treatment* of UTI in pregnant

women with SCIs should be considered given the association between uncomplicated UTI and complications such as pyelonephritis. A 2004 randomized controlled trial of length of treatment for acute symptomatic UTIs in patients with SCIs found that a longer duration of treatment (14 day) led to improved clinical and microbiological outcomes compared with short-course (3 day) therapy (26), although pregnant women were excluded from this study. A 2011 Cochrane review of treatment of symptomatic UTI in pregnant women demonstrated efficacy of antibiotics for the eradication of UTI and in decreasing the incidence of preterm delivery and prelabor rupture of membranes (also referred to as premature rupture of membranes) (27). Although patients with SCIs were not the focus of that review, given the increased risk of medical complications in pregnant women with SCIs, practitioners should treat UTI in pregnant women with SCIs just as they would in all pregnant women, but may consider prescribing a longer course of antibiotics. More research is needed regarding the optimal course and duration of UTI treatment for pregnant women with SCIs.

Decubital Ulcers

Decubital ulcers are a frequent and preventable complication in women with SCIs (3), and contributing factors are increased weight, altered center of gravity, and decreased ability to transfer (17). Decubiti can result in sepsis and trigger autonomic dysreflexia (3). Pressure sores occur in 6–15% of pregnant women with SCIs (5), although one study (10) found no increase in skin breakdown in pregnancy. Ulcers most commonly occur over ischial and sacral areas (11). During pregnancy, women with SCIs should have routine skin examinations, frequent position changes, adequate padding, and appropriately sized medical equipment (eg, wheelchairs). The importance of practicing proper pressure relief techniques needs to be emphasized to the patient, and she should be seen by a clinician on a regular basis to monitor for skin breakdown (28). Strategies to avoid pressure ulcers include heightened monitoring of vulnerable areas, changing seat cushions to reduce pressure, performing pressure relief maneuvers more often by slightly elevating the body briefly or shifting seated position, and using tilt and leg elevation features available on high-tech power wheelchairs (11).

Pulmonary Function

Impaired pulmonary function may be present in women with high thoracic or cervical spine lesions, usually above the T5 level (3). Breathing difficulties accompany many movement disabilities, with a variety of causes including anatomic limitations that compromise the ability to fully inflate lungs, musculoskeletal strength and structural problems, and neurological factors that affect respiratory function (11). Diminished respiratory volumes from upward displacement of the diaphragm by the enlarging gravid uterus is particularly problematic for patients with tetraplegia, in whom the diaphragm is the primary muscle of respiration (28). Reduced diaphragmatic function can impair effective coughing, and atelectasis and the accumulation of bronchial secretions can lead to bronchopneumonia (28). For patients with borderline function, ventilatory support and meticulous attention to pulmonary care is necessary during pregnancy and delivery. Supine positioning in labor may exacerbate respiratory complications (14). Isolated or serial pulmonary function testing as well as specialty involvement or comanagement from respiratory therapists or pulmonary medicine specialists may be warranted.

Falls

Weight gain and changes in the center of gravity as pregnancy advances can contribute to falls in pregnancy, which can cause fractures and other injuries (11). Falls can occur with transfers in and out of wheelchairs, from the tipping over of a wheelchair on uneven pavement, and from tripping while ambulating or over scattered items. Such incidents are preventable with input from rehabilitation therapists and occupational therapists (11).

Antenatal and Intrapartum Considerations

Excess weight gain may increase the difficulty of moving and transporting pregnant women with SCIs. Counseling regarding nutrition and weight gain is therefore especially important in this population. Because of the increased risk of small-for-gestational-age infants (15), fetal growth may be monitored serially. However, because the external uterine compression that occurs during an ultrasound examination can cause autonomic dysreflexia, care should be taken to monitor for and prevent this outcome. Muscle-strengthening exercises may be recommended for the upper extremities of patients who are not quadriplegic. For all patients, elevation of the legs and range-of-motion exercises may be implemented as pregnancy advances. Decreased or limited mobility increases the risk of venous thromboembolic disease, and although some have recommended routine antenatal pharmacologic prophylaxis, there are no data supporting the efficacy or safety of this treatment (15, 29); consideration can therefore be given to mechanical or pharmacologic prophylaxis after patient counseling and depending on other risk factors and local protocols.

Patients with total transection at a lower thoracic level should be counseled that labor pain may be so reduced that they may be unaware of uterine contractions, especially during sleep. However, symptoms under the control of the sympathetic nervous system (eg, abdominal or leg spasms, shortness of breath, increased spasticity) concurrent with uterine contractions may make women aware of labor. Patients should be instructed in uterine palpation techniques to detect contractions. Since preterm delivery is common, occurring

in 33% of one study with 22% of these women unable to feel contractions (8), patients should be instructed how to recognize even atypical symptoms of preterm and term labor.

Women with SCIs may give birth vaginally. Women with spinal cord transection above the T10 segment may have painless labor, but this does not negate the need for neuraxial anesthesia.

Breastfeeding difficulties can result from autonomic dysreflexia, inhibition of the milk ejection reflex because of the underlying neurologic lesion, and problems with infant handling (12). Anticipatory guidance should therefore also address the possibility of an increased need for social support services, breastfeeding support (30), and modifications for newborn care.

Postpartum Considerations

In addition to routine postpartum care, obstetrician–gynecologists and other obstetric care professionals should ensure that perineal and cesarean wounds are examined appropriately because of concerns for delayed wound healing in patients with SCI. Health care professionals should also be aware of and able to counsel patients about common postpartum medications, experiences, and procedures, such as bladder distension and fundal massage, which may increase the risk of autonomic dysreflexia. Although breastfeeding may be possible, data suggest that SCI, particularly at or above T6, can disrupt lactation and is associated with shorter breastfeeding duration (30, 31). Additional support may be needed to facilitate breastfeeding in women with SCIs who desire to breastfeed and are physiologically capable of doing so. Depression, suicide, alcoholism, and a wide variety of other mental health problems all occur at higher rates in women with SCIs (30). Additionally, postpartum women with SCIs are reported to have higher rates of rehospitalization for postpartum depression (32). Therefore, screening and treatment for postpartum depression and other maternal mental health disorders are especially important in this population.

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