

**HIGHLIGHTS OF PRESCRIBING INFORMATION**

These highlights do not include all the information needed to use **ESTRADIOL TRANSDERMAL SYSTEM (TWICE-WEEKLY)** safely and effectively. See full prescribing information for **ESTRADIOL TRANSDERMAL SYSTEM (TWICE-WEEKLY)**.

**ESTRADIOL** transdermal system (twice-weekly)  
Initial U.S. Approval: 1975

**WARNING: ENDOMETRIAL CANCER, CARDIOVASCULAR DISORDERS, BREAST CANCER, and PROBABLE DEMENTIA**  
*See full prescribing information for complete boxed warning.*

**Estrogen-Alone Therapy**

- There is an increased risk of endometrial cancer in a woman with a uterus who uses unopposed estrogens (5.2)
- Estrogen-alone therapy should not be used for the prevention of cardiovascular disease or dementia (5.1, 5.3)
- The Women’s Health Initiative (WHI) estrogen-alone substudy reported increased risks of stroke and deep vein thrombosis (DVT) (5.1)
- The WHI Memory Study (WHIMS) estrogen-alone ancillary study of WHI reported an increased risk of probable dementia in postmenopausal women 65 years of age and older (5.3)

**Estrogen Plus Progestin Therapy**

- Estrogen plus progestin therapy should not be used for the prevention of cardiovascular disease or dementia (5.1, 5.3)
- The WHI estrogen plus progestin substudy reported increased risks of DVT, pulmonary embolism (PE), stroke, and myocardial infarction (MI) (5.1)
- The WHI estrogen plus progestin substudy reported increased risks of invasive breast cancer (5.2)
- The WHIMS estrogen plus progestin ancillary study of WHI reported an increased risk of probable dementia in postmenopausal women 65 years of age and older (5.3)

----- **RECENT MAJOR CHANGES** -----  
Warnings and Precautions, Malignant Neoplasms (5.2) 11/2017

----- **INDICATIONS AND USAGE** -----  
Estradiol transdermal system (twice-weekly) is an estrogen indicated for:  
• Treatment of moderate to severe vasomotor symptoms due to menopause (1.1)  
• Prevention of postmenopausal osteoporosis (1 2)

----- **DOSAGE AND ADMINISTRATION** -----  
**For Vasomotor Symptoms:** Start therapy with estradiol transdermal system (twice-weekly) 0.0375 mg per day applied to the skin twice weekly. Dosage adjustment should be guided by the clinical response (2.1)  
**For Postmenopausal Osteoporosis Prevention:** Start therapy with estradiol transdermal system (twice-weekly) 0.025 mg per day applied to the skin twice weekly. The dose may be adjusted as necessary (2.2)  
Estradiol transdermal system (twice-weekly) should be placed on a clean, dry area on the lower abdomen (below the umbilicus) or buttocks. Estradiol transdermal system (twice-weekly) should not be applied to the breasts (2.3)

----- **DOSAGE FORMS AND STRENGTHS** -----  
Transdermal system: 0.025 mg/day, 0.0375 mg/day, 0.05 mg/day, 0.075 mg/day, and 0.1 mg/day (3)

----- **CONTRAINDICATIONS** -----  
Undiagnosed abnormal genital bleeding (4)  
Known, suspected, or history of breast cancer (4, 5.2)  
Known or suspected estrogen-dependent neoplasia (4, 5.2)  
Active DVT, PE, or a history of these conditions (4, 5.1)  
Active arterial thromboembolic disease (for example, stroke and MI), or a history of these conditions (4, 5.1)  
Known anaphylactic reaction or angioedema or hypersensitivity with estradiol transdermal system (twice-weekly) (4)  
Known liver impairment or disease (4, 5.10)  
Known protein C, protein S, or antithrombin deficiency, or other known thrombophilic disorders (4)  
Known or suspected pregnancy (4, 8.1)

----- **WARNINGS AND PRECAUTIONS** -----  
Estrogens increase the risk of gallbladder disease (5.4)  
Discontinue estrogen if severe hypercalcemia, loss of vision, severe hypertriglyceridemia or cholestatic jaundice occurs (5.5, 5.6, 5.9, 5.10)  
Monitor thyroid function in women on thyroid replacement therapy (5.11, 5.18)

----- **ADVERSE REACTIONS** -----  
Most common adverse reactions (greater than or equal to 5 percent) with Vivelle are: headache, breast tenderness, back pain, pain in limb, nasopharyngitis, dyspepsia, nausea, sinusitis, and intermenstrual bleeding (6.1)

**To report SUSPECTED ADVERSE REACTIONS, contact Mylan Pharmaceuticals Inc. at 1-877-446-3679 (1-877-4-INFO-RX) or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.**

----- **DRUG INTERACTIONS** -----  
Inducers and/or inhibitors of CYP3A4 may affect estrogen drug metabolism (7.1)

----- **USE IN SPECIFIC POPULATIONS** -----  
**Nursing Mothers:** Estrogen administration to nursing women has been shown to decrease the quantity and quality of breast milk. Detectable amounts of estrogens have been identified in the breast milk of women receiving estrogens. (8.3)  
**Geriatric Use:** An increased risk of probable dementia in women over 65 years of age was reported in the WHIMS ancillary studies of the WHI (5.3, 8.5)

**See 17 for PATIENT COUNSELING INFORMATION and FDA-approved patient labeling.**

**Revised: 1/2018**

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## FULL PRESCRIBING INFORMATION

### **WARNING: ENDOMETRIAL CANCER, CARDIOVASCULAR DISORDERS, BREAST CANCER, and PROBABLE DEMENTIA**

#### **Estrogen-Alone Therapy**

##### **Endometrial Cancer**

**There is an increased risk of endometrial cancer in a woman with a uterus who uses unopposed estrogens. Adding a progestin to estrogen therapy has been shown to reduce the risk of endometrial hyperplasia, which may be a precursor to endometrial cancer. Adequate diagnostic measures, including directed or random endometrial sampling when indicated, should be undertaken to rule out malignancy in postmenopausal women with undiagnosed persistent or recurring abnormal genital bleeding [see Warnings and Precautions (5.2)].**

##### **Cardiovascular Disorders and Probable Dementia**

**Estrogen-alone therapy should not be used for the prevention of cardiovascular disease or dementia [see Warnings and Precautions (5.1, 5.3), and Clinical Studies (14.3, 14.4)].**

**The Women's Health Initiative (WHI) estrogen-alone substudy reported increased risks of stroke and deep vein thrombosis (DVT) in postmenopausal women (50 to 79 years of age) during 7.1 years of treatment with daily oral conjugated estrogens (CE) [0.625 mg]-alone, relative to placebo [see Warnings and Precautions (5.1), and Clinical Studies (14.3)].**

**The WHI Memory Study (WHIMS) estrogen-alone ancillary study of WHI reported an increased risk of developing probable dementia in postmenopausal women 65 years of age or older during 5.2 years of treatment with daily CE (0.625 mg)-alone, relative to placebo. It is unknown whether this finding applies to younger postmenopausal women [see Warnings and Precautions (5.3), Use in Specific Populations (8.5), and Clinical Studies (14.4)].**

**In the absence of comparable data, these risks should be assumed to be similar for other doses of CE and other dosage forms of estrogens.**

**Estrogens with or without progestins should be prescribed at the lowest effective doses and for the shortest duration consistent with treatment goals and risks for the individual woman.**

#### **Estrogen Plus Progestin Therapy**

##### **Cardiovascular Disorders and Probable Dementia**

**Estrogen plus progestin therapy should not be used for the prevention of cardiovascular disease or dementia [see Warnings and Precautions (5.1, 5.3), and Clinical Studies (14.3, 14.4)].**

**The WHI estrogen plus progestin substudy reported increased risks of DVT, pulmonary embolism (PE), stroke and myocardial infarction (MI) in postmenopausal women (50 to 79 years of age) during 5.6 years of treatment with daily oral CE (0.625 mg) combined with medroxyprogesterone acetate (MPA) [2.5 mg], relative to placebo [see Warnings and Precautions (5.1), and Clinical Studies (14.3)].**

**The WHIMS estrogen plus progestin ancillary study of the WHI, reported an increased risk of developing probable dementia in postmenopausal women 65 years of age or older during 4 years of treatment with daily CE (0.625 mg) combined with MPA (2.5 mg), relative to placebo. It is unknown whether this finding applies to younger postmenopausal women [see Warnings and Precautions (5.3), Use in Specific Populations (8.5), and Clinical Studies (14.4)].**

### **Breast Cancer**

**The WHI estrogen plus progestin substudy also demonstrated an increased risk of invasive breast cancer [see Warnings and Precautions (5.2), and Clinical Studies (14.3)].**

**In the absence of comparable data, these risks should be assumed to be similar for other doses of CE and MPA, and other combinations and dosage forms of estrogens and progestins.**

**Estrogens with or without progestins should be prescribed at the lowest effective doses and for the shortest duration consistent with treatment goals and risks for the individual woman.**

## **1 INDICATIONS AND USAGE**

### **1.1 Treatment of Moderate to Severe Vasomotor Symptoms Due to Menopause**

Estradiol transdermal system (twice-weekly) is indicated for the treatment of moderate to severe vasomotor symptoms due to menopause.

### **1.2 Prevention of Postmenopausal Osteoporosis**

Estradiol transdermal system (twice-weekly) is indicated for the prevention of postmenopausal osteoporosis. When prescribing solely for the prevention of postmenopausal osteoporosis, therapy should only be considered for women at significant risk of osteoporosis and non-estrogen medications should be carefully considered.

***Limitation of Use:*** When prescribing solely for the prevention of postmenopausal osteoporosis, therapy should only be considered for women at significant risk of osteoporosis and non-estrogen medications should be carefully considered.

## **2 DOSAGE AND ADMINISTRATION**

Generally, when estrogen is prescribed for a postmenopausal woman with a uterus, a progestin should be considered to reduce the risk of endometrial cancer. A woman without a uterus does not need a progestin. In some cases, however, hysterectomized women with a history of endometriosis may need a progestin [*see Warnings and Precautions (5.2, 5.14)*].

Use of estrogen-alone, or in combination with a progestin, should be with the lowest effective dose and for the shortest duration consistent with treatment goals and risks for the individual woman. Postmenopausal women should be re-evaluated periodically as clinically appropriate to determine if treatment is still necessary.

### **2.1 Treatment of Moderate to Severe Vasomotor Symptoms**

Start therapy with estradiol transdermal system (twice-weekly) 0.0375 mg per day applied to the skin twice weekly. Dosage adjustment should be guided by the clinical response.

Therapy should be started at the lowest effective dose and the shortest duration consistent with the treatment goals. Attempts to taper or discontinue the medication should be made at 3 to 6 month intervals.

### **2.2 Prevention of Postmenopausal Osteoporosis**

Start therapy with estradiol transdermal system (twice-weekly) 0.025 mg per day applied to the skin twice weekly. The dose may be adjusted as necessary.

### **2.3 Patch Application Instructions**

The adhesive side of estradiol transdermal system (twice-weekly) should be placed on a clean, dry area on the lower abdomen (below the umbilicus) or buttocks. Estradiol transdermal system (twice-weekly) should not be applied to the breasts.

Estradiol transdermal system (twice-weekly) should be replaced twice weekly (every 3 to 4 days).

The sites of application must be rotated, with an interval of at least 1 week allowed between applications to a particular site.

The area selected should not be oily, damaged, or irritated. The waistline should be avoided, since tight clothing may rub the system off. The system should be applied immediately after opening the pouch and removing the protective liner. The system should be pressed firmly in place with the palm of the hand for about 10 seconds, making sure there is good contact with the skin, especially around the edges. In the event that a system should fall off, the same system may be reapplied. If the same system cannot be reapplied, a new system should be applied to another location. If a woman has forgotten to apply a patch, she should apply a new patch as soon as possible. In either case, the original treatment schedule should be continued. The interruption of treatment in women taking estradiol transdermal system (twice-weekly) might increase the likelihood of breakthrough bleeding, spotting and recurrence of symptoms.

### 3 DOSAGE FORMS AND STRENGTHS

Estradiol Transdermal System, USP (Twice-Weekly) is available as 0.025 mg/day, 0.0375 mg/day, 0.05 mg/day, 0.075 mg/day, or 0.1 mg/day of estradiol.

- The 0.025 mg per day is available as a 2.5 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 0.41 mg of estradiol for nominal\* delivery of 0.025 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.025 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date.
- The 0.0375 mg per day is available as a 3.75 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 0.62 mg of estradiol for nominal\* delivery of 0.0375 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.0375 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date.
- The 0.05 mg per day is available as a 5.0 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 0.82 mg of estradiol for nominal\* delivery of 0.05 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.05 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date.
- The 0.075 mg per day is available as a 7.5 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 1.23 mg of estradiol for nominal\* delivery of 0.075 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.075 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date.
- The 0.1 mg per day is available as a 10.0 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 1.64 mg of estradiol for nominal\* delivery of 0.1 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.1 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date.

[\*see DESCRIPTION]

### 4 CONTRAINDICATIONS

Estradiol transdermal system (twice-weekly) is contraindicated in women with any of the following conditions:

- Undiagnosed abnormal genital bleeding
- Known, suspected or history of breast cancer
- Known or suspected estrogen-dependent neoplasia

- Active DVT, PE, or a history of these conditions
- Active arterial thromboembolic disease (for example, stroke and MI), or a history of these conditions
- Known anaphylactic reaction or angioedema or hypersensitivity with estradiol transdermal system (twice-weekly)
- Known liver impairment or disease
- Known protein C, protein S, or antithrombin deficiency, or other known thrombophilic disorders
- Known or suspected pregnancy

## 5 WARNINGS AND PRECAUTIONS

### 5.1 Cardiovascular Disorders

An increased risk of stroke and DVT has been reported with estrogen-alone therapy. An increased risk of PE, DVT, stroke and MI has been reported with estrogen plus progestin therapy. Should any of these occur or be suspected, estrogen with or without progestin therapy should be discontinued immediately.

Risk factors for arterial vascular disease (for example, hypertension, diabetes mellitus, tobacco use, hypercholesterolemia, and obesity) and/or venous thromboembolism (VTE) (for example, personal history or family history of VTE, obesity, and systemic lupus erythematosus) should be managed appropriately.

**Stroke:** In the WHI estrogen-alone substudy, a statistically significant increased risk of stroke was reported in women 50 to 79 years of age receiving daily CE (0.625 mg)-alone compared to women in the same age group receiving placebo (45 versus 33 per 10,000 women-years). The increase in risk was demonstrated in year 1 and persisted [*see Clinical Studies (14.3)*]. Should a stroke occur or be suspected, estrogen-alone therapy should be discontinued immediately.

Subgroup analyses of women 50 to 59 years of age suggest no increased risk of stroke for those women receiving CE (0.625 mg)-alone versus those receiving placebo (18 versus 21 per 10,000 women-years).<sup>1</sup>

In the WHI estrogen plus progestin substudy, a statistically significant increased risk of stroke was reported in women 50 to 79 years of age receiving CE (0.625 mg) plus MPA (2.5 mg) compared to women in the same age group receiving placebo (33 versus 25 per 10,000 women-years) [*see Clinical Studies (14.3)*]. The increase in risk was demonstrated after the first year and persisted.<sup>1</sup> Should a stroke occur or be suspected, estrogen plus progestin therapy should be discontinued immediately.

**Coronary Heart Disease:** In the WHI estrogen-alone substudy, no overall effect on coronary heart disease (CHD) events (defined as nonfatal MI, silent MI, or CHD death) was reported in women receiving estrogen-alone compared to placebo<sup>2</sup> [*see Clinical Studies (14.3)*].

Subgroup analyses of women 50 to 59 years of age suggest a statistically non-significant reduction in CHD events (CE [0.625 mg]-alone compared to placebo) in women with less than 10 years since menopause (8 versus 16 per 10,000 women-years).<sup>1</sup>

In the WHI estrogen plus progestin substudy, there was a statistically non-significant increased risk of CHD events reported in women receiving daily CE (0.625 mg) plus MPA (2.5 mg) compared to women receiving placebo (41 versus 34 per 10,000 women years).<sup>1</sup> An increase in relative risk was demonstrated in year 1, and a trend toward decreasing relative risk was reported in years 2 through 5 [see *Clinical Studies (14.3)*].

In postmenopausal women with documented heart disease (n = 2,763, average 66.7 years of age), in a controlled clinical trial of secondary prevention of cardiovascular disease (Heart and Estrogen/Progestin Replacement Study; [HERS]), treatment with daily CE (0.625 mg) plus MPA (2.5 mg) demonstrated no cardiovascular benefit. During an average follow-up of 4.1 years, treatment with CE plus MPA did not reduce the overall rate of CHD events in postmenopausal women with established CHD. There were more CHD events in the CE plus MPA-treated group than in the placebo group in year 1, but not during the subsequent years. Two thousand, three hundred and twenty-one (2,321) women from the original HERS trial agreed to participate in an open-label extension of HERS, HERS II. Average follow-up in HERS II was an additional 2.7 years, for a total of 6.8 years overall. Rates of CHD events were comparable among women in the CE plus MPA group and the placebo group in the HERS, HERS II, and overall.

**Venous Thromboembolism:** In the WHI estrogen-alone substudy, the risk of VTE (DVT and PE), was increased for women receiving daily CE (0.625 mg)-alone compared to placebo (30 versus 22 per 10,000 women-years), although only the increased risk of DVT reached statistical significance (23 versus 15 per 10,000 women years). The increase in VTE risk was demonstrated during the first 2 years<sup>3</sup> [see *Clinical Studies (14.3)*]. Should a VTE occur or be suspected, estrogen-alone therapy should be discontinued immediately.

In the WHI estrogen plus progestin substudy, a statistically significant 2-fold greater rate of VTE was reported in women receiving daily CE (0.625 mg) plus MPA (2.5 mg) compared to women receiving placebo (35 versus 17 per 10,000 women-years). Statistically significant increases in risk for both DVT (26 versus 13 per 10,000 women-years) and PE (18 versus 8 per 10,000 women-years) were also demonstrated. The increase in VTE risk was demonstrated during the first year and persisted<sup>4</sup> [see *Clinical Studies (14.3)*]. Should a VTE occur or be suspected, estrogen plus progestin therapy should be discontinued immediately.

If feasible, estrogens should be discontinued at least 4 to 6 weeks before surgery of the type associated with an increased risk of thromboembolism, or during periods of prolonged immobilization.

## 5.2 Malignant Neoplasms

**Endometrial cancer:** An increased risk of endometrial cancer has been reported with the use of unopposed estrogen therapy in women with a uterus. The reported endometrial cancer risk among unopposed estrogen users is about 2 to 12 times greater than in non-users, and appears dependent on duration of treatment and on estrogen dose. Most studies show no significant

increased risk associated with the use of estrogens for less than 1 year. The greatest risk appears to be associated with prolonged use, with increased risks of 15- to 24-fold for 5 to 10 years or more. This risk has been shown to persist for at least 8 to 15 years after estrogen therapy is discontinued.

Clinical surveillance of all women using estrogen-alone or estrogen plus progestin therapy is important. Adequate diagnostic measures, including directed or random endometrial sampling when indicated, should be undertaken to rule out malignancy in postmenopausal women with undiagnosed persistent or recurring abnormal genital bleeding.

There is no evidence that the use of natural estrogens results in a different endometrial risk profile than synthetic estrogens of equivalent estrogen dose. Adding a progestin to postmenopausal estrogen therapy has been shown to reduce the risk of endometrial hyperplasia, which may be a precursor to endometrial cancer.

**Breast Cancer:** The most important randomized clinical trial providing information about breast cancer in estrogen-alone users is the WHI substudy of daily CE (0.625 mg)-alone. In the WHI estrogen-alone substudy, after an average follow-up of 7.1 years, daily CE-alone was not associated with an increased risk of invasive breast cancer (relative risk [RR] 0.80)<sup>5</sup> [see *Clinical Studies (14.3)*].

The most important randomized clinical trial providing information about breast cancer in estrogen plus progestin users is the WHI substudy of daily CE (0.625 mg) plus MPA (2.5 mg). After a mean follow-up of 5.6 years, the estrogen plus progestin substudy reported an increased risk of invasive breast cancer in women who took daily CE plus MPA. In this substudy, prior use of estrogen-alone or estrogen plus progestin therapy was reported by 26 percent of the women. The relative risk of invasive breast cancer was 1.24, and the absolute risk was 41 versus 33 cases per 10,000 women-years, for CE plus MPA compared with placebo. Among women who reported prior use of hormone therapy, the relative risk of invasive breast cancer was 1.86, and the absolute risk was 46 versus 25 cases per 10,000 women-years, for CE plus MPA compared with placebo. Among women who reported no prior use of hormone therapy, the relative risk of invasive breast cancer was 1.09, and the absolute risk was 40 versus 36 cases per 10,000 women-years for CE plus MPA compared with placebo. In the same substudy, invasive breast cancers were larger, were more likely to be node positive, and were diagnosed at a more advanced stage in the CE (0.625 mg) plus MPA (2.5 mg) group compared with the placebo group. Metastatic disease was rare, with no apparent difference between the two groups. Other prognostic factors, such as histologic subtype, grade and hormone receptor status did not differ between the groups<sup>6</sup> [see *Clinical Studies (14.3)*].

Consistent with the WHI clinical trial, observational studies have also reported an increased risk of breast cancer for estrogen plus progestin therapy, and a smaller increased risk for estrogen-alone therapy, after several years of use. The risk increased with duration of use, and appeared to return to baseline over about 5 years after stopping treatment (only the observational studies have substantial data on risk after stopping). Observational studies also suggest that the risk of breast cancer was greater, and became apparent earlier, with estrogen plus progestin therapy as compared to estrogen-alone therapy. However, these studies have not found significant variation

in the risk of breast cancer among different estrogen plus progestin combinations, doses, or routes of administration.

The use of estrogen-alone and estrogen plus progestin has been reported to result in an increase in abnormal mammograms requiring further evaluation.

All women should receive yearly breast examinations by a healthcare provider and perform monthly breast self examinations. In addition, mammography examinations should be scheduled based on patient age, risk factors, and prior mammogram results.

**Ovarian Cancer:** The WHI estrogen plus progestin substudy reported a statistically non-significant increased risk of ovarian cancer. After an average follow-up of 5.6 years, the relative risk for ovarian cancer for CE plus MPA versus placebo was 1.58 (95 percent CI, 0.77 to 3.24). The absolute risk for CE plus MPA versus placebo was 4 versus 3 cases per 10,000 women-years.<sup>7</sup>

A meta-analysis of 17 prospective and 35 retrospective epidemiology studies found that women who used hormonal therapy for menopausal symptoms had an increased risk for ovarian cancer. The primary analysis, using case-control comparisons, included 12,110 cancer cases from the 17 prospective studies. The relative risks associated with current use of hormonal therapy was 1.41 (95% confidence interval [CI] 1.32 to 1.50); there was no difference in the risk estimates by duration of the exposure (less than 5 years [median of 3 years] vs. greater than 5 years [median of 10 years] of use before the cancer diagnosis). The relative risk associated with combined current and recent use (discontinued use within 5 years before cancer diagnosis) was 1.37 (95% CI, 1.27 to 1.48), and the elevated risk was significant for both estrogen-alone and estrogen plus progestin products. The exact duration of hormone therapy use associated with an increased risk of ovarian cancer, however, is unknown.

### 5.3 Probable Dementia

In the WHIMS estrogen-alone ancillary study of WHI, a population of 2,947 hysterectomized women 65 to 79 years of age was randomized to daily CE (0.625 mg)-alone or placebo.

After an average follow-up of 5.2 years, 28 women in the estrogen-alone group and 19 women in the placebo group were diagnosed with probable dementia. The relative risk of probable dementia for CE-alone versus placebo was 1.49 (95 percent CI, 0.83 to 2.66). The absolute risk of probable dementia for CE-alone versus placebo was 37 versus 25 cases per 10,000 women-years<sup>8</sup> [see *Use in Specific Populations (8.5)*, and *Clinical Studies (14.4)*].

In the WHIMS estrogen plus progestin ancillary study of WHI, a population of 4,532 postmenopausal women 65 to 79 years of age was randomized to daily CE (0.625 mg) plus MPA (2.5 mg) or placebo.

After an average follow-up of 4 years, 40 women in the CE plus MPA group and 21 women in the placebo group were diagnosed with probable dementia. The relative risk of probable dementia for CE plus MPA versus placebo was 2.05 (95 percent CI, 1.21 to 3.48). The absolute

risk of probable dementia for CE plus MPA versus placebo was 45 versus 22 cases per 10,000 women-years<sup>8</sup> [see *Use in Specific Populations (8.5)*, and *Clinical Studies (14.4)*].

When data from the two populations in the WHIMS estrogen-alone and estrogen plus progestin ancillary studies were pooled as planned in the WHIMS protocol, the reported overall relative risk for probable dementia was 1.76 (95 percent CI, 1.19 to 2.60). Since both ancillary studies were conducted in women 65 to 79 years of age, it is unknown whether these findings apply to younger postmenopausal women<sup>8</sup> [see *Use in Specific Populations (8.5)*, and *Clinical Studies (14.4)*].

#### **5.4 Gallbladder Disease**

A 2- to 4-fold increase in the risk of gallbladder disease requiring surgery in postmenopausal women receiving estrogens has been reported.

#### **5.5 Hypercalcemia**

Estrogen administration may lead to severe hypercalcemia in women with breast cancer and bone metastases. If hypercalcemia occurs, use of the drug should be stopped and appropriate measures taken to reduce the serum calcium level.

#### **5.6 Visual Abnormalities**

Retinal vascular thrombosis has been reported in patients receiving estrogens. Discontinue medication pending examination if there is sudden partial or complete loss of vision, or a sudden onset of proptosis, diplopia, or migraine. If examination reveals papilledema or retinal vascular lesions, estrogens should be permanently discontinued.

#### **5.7 Addition of a Progestin When a Woman Has Not Had a Hysterectomy**

Studies of the addition of a progestin for 10 or more days of a cycle of estrogen administration, or daily with estrogen in a continuous regimen, have reported a lowered incidence of endometrial hyperplasia than would be induced by estrogen treatment alone. Endometrial hyperplasia may be a precursor to endometrial cancer.

There are, however, possible risks that may be associated with the use of progestins with estrogens compared to estrogen-alone regimens. These include an increased risk of breast cancer.

#### **5.8 Elevated Blood Pressure**

In a small number of case reports, substantial increases in blood pressure have been attributed to idiosyncratic reactions to estrogens. In a large, randomized, placebo-controlled clinical trial, a generalized effect of estrogens on blood pressure was not seen.

#### **5.9 Hypertriglyceridemia**

In women with pre-existing hypertriglyceridemia, estrogen therapy may be associated with elevations of plasma triglycerides leading to pancreatitis. Consider discontinuation of treatment if pancreatitis occurs.

### **5.10 Hepatic Impairment and/or Past History of Cholestatic Jaundice**

Estrogens may be poorly metabolized in patients with impaired liver function. For women with a history of cholestatic jaundice associated with past estrogen use or with pregnancy, caution should be exercised and in the case of recurrence, medication should be discontinued.

### **5.11 Hypothyroidism**

Estrogen administration leads to increased thyroid-binding globulin (TBG) levels. Women with normal thyroid function can compensate for the increased TBG by making more thyroid hormone, thus maintaining free T<sub>4</sub> and T<sub>3</sub> serum concentrations in the normal range. Women dependent on thyroid hormone replacement therapy who are also receiving estrogens may require increased doses of their thyroid replacement therapy. These women should have their thyroid function monitored in order to maintain their free thyroid hormone levels in an acceptable range.

### **5.12 Fluid Retention**

Estrogens may cause some degree of fluid retention. Women with conditions that might be influenced by this factor, such as cardiac or renal dysfunction, warrant careful observation when estrogen is prescribed.

### **5.13 Hypocalcemia**

Estrogen therapy should be used with caution in women with hypoparathyroidism as estrogen-induced hypocalcemia may occur.

### **5.14 Exacerbation of Endometriosis**

A few cases of malignant transformation of residual endometrial implants have been reported in women treated post-hysterectomy with estrogen-alone therapy. For women known to have residual endometriosis post-hysterectomy, the addition of progestin should be considered.

### **5.15 Severe Anaphylactic/Anaphylactoid Reactions and Angioedema**

Cases of anaphylactic/anaphylactoid reactions, which developed anytime during the course of estradiol transdermal system (twice-weekly) treatment and required emergency medical management, have been reported in the postmarketing setting. Involvement of skin (hives, pruritus, swollen lips-tongue-face) and either respiratory tract (respiratory compromise) or gastrointestinal tract (abdominal pain, vomiting) has been noted.

Angioedema involving eye/eyelid, face, larynx, pharynx, tongue and extremity (hands, legs, ankles, and fingers) with or without urticaria requiring medical intervention has occurred in the postmarketing experience of using estradiol transdermal system (twice-weekly). If angioedema involves the tongue, glottis, or larynx, airway obstruction may occur. Patients who develop angioedema anytime during the course of treatment with estradiol transdermal system (twice-weekly) should not receive it again.

Exogenous estrogens may exacerbate symptoms of angioedema in women with hereditary angioedema.

### **5.16 Exacerbation of Other Conditions**

Estrogen therapy may cause an exacerbation of asthma, diabetes mellitus, epilepsy, migraines, porphyria, systemic lupus erythematosus, and hepatic hemangiomas and should be used with caution in women with these conditions.

### **5.17 Laboratory Tests**

Serum follicle stimulating hormone (FSH) and estradiol levels have not been shown to be useful in the management of moderate to severe vasomotor symptoms.

### **5.18 Drug-Laboratory Test Interactions**

Accelerated prothrombin time, partial thromboplastin time, and platelet aggregation time; increased platelet count; increased factors II, VII antigen, VIII antigen, VIII coagulant activity, IX, X, XII, VII-X complex, II-VII-X complex; and beta-thromboglobulin; decreased levels of anti factor Xa and antithrombin III; decreased antithrombin III activity; increased levels of fibrinogen and fibrinogen activity; increased plasminogen antigen and activity.

Increased thyroid-binding globulin (TBG) leading to increased circulating total thyroid hormone levels, as measured by protein-bound iodine (PBI), T<sub>4</sub> levels (by column or by radioimmunoassay) or T<sub>3</sub> levels by radioimmunoassay. T<sub>3</sub> resin uptake is decreased, reflecting the elevated TBG. Free T<sub>4</sub> and free T<sub>3</sub> concentrations are unaltered. Women on thyroid replacement therapy may require higher doses of thyroid hormone.

Other binding proteins may be elevated in serum, for example, corticosteroid-binding globulin (CBG), sex hormone-binding globulin (SHBG), leading to increased total circulating corticosteroids and sex steroids, respectively. Free hormone concentrations, such as testosterone and estradiol, may be decreased. Other plasma proteins may be increased (angiotensinogen/renin substrate, alpha-1-antitrypsin, ceruloplasmin).

Increased plasma high-density lipoprotein (HDL) and HDL<sub>2</sub> cholesterol subfraction concentrations, reduced low-density lipoprotein (LDL) cholesterol concentration, increased triglycerides levels.

Impaired glucose tolerance.

## **6 ADVERSE REACTIONS**

The following serious adverse reactions are discussed elsewhere in labeling:

- Cardiovascular Disorders [*see Boxed Warning, Warnings and Precautions (5.1)*]
- Endometrial Cancer [*see Boxed Warning, Warnings and Precautions (5.2)*]

### **6.1 Clinical Trials Experience**

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice.

There were no clinical trials conducted with estradiol transdermal system (twice-weekly). Estradiol transdermal system (twice-weekly) is bioequivalent to Vivelle®. The following adverse reactions are reported with Vivelle therapy:

**Table 1:  
Summary of Most Frequently Reported Adverse Reactions (Vivelle versus Placebo)  
Regardless of Relationship Reported at a Frequency ≥ 5 Percent**

	<b>Vivelle 0.025 mg/day<sup>†</sup> (N = 47) N (%)</b>	<b>Vivelle 0.0375 mg/day<sup>†</sup> (N = 130) N (%)</b>	<b>Vivelle 0.05 mg/day<sup>†</sup> (N = 103) N (%)</b>	<b>Vivelle 0.075 mg/day<sup>†</sup> (N = 46) N (%)</b>	<b>Vivelle 0.1 mg/day<sup>†</sup> (N = 132) N (%)</b>	<b>Placebo (N=157) N (%)</b>
<b>Gastrointestinal disorders</b>						
Constipation	2 (4.3)	5 (3.8)	4 (3.9)	3 (6.5)	2 (1.5)	4 (2.5)
Dyspepsia	4 (8.5)	12 (9.2)	3 (2.9)	2 (4.3)	0	10 (6.4)
Nausea	2 (4.3)	8 (6.2)	4 (3.9)	0	7 (5.3)	5 (3.2)
<b>General disorders and administration site conditions***</b>						
Influenza-like illness	3 (6.4)	6 (4.6)	8 (7.8)	0	3 (2.3)	10 (6.4)
Pain NOS*	0	8 (6.2)	0	2 (4.3)	7 (5.3)	7 (4.5)
<b>Infections and infestations</b>						
Influenza	4 (8.5)	4 (3.1)	6 (5.8)	0	10 (7.6)	14 (8.9)
Nasopharyngitis	3 (6.4)	16 (12.3)	10 (9.7)	9 (19.6)	11 (8.3)	24 (15.3)
Sinusitis NOS*	4 (8.5)	17 (13.1)	13 (12.6)	3 (6.5)	7 (5.3)	16 (10.2)
Upper respiratory tract infection NOS*	3 (6.4)	8 (6.2)	11 (10.7)	4 (8.7)	6 (4.5)	9 (5.7)
<b>Investigations</b>						
Weight increased	4 (8.5)	5 (3.8)	2 (1.9)	2 (4.3)	0	3 (1.9)
<b>Musculoskeletal and connective tissue disorders</b>						
Arthralgia	0	11 (8.5)	4 (3.9)	2 (4.3)	5 (3.8)	9 (5.7)
Back pain	4 (8.5)	10 (7.7)	9 (8.7)	4 (8.7)	14 (10.6)	10 (6.4)
Neck pain	3 (6.4)	4 (3.1)	4 (3.9)	0	6 (4.5)	2 (1.3)
Pain in limb	0	10 (7.7)	7 (6.8)	2 (4.3)	6 (4.5)	9 (5.7)
<b>Nervous system disorders</b>						
Headache NOS*	7 (14.9)	35 (26.9)	32 (31.1)	23 (50.0)	34 (25.8)	37 (23.6)
Sinus headache	0	12 (9.2)	5 (4.9)	5 (10.9)	2 (1.5)	8 (5.1)
<b>Psychiatric disorders</b>						
Anxiety NEC**	3 (6.4)	5 (3.8)	0	0	2 (1.5)	4 (2.5)
Depression	5 (10.6)	4 (3.1)	7 (6.8)	0	4 (3.0)	6 (3.8)
Insomnia	3 (6.4)	6 (4.6)	4 (3.9)	2 (4.3)	2 (1.5)	9 (5.7)
<b>Reproductive system and breast disorders</b>						
Breast tenderness	8 (17.0)	10 (7.7)	8 (7.8)	3 (6.5)	17 (12.9)	0
Dysmenorrhea	0	0	0	3 (6.5)	0	0
Intermenstrual bleeding	3 (6.4)	9 (6.9)	6 (5.8)	0	14 (10.6)	7 (4.5)

<b>Respiratory, thoracic and mediastinal disorders</b>						
Sinus congestion	0	4 (3.1)	3 (2.9)	3 (6.5)	6 (4.5)	7 (4.5)
<b>Vascular disorders</b>						
Hot flushes NOS*	3 (6.4)	0	3 (2.9)	0	0	6 (3.8)
Hypertension NOS*	2 (4.3)	0	3 (2.9)	0	0	2 (1.3)

† Represents milligrams of estradiol delivered daily by each system

\*NOS represents not otherwise specified

\*\*NEC represents not elsewhere classified

\*\*\*Application site erythema and application site irritation were observed in 3.2% or less of patients across treatment groups.

During the clinical pharmacology studies with estradiol transdermal system (twice-weekly), 35 percent or less of subjects experienced barely perceptible erythema. No transdermal systems were removed due to irritation. Three subjects (2.2 percent) reported mild discomfort while wearing estradiol transdermal system (twice-weekly) (N = 136).

## 6.2 Postmarketing Experience

The following additional adverse reactions have been identified during post-approval use of estradiol transdermal system (twice-weekly). Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

**Breast:** Breast enlargement

**Cardiovascular:** Palpitations, angina unstable

**Gastrointestinal:** Hemorrhage, diarrhea

**Skin:** Application site reactions, erythema, rash, hyperhidrosis, pruritus, urticaria

**Central Nervous System:** Dizziness, paresthesia, migraine, mood swings, emotional disorder, irritability, nervousness

**Miscellaneous:** Portal vein thrombosis, dyspnea, malaise, fatigue, peripheral edema, muscle spasms, paresthesia oral, swollen tongue, lip swelling, pharyngeal edema

## 7 DRUG INTERACTIONS

No drug interaction studies have been conducted for estradiol transdermal system (twice-weekly).

### 7.1 Metabolic Interactions

*In vitro* and *in vivo* studies have shown that estrogens are metabolized partially by cytochrome P450 3A4 (CYP3A4). Therefore, inducers or inhibitors of CYP3A4 may affect estrogen drug metabolism. Inducers of CYP3A4 such as St. John's wort (*Hypericum perforatum*) preparations, phenobarbital, carbamazepine and rifampin may reduce plasma concentrations of estrogens, possibly resulting in a decrease in therapeutic effects and/or changes in the uterine bleeding profile. Inhibitors of CYP3A4 such as erythromycin, clarithromycin, ketoconazole, itraconazole, ritonavir, and grapefruit juice may increase plasma concentrations of estrogens and may result in side effects.

## **8 USE IN SPECIFIC POPULATIONS**

### **8.1 Pregnancy**

Estradiol transdermal system (twice-weekly) should not be used during pregnancy [*see Contraindications (4)*]. There appears to be little or no increased risk of birth defects in children born to women who have used estrogens and progestins as an oral contraceptive inadvertently during early pregnancy.

### **8.3 Nursing Mothers**

Estradiol transdermal system (twice-weekly) should not be used during lactation. Estrogen administration to nursing women has been shown to decrease the quantity and quality of the breast milk. Detectable amounts of estrogens have been identified in the breast milk of women receiving estrogen therapy. Caution should be exercised when estradiol transdermal system (twice-weekly) is administered to a nursing woman.

### **8.4 Pediatric Use**

Estradiol transdermal system (twice-weekly) is not indicated in children. Clinical studies have not been conducted in the pediatric population.

### **8.5 Geriatric Use**

There have not been sufficient numbers of geriatric women involved in clinical studies utilizing estradiol transdermal system (twice-weekly) to determine whether those over 65 years of age differ from younger subjects in their response to estradiol transdermal system (twice-weekly).

***The Women's Health Initiative Studies:*** In the WHI estrogen-alone substudy (daily CE [0.625 mg]-alone versus placebo), there was a higher relative risk of stroke in women greater than 65 years of age [*see Clinical Studies (14.3)*].

In the WHI estrogen plus progestin substudy (daily CE [0.625 mg] plus MPA [2.5 mg] versus placebo), there was a higher relative risk of nonfatal stroke and invasive breast cancer in women greater than 65 years of age [*see Clinical Studies (14.3)*].

***The Women's Health Initiative Memory Study:*** In the WHIMS ancillary studies of postmenopausal women 65 to 79 years of age, there was an increased risk of probable dementia in women receiving estrogen-alone or estrogen plus progestin when compared to placebo [*see Warnings and Precautions (5.3), and Clinical Studies (14.4)*].

Since both ancillary studies were conducted in women 65 to 79 years of age, it is unknown whether these findings apply to younger postmenopausal women<sup>8</sup> [*see Warnings and Precautions (5.3), and Clinical Studies (14.3)*].

### **8.6 Renal Impairment**

The effect of renal impairment on the pharmacokinetics of estradiol transdermal system (twice-weekly) has not been studied.

## 8.7 Hepatic Impairment

The effect of hepatic impairment on the pharmacokinetics of estradiol transdermal system (twice-weekly) has not been studied.

## 10 OVERDOSAGE

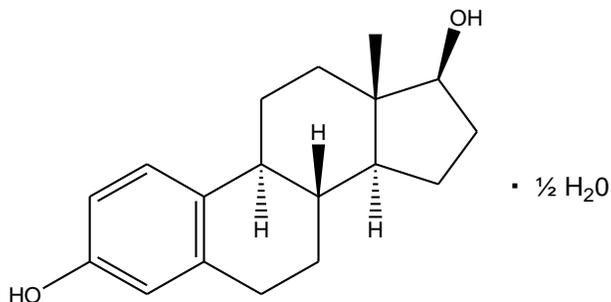
Overdosage of estrogen may cause nausea, vomiting, breast tenderness, abdominal pain, drowsiness and fatigue, and withdrawal bleeding may occur in women. Treatment of overdose consists of discontinuation of estradiol transdermal system (twice-weekly) therapy with institution of appropriate symptomatic care.

## 11 DESCRIPTION

Estradiol transdermal system, USP (twice-weekly) contains estradiol hemihydrate in a multipolymeric adhesive. The system is designed to release estradiol continuously upon application to intact skin.

Five dosage strengths of estradiol transdermal system (twice-weekly) are available to provide nominal *in vivo* delivery rates of 0.025, 0.0375, 0.05, 0.075, or 0.1 mg of estradiol per day via the skin. Each corresponding system has an active surface area of 2.5, 3.75, 5.0, 7.5, or 10.0 cm<sup>2</sup> and contains estradiol, USP hemihydrate equivalent to 0.41, 0.62, 0.82, 1.23, or 1.64 mg of estradiol, respectively. The composition of the systems per unit area is identical.

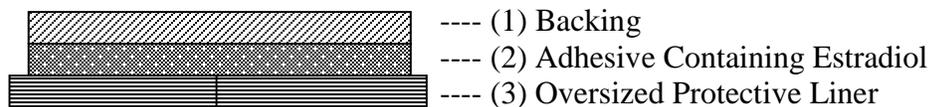
Estradiol, USP hemihydrate is a white, crystalline powder, chemically described as estradiol hemihydrate. The structural formula is



The molecular formula of estradiol hemihydrate is  $\text{C}_{18}\text{H}_{24}\text{O}_2 \cdot \frac{1}{2} \text{H}_2\text{O}$ . The molecular weight is 281.39.

### *Meets USP Drug Release Test 4*

Estradiol transdermal system (twice-weekly) is comprised of three layers. Proceeding from the visible surface toward the surface attached to the skin, these layers are (1) a translucent polyolefin backing film printed with brown ink, (2) an adhesive formulation containing estradiol, silicone adhesive, acrylic adhesive, dipropylene glycol, povidone, oleyl alcohol, and (3) an oversized slit polyester release liner which is attached to the adhesive surface and must be removed before the system can be used.



The active component of the system is estradiol. The remaining components of the system are pharmacologically inactive.

## 12 CLINICAL PHARMACOLOGY

### 12.1 Mechanism of Action

Endogenous estrogens are largely responsible for the development and maintenance of the female reproductive system and secondary sexual characteristics. Although circulating estrogens exist in a dynamic equilibrium of metabolic interconversions, estradiol is the principal intracellular human estrogen and is substantially more potent than its metabolites, estrone and estriol, at the receptor level.

The primary source of estrogen in normally cycling adult women is the ovarian follicle, which secretes 70 to 500 mcg of estradiol daily, depending on the phase of the menstrual cycle. After menopause, most endogenous estrogen is produced by conversion of androstenedione, secreted by the adrenal cortex, to estrone in the peripheral tissues. Thus, estrone and the sulfate conjugated form, estrone sulfate, are the most abundant circulating estrogens in postmenopausal women.

Estrogens act through binding to nuclear receptors in estrogen responsive tissues. To date, two estrogen receptors have been identified. These vary in proportion from tissue to tissue.

Circulating estrogens modulate the pituitary secretion of the gonadotropins, luteinizing hormone (LH) and follicle stimulating hormone (FSH) through a negative feedback mechanism. Estrogens act to reduce the elevated concentrations of these hormones seen in postmenopausal women.

### 12.2 Pharmacodynamics

There are no pharmacodynamic data for estradiol transdermal system (twice-weekly).

### 12.3 Pharmacokinetics

**Absorption:** In a single-dose, two way-crossover clinical study conducted in 96 healthy, non-smoking postmenopausal women under fed condition, estradiol transdermal system (twice-weekly) (0.1 mg per day) was bioequivalent to Vivelle (0.1 mg per day) based on estradiol exposure ( $AUC_{0-84}$ ) and estradiol peak concentration ( $C_{max}$ ) following a single-dose on the lower abdomen for 84 hours.

Estradiol pharmacokinetics were characterized in a separate open-label, single-center, randomized, single-dose, three-way crossover study conducted in 36 healthy, non-smoking postmenopausal women (aged 40 to 65 years). Estradiol transdermal system (twice-weekly) delivering nominal estradiol of approximately 0.025 mg, 0.05 mg, and 0.1 mg per day were applied to the lower abdomen under fed state in a crossover fashion for 84 hours. The mean

estradiol pharmacokinetics parameters are summarized in Table 2. AUC and  $C_{max}$  are dose proportional from 0.025 mg to 0.1 mg per day.

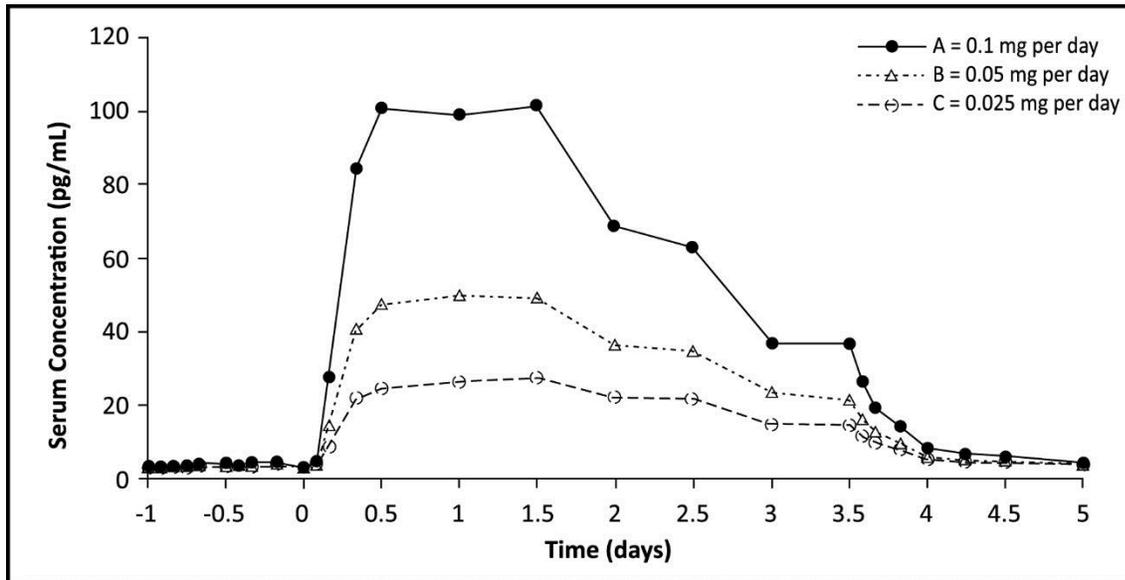
**Table 2:**  
**Mean (SD) Serum Pharmacokinetic Parameters of Baseline-Uncorrected Estradiol following a Single Dose of Estradiol Transdermal System (Twice-Weekly) (N = 36)**

Parameter	0.1 mg/day	0.05 mg/day	0.025 mg/day
AUC <sub>84</sub> (pg•hr/mL)	5875 (1857)	3057 (980)	1763 (600)
AUC <sub>120</sub> (pg•hr/mL)	6252 (1938)	3320 (1038)	1979 (648)
$C_{max}$ (pg/mL)	117 (39.3)	56.6 (17.6)	30.3 (11.1)
$T_{max}$ (hr) <sup>a</sup>	24.0 (8-60)	24.0 (8-60)	36.0 (8-84)

<sup>a</sup>Median (minimum-maximum)

Figure 1 illustrates the mean baseline-uncorrected estradiol serum concentrations of estradiol transdermal system (twice-weekly) at three different strengths.

**Figure 1:**  
**Mean Baseline-Uncorrected Estradiol Serum Concentration-Time Profiles Following a Single Dose of Estradiol Transdermal System (Twice-Weekly) 0.1 mg per day (Treatment A), 0.05 mg per day (Treatment B), and 0.025 mg per day (Treatment C) (N = 36)**



**Distribution:** No specific investigation of the tissue distribution of estradiol absorbed from estradiol transdermal system (twice-weekly) in humans has been conducted. The distribution of exogenous estrogens is similar to that of endogenous estrogens. Estrogens are widely distributed in the body and are generally found in higher concentrations in the sex hormone target organs. Estrogens circulate in the blood largely bound to sex hormone-binding globulin (SHBG) and albumin.

**Metabolism:** Exogenous estrogens are metabolized in the same manner as endogenous estrogens. Circulating estrogens exist in a dynamic equilibrium of metabolic interconversions. These transformations take place mainly in the liver. Estradiol is converted reversibly to estrone, and both can be converted to estriol, which is a major urinary metabolite. Estrogens also undergo enterohepatic recirculation via sulfate and glucuronide conjugation in the liver, biliary secretion of conjugates into the intestine, and hydrolysis in the intestine followed by reabsorption. In postmenopausal women a significant portion of the circulating estrogens exist as sulfate conjugates, especially estrone sulfate, which serves as a circulating reservoir for the formation of more active estrogens.

**Excretion:** Estradiol, estrone and estriol are excreted in the urine along with glucuronide and sulfate conjugates. The mean half-life values of estradiol calculated from treatment groups in the bioequivalence study and dose-proportionality study after dosing with the estradiol transdermal system (twice-weekly) ranged from 6.2 to 7.9 hours. After removal of the transdermal systems, serum concentrations of estradiol and estrone returned to baseline concentrations within 24 hours.

**Adhesion and Adhesive Residue:** Based on combined data from bioequivalence and dose proportionality studies consisting of 208 estradiol transdermal system (twice-weekly) observations, approximately 98 percent of the observations had an adhesion score of 0 (i.e., the skin adhesion rate was greater than or equal to 90 percent) over the 84-hour wear period. One subject had a complete detachment during the wear period. Approximately 65 percent of the transdermal systems evaluated in these studies were with estradiol transdermal system (twice-weekly) 0.1 mg per day (10.0 cm<sup>2</sup> active surface area).

After removal of estradiol transdermal system (twice-weekly), subjects had either no adhesive residue (score of 0) or light adhesive residue (score of 1). There were no subjects who had medium adhesive residue. Of the 208 estradiol transdermal system (twice-weekly) observations, 54 percent had light adhesive residue and 46 percent had no adhesive residue.

## **13 NONCLINICAL TOXICOLOGY**

### **13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility**

Long-term, continuous administration of natural and synthetic estrogens in certain animal species increases the frequency of carcinomas of the breast, uterus, cervix, vagina, testis, and liver.

## **14 CLINICAL STUDIES**

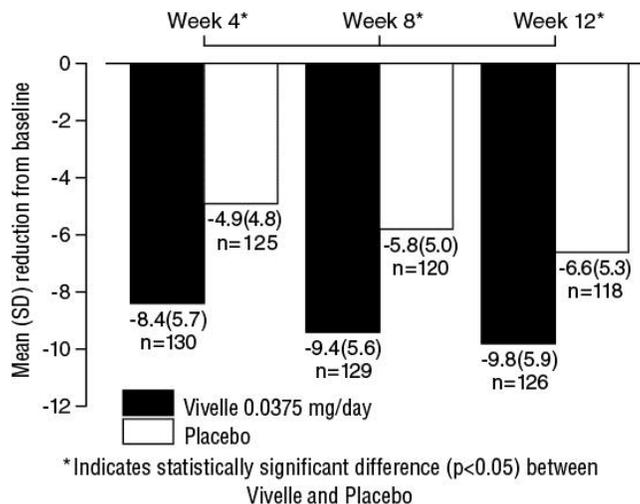
### **14.1 Effects on Vasomotor Symptoms**

There have been no efficacy and safety trials conducted with estradiol transdermal system (twice-weekly). In a pharmacokinetic study, estradiol transdermal system (twice-weekly) was shown to be bioequivalent to Vivelle.

In two controlled clinical trials with Vivelle, in a total of 356 subjects, the 0.075 and 0.1 mg doses were superior to placebo in relieving vasomotor symptoms at Weeks 4, 8 and 12 of treatment. In these studies, the 0.0375 and 0.05 mg doses did not differ from placebo at Week 4, therefore, a third 12-week placebo-controlled study in 255 subjects was performed with Vivelle

to establish the efficacy of the lowest dose of 0.0375 mg. The baseline mean daily number of hot flushes in these 255 subjects was 11.5. Results at Weeks 4, 8, and 12 of treatment are shown in Figure 2.

**Figure 2:**  
**Mean (SD) Change from Baseline in Mean Daily Number of Hot Flushes for Vivelle 0.0375 mg versus Placebo in a 12-Week Trial.**



The 0.0375 mg dose was superior to placebo in reducing both the frequency and severity of vasomotor symptoms at Weeks 4, 8 and 12 of treatment.

#### 14.2 Effects on Bone Mineral Density

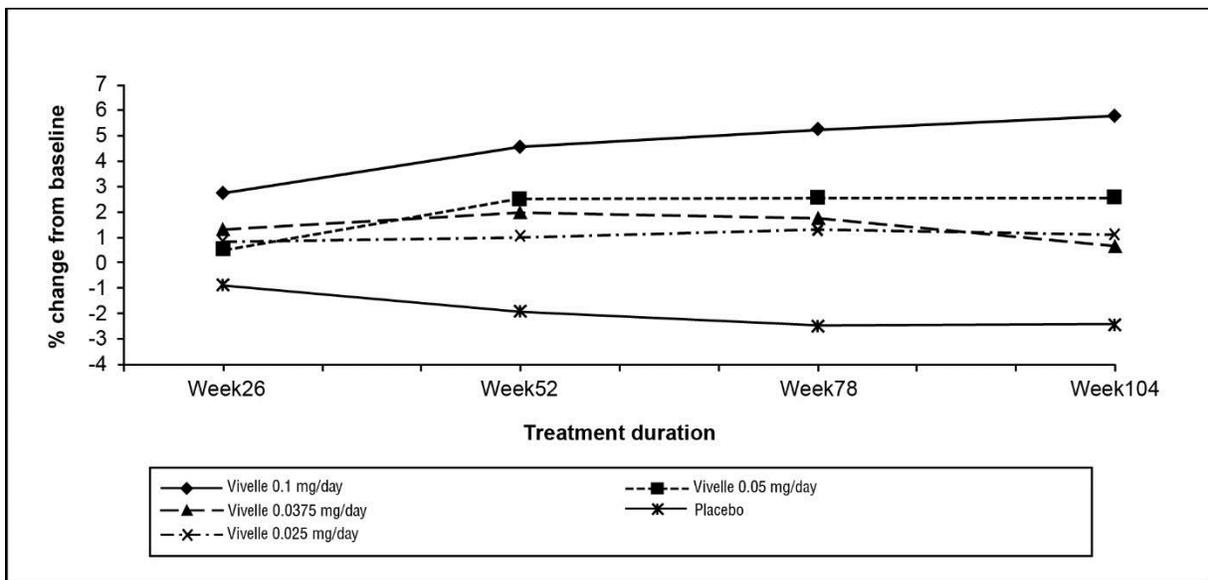
There have been no bone efficacy and safety trials conducted with estradiol transdermal system (twice-weekly). In a pharmacokinetic study, estradiol transdermal system (twice-weekly) was shown to be bioequivalent to Vivelle.

Efficacy and safety of Vivelle in the prevention of postmenopausal osteoporosis have been studied in a 2-year double-blind, randomized, placebo-controlled, parallel group study. A total of 261 hysterectomized (161) and non-hysterectomized (100), surgically or naturally menopausal women (within 5 years of menopause), with no evidence of osteoporosis (lumbar spine bone mineral density within 2 standard deviations of average peak bone mass, i.e.,  $\geq 0.0827 \text{ g/cm}^2$ ) were enrolled in this study; 194 patients were randomized to one of the four doses of Vivelle (0.1, 0.05, 0.0375, or 0.025 mg/day) and 67 patients to placebo. Over 2 years, study systems were applied to the buttock or the abdomen twice a week. Non-hysterectomized women received oral medroxyprogesterone acetate (2.5 mg/day) throughout the study.

The study population comprised naturally (82 percent) or surgically (18 percent) menopausal, hysterectomized (61 percent) or non-hysterectomized (39 percent) women with a mean age of 52.0 years (range 27 to 62 years); the mean duration of menopause was 31.7 months (range 2 to 72 months). Two hundred thirty-two (89 percent) randomized subjects (173 on active drug, 59 on placebo) contributed data to the analysis of percent change from baseline in bone mineral density

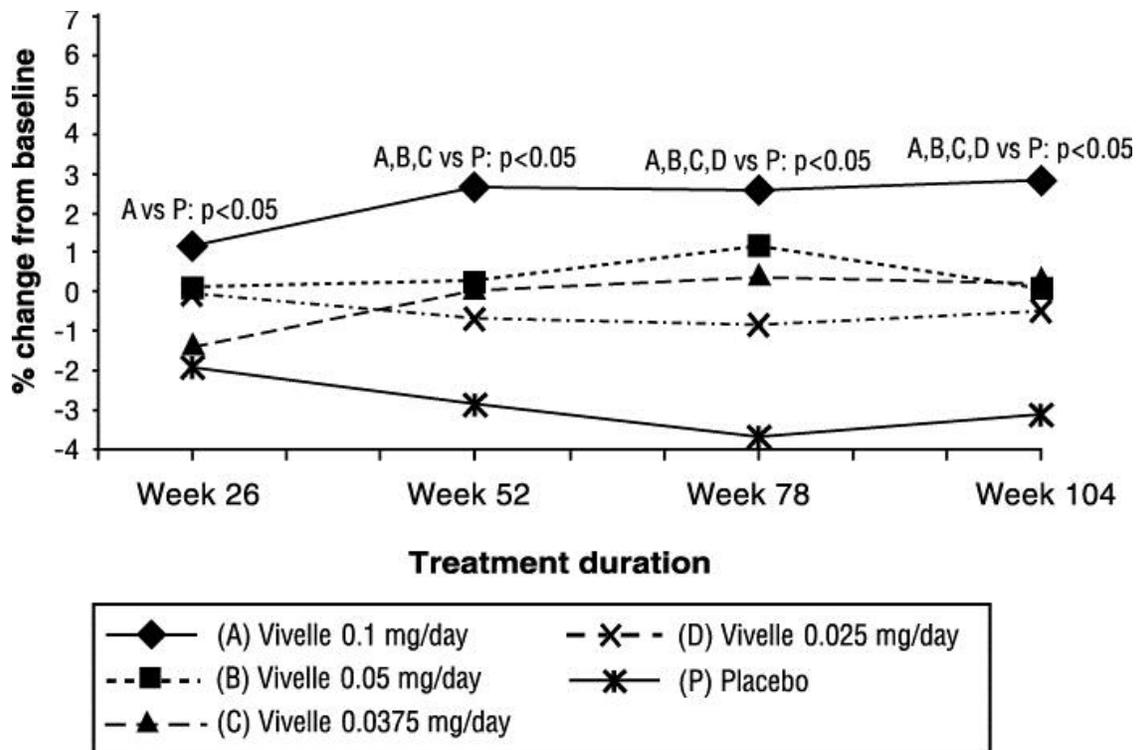
(BMD) of the AP lumbar spine, the primary efficacy variable. Patients were given supplemental dietary calcium (100 mg elemental calcium/day) but no supplemental vitamin D. There was an increase in BMD of the AP lumbar spine in all Vivelle dose groups; in contrast to this, a decrease in AP lumbar spine BMD was observed in placebo patients. All Vivelle doses were significantly superior to placebo ( $p < 0.05$ ) at all time points with the exception of Vivelle 0.05 mg/day at 6 months. The highest dose of Vivelle was superior to the three lower doses. There were no statistically significant differences in pairwise comparisons among the three lower doses (See Figure 3).

**Figure 3:**  
**Bone Mineral Density – AP Lumbar Spine**  
**Least Squares Means of Percentage Change from Baseline**  
**All Randomized Patients with at Least One Post-baseline Assessment Available with Last Post-baseline Observation Carried Forward**



Analysis of percent change from baseline in femoral neck BMD, a secondary efficacy outcome variable, showed qualitatively similar results; all doses of Vivelle were significantly superior to placebo ( $p < 0.05$ ) at 24 months. The highest Vivelle dose was superior to placebo at all time points. A mixture of significant and non-significant results were obtained for the lower dose groups at earlier time points. The highest Vivelle dose was superior to the three lower doses, and there were no significant differences among the three lower doses at this skeletal site (see Figure 4).

**Figure 4:**  
**Bone Mineral Density – Femoral Neck**  
**Least Squares Means of Percentage Change from Baseline**  
**All Randomized Patients with at Least One Post-baseline Assessment Available with Last Post-baseline Observation Carried Forward**



### 14.3 Women’s Health Initiative Studies

The WHI enrolled approximately 27,000 predominantly healthy postmenopausal women in two substudies to assess the risks and benefits of daily oral CE (0.625 mg)-alone or in combination with MPA (2.5 mg) compared to placebo in the prevention of certain chronic diseases. The primary endpoint was the incidence of CHD (defined as nonfatal MI, silent MI and CHD death), with invasive breast cancer as the primary adverse outcome. A “global index” included the earliest occurrence of CHD, invasive breast cancer, stroke, PE, endometrial cancer (only in the CE plus MPA substudy), colorectal cancer, hip fracture, or death due to other cause. These substudies did not evaluate the effects of CE-alone or CE plus MPA on menopausal symptoms.

**WHI Estrogen-Alone Substudy:** The WHI estrogen-alone substudy was stopped early because an increased risk of stroke was observed, and it was deemed that no further information would be obtained regarding the risks and benefits of estrogen-alone in predetermined primary endpoints.

Results of the estrogen-alone substudy, which included 10,739 women (average 63 years of age, range 50 to 79; 75.3 percent White, 15.1 percent Black, 6.1 percent Hispanic, 3.6 percent Other), after an average follow-up of 7.1 years are presented in Table 3.

**Table 3:  
Relative and Absolute Risk Seen in the Estrogen Alone Substudy of WHI<sup>a</sup>**

Event	Relative Risk CE vs. Placebo (95% nCI <sup>b</sup> )	CE n = 5,310	Placebo n = 5,429
		Absolute Risk per 10,000 Women-Years	
CHD events <sup>c</sup>	0.95 (0.78–1.16)	54	57
<i>Non-fatal MI<sup>c</sup></i>	<i>0.91 (0.73–1.14)</i>	<i>40</i>	<i>43</i>
<i>CHD death<sup>c</sup></i>	<i>1.01 (0.71–1.43)</i>	<i>16</i>	<i>16</i>
All strokes <sup>c</sup>	1.33 (1.15–1.68)	45	33
<i>Ischemic stroke<sup>c</sup></i>	<i>1.55 (1.19–2.01)</i>	<i>38</i>	<i>25</i>
Deep vein thrombosis <sup>c,d</sup>	1.47 (1.06–2.06)	23	15
Pulmonary embolism <sup>c</sup>	1.37 (0.90–2.07)	14	10
Invasive breast cancer <sup>c</sup>	0.80 (0.62–1.04)	28	34
Colorectal cancer <sup>e</sup>	1.08 (0.75–1.55)	17	16
Hip fracture <sup>c</sup>	0.65 (0.45–0.94)	12	19
Vertebral fractures <sup>c,d</sup>	0.64 (0.44–0.93)	11	18
Lower arm/wrist fractures <sup>c,d</sup>	0.58 (0.47–0.72)	35	59
Total fractures <sup>c,d</sup>	0.71 (0.64–0.80)	144	197
Death due to other causes <sup>e,f</sup>	1.08 (0.88–1.32)	53	50
Overall mortality <sup>c,d</sup>	1.04 (0.88–1.22)	79	75
Global Index <sup>g</sup>	1.02 (0.92–1.13)	206	201

<sup>a</sup> Adapted from numerous WHI publications. WHI publications can be viewed at [www.nhlbi.nih.gov/whi](http://www.nhlbi.nih.gov/whi).

<sup>b</sup> Nominal confidence intervals unadjusted for multiple looks and multiple comparisons.

<sup>c</sup> Results are based on centrally adjudicated data for an average follow-up of 7.1 years.

<sup>d</sup> Not included in “global index”.

<sup>e</sup> Results are based on an average follow-up of 6.8 years.

<sup>f</sup> All deaths, except from breast or colorectal cancer, definite or probable CHD, PE, or cerebrovascular disease.

<sup>g</sup> A subset of the events was combined in a “global index”, defined as the earliest occurrence of CHD events, invasive breast cancer, stroke, PE, endometrial cancer, colorectal cancer, hip fracture, or death due to other causes.

For those outcomes included in the WHI “global index” that reached statistical significance, the absolute excess risk per 10,000 women-years in the group treated with CE-alone was 12 more strokes, while the absolute risk reduction per 10,000 women-years was seven fewer hip fractures.<sup>9</sup> The absolute excess risk of events included in the “global index” was a non-significant five events per 10,000 women-years. There was no difference between the groups in terms of all-cause mortality.

No overall difference for primary CHD events (nonfatal MI, silent MI and CHD death) and invasive breast cancer incidence in women receiving CE-alone compared to placebo was reported in final centrally adjudicated results from the estrogen-alone substudy, after an average follow-up of 7.1 years.

Centrally adjudicated results for stroke events from the estrogen-alone substudy, after an average follow-up of 7.1 years, reported no significant differences in distribution of stroke subtype or severity, including fatal strokes, in women receiving CE-alone compared to placebo. Estrogen-

alone increased the risk for ischemic stroke, and this excess risk was present in all subgroups of women examined.<sup>10</sup>

Timing of the initiation of estrogen-alone therapy relative to the start of menopause may affect the overall risk benefit profile. The WHI estrogen-alone substudy, stratified by age, showed in women 50 to 59 years of age a non-significant trend toward reduced risk for CHD [*hazard ratio (HR)* 0.63 (95 percent CI, 0.36 to 1.09)] and overall mortality [*HR* 0.71 (95 percent CI, 0.46 to 1.11)].

**WHI Estrogen Plus Progestin Substudy:** The WHI estrogen plus progestin substudy was stopped early. According to the predefined stopping rule, after an average follow-up of 5.6 years of treatment, the increased risk of invasive breast cancer and cardiovascular events exceeded the specified benefits included in the “global index”. The absolute excess risk of events included in the “global index” was 19 per 10,000 women-years.

For those outcomes included in the WHI “global index” that reached statistical significance after 5.6 years of follow-up, the absolute excess risks per 10,000 women-years in the group treated with CE plus MPA were 7 more CHD events, 8 more strokes, 10 more PEs, and 8 more invasive breast cancers, while the absolute risk reduction per 10,000 women-years were 6 fewer colorectal cancers and 5 fewer hip fractures.

Results of the CE plus MPA substudy, which included 16,608 women (average 63 years of age, range 50 to 79; 83.9 percent White, 6.8 percent Black, 5.4 percent Hispanic, 3.9 percent Other) are presented in Table 4. These results reflect centrally adjudicated data after an average follow-up of 5.6 years.

**Table 4:  
Relative and Absolute Risk Seen in the Estrogen Plus Progestin Substudy of WHI at an Average of 5.6 Years<sup>a,b</sup>**

Event	Relative Risk CE/MPA vs. Placebo (95% nCI <sup>c</sup> )	CE/MPA (n = 8,506)	Placebo (n = 8,102)
		Absolute Risk per 10,000 Women-Years	
CHD events	1.23 (0.99–1.53)	41	34
<i>Non-fatal MI</i>	<i>1.28 (1.00–1.63)</i>	<i>31</i>	<i>25</i>
<i>CHD death</i>	<i>1.10 (0.70–1.75)</i>	<i>8</i>	<i>8</i>
All strokes	1.31 (1.03–1.68)	33	25
<i>Ischemic stroke</i>	<i>1.44 (1.09–1.90)</i>	<i>26</i>	<i>18</i>
Deep vein thrombosis <sup>d</sup>	1.95 (1.43–2.67)	26	13
Pulmonary embolism	2.13 (1.45–3.11)	18	8
Invasive breast cancer <sup>c</sup>	1.24 (1.01–1.54)	41	33
Colorectal cancer	0.61 (0.42–0.87)	10	16
Endometrial cancer <sup>d</sup>	0.81 (0.48–1.36)	6	7
Cervical cancer <sup>d</sup>	1.44 (0.47–4.42)	2	1
Hip fracture	0.67 (0.47–0.96)	11	16
Vertebral fractures <sup>d</sup>	0.65 (0.46–0.92)	11	17

Lower arm/wrist fractures <sup>d</sup>	0.71 (0.59–0.85)	44	62
Total fractures <sup>d</sup>	0.76 (0.69–0.83)	152	199
Overall mortality <sup>f</sup>	1.00 (0.83–1.19)	52	52
Global Index <sup>g</sup>	1.13 (1.02–1.25)	184	165

<sup>a</sup> Adapted from numerous WHI publications. WHI publications can be viewed at [www.nhlbi.nih.gov/whi](http://www.nhlbi.nih.gov/whi).

<sup>b</sup> Results are based on centrally adjudicated data.

<sup>c</sup> Nominal confidence intervals unadjusted for multiple looks and multiple comparisons.

<sup>d</sup> Not included in “global index”.

<sup>e</sup> Includes metastatic and non-metastatic breast cancer, with the exception of in situ breast cancer.

<sup>f</sup> All deaths, except from breast or colorectal cancer, definite or probable CHD, PE, or cerebrovascular disease.

<sup>g</sup> A subset of the events was combined in a “global index”, defined as the earliest occurrence of CHD events, invasive breast cancer, stroke, pulmonary embolism, endometrial cancer, colorectal cancer, hip fracture, or death due to other causes.

Timing of the initiation of estrogen plus progestin therapy relative to the start of menopause may affect the overall risk benefit profile. The WHI estrogen plus progestin substudy stratified for age showed in women 50 to 59 years of age a non-significant trend toward reduced risk for overall mortality [*HR 0.69 (95 percent CI, 0.44 to 1.07)*].

#### 14.4 Women’s Health Initiative Memory Study

The WHIMS estrogen-alone ancillary study of WHI enrolled 2,947 predominantly healthy hysterectomized postmenopausal women 65 to 79 years of age (45 percent were 65 to 69 years of age, 36 percent were 70 to 74 years of age, and 19 percent were 75 years of age and older) to evaluate the effects of daily CE (0.625 mg)-alone on the incidence of probable dementia (primary outcome) compared to placebo.

After an average follow-up of 5.2 years, the relative risk of probable dementia for CE-alone versus placebo was 1.49 (95 percent CI, 0.83 to 2.66). The absolute risk of probable dementia for CE-alone versus placebo was 37 versus 25 cases per 10,000 women-years. Probable dementia as defined in this study included Alzheimer’s disease (AD), vascular dementia (VaD) and mixed type (having features of both AD and VaD). The most common classification of probable dementia in the treatment group and the placebo group was AD. Since the ancillary study was conducted in women 65 to 79 years of age, it is unknown whether these findings apply to younger postmenopausal women [*see Warnings and Precautions (5.3) and Use in Specific Populations (8.5)*].

The WHIMS estrogen plus progestin ancillary study enrolled 4,532 predominantly healthy postmenopausal women 65 years of age and older (47 percent were 65 to 69 years of age, 35 percent were 70 to 74 years of age, and 18 percent were 75 years of age and older) to evaluate the effects of daily CE (0.625 mg) plus MPA (2.5 mg) on the incidence of probable dementia (primary outcome) compared to placebo.

After an average follow-up of 4 years, the relative risk of probable dementia for CE plus MPA versus placebo was 2.05 (95 percent CI, 1.21 to 3.48). The absolute risk of probable dementia for CE plus MPA versus placebo was 45 versus 22 per 10,000 women-years. Probable dementia as defined in this study included AD, VaD and mixed type (having features of both AD and VaD). The most common classification of probable dementia in the treatment group and the placebo group was AD. Since the ancillary study was conducted in women 65 to 79 years of age, it is

unknown whether these findings apply to younger postmenopausal women [see *Warnings and Precautions (5.3) and Use in Specific Populations (8.5)*].

When data from the two populations were pooled as planned in the WHIMS protocol, the reported overall relative risk for probable dementia was 1.76 (95 percent CI, 1.19 to 2.60). Differences between groups became apparent in the first year of treatment. It is unknown whether these findings apply to younger postmenopausal women [see *Warnings and Precautions (5.3) and Use in Specific Populations (8.5)*].

## 15 REFERENCES

1. Rossouw JE, et al. Postmenopausal Hormone Therapy and Risk of Cardiovascular Disease by Age and Years Since Menopause. *JAMA*. 2007;297:1465-1477.
2. Hsia J, et al. Conjugated Equine Estrogens and Coronary Heart Disease. *Arch Int Med*. 2006;166:357-365.
3. Curb JD, et al. Venous Thrombosis and Conjugated Equine Estrogen in Women Without a Uterus. *Arch Int Med*. 2006; 166:772-780.
4. Cushman M, et al. Estrogen Plus Progestin and Risk of Venous Thrombosis. *JAMA*. 2004;292:1573-1580.
5. Stefanick ML, et al. Effects of Conjugated Equine Estrogens on Breast Cancer and Mammography Screening in Postmenopausal Women with Hysterectomy. *JAMA*. 2006;295:1647-1657.
6. Chlebowski RT, et al. Influence of Estrogen Plus Progestin on Breast Cancer and Mammography in Healthy Postmenopausal Women. *JAMA*. 2003;289:3234-3253.
7. Anderson GL, et al. Effects of Estrogen Plus Progestin on Gynecologic Cancers and Associated Diagnostic Procedures. *JAMA*. 2003;290:1739-1748.
8. Shumaker SA, et al. Conjugated Equine Estrogens and Incidence of Probable Dementia and Mild Cognitive Impairment in Postmenopausal Women. *JAMA*. 2004;291:2947-2958.
9. Jackson RD, et al. Effects of Conjugated Equine Estrogen on Risk of Fractures and BMD in Postmenopausal Women With Hysterectomy: Results From the Women's Health Initiative Randomized Trial. *J Bone Miner Res*. 2006;21:817-828.
10. Hendrix SL, et al. Effects of Conjugated Equine Estrogen on Stroke in the Women's Health Initiative. *Circulation*. 2006;113:2425-2434.

## 16 HOW SUPPLIED/STORAGE AND HANDLING

### 16.1 How Supplied

Estradiol Transdermal System, USP (Twice-Weekly) is available as 0.025 mg/day, 0.0375 mg/day, 0.05 mg/day, 0.075 mg/day or 0.1 mg/day of estradiol. Each strength is supplied in a Patient Calendar Pack containing 8 individually packaged systems.

The 0.025 mg per day is available as a 2.5 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 0.41 mg of estradiol, for nominal\* delivery of 0.025 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with "Estradiol 0.025 mg/day" in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date. They are available as follows:

NDC 0378-4619-26  
carton containing 8 systems

The 0.0375 mg per day is available as a 3.75 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 0.62 mg of estradiol for nominal\* delivery of 0.0375 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.0375 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date. They are available as follows:

NDC 0378-4620-26  
carton containing 8 systems

The 0.05 mg per day is available as a 5.0 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 0.82 mg of estradiol for nominal\* delivery of 0.05 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.05 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date. They are available as follows:

NDC 0378-4621-26  
carton containing 8 systems

The 0.075 mg per day is available as a 7.5 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 1.23 mg of estradiol for nominal\* delivery of 0.075 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.075 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date. They are available as follows:

NDC 0378-4622-26  
carton containing 8 systems

The 0.1 mg per day is available as a 10.0 cm<sup>2</sup> system containing estradiol, USP hemihydrate equivalent to 1.64 mg of estradiol for nominal\* delivery of 0.1 mg of estradiol per day. Each rectangular patch with rounded corners consists of an opaque, white to cream adhesive layer, matte film backing randomly printed with “Estradiol 0.1 mg/day” in brown ink, and a clear release liner. The patch is contained in a square, flat, notched, pouch. The pouch is imprinted with the lot number and expiration date. They are available as follows:

NDC 0378-4623-26  
carton containing 8 systems

[\*see DESCRIPTION]

## 16.2 Storage and Handling

Store at room temperature 20° to 25°C (68° to 77°F). [See USP Controlled Room Temperature.]

Do not store unpouched. Apply immediately upon removal from the protective pouch.

Used transdermal systems still contain active hormone. To discard, fold the sticky side of the transdermal system together, place it in a sturdy child-proof container, and place this container in the trash. Used transdermal systems should not be flushed in the toilet.

## 17 PATIENT COUNSELING INFORMATION

See FDA-approved patient labeling (Patient Information and Instructions for Use).

### 17.1 Vaginal Bleeding

Inform postmenopausal women of the importance of reporting unusual vaginal bleeding to their healthcare providers as soon as possible [see *Warnings and Precautions (5.2)*].

### 17.2 Possible Serious Adverse Reactions with Estrogen-Alone Therapy

Inform postmenopausal women of possible serious adverse reactions of estrogen-alone therapy including Cardiovascular Disorders, Malignant Neoplasms, and Probable Dementia [see *Warnings and Precautions (5.1, 5.2, 5.3)*].

### 17.3 Possible Less Serious but Common Adverse Reactions with Estrogen-Alone Therapy

Inform postmenopausal women of less serious but common adverse reactions of estrogen-alone therapy such as headache, breast pain and tenderness, nausea and vomiting.

The brands listed are trademarks of their respective owners.

### **Patient Information** **Estradiol Transdermal System, USP (Twice-Weekly)** (es" tra dye' ol)

Read this patient information before you start using estradiol transdermal system (twice-weekly) and each time you get a refill. There may be new information. This information does not take the place of talking to your healthcare provider about your medical condition or your treatment.

#### **What is the most important information I should know about estradiol transdermal system (twice-weekly) (an estrogen hormone)?**

- Using estrogen-alone may increase your chance of getting cancer of the uterus (womb). Report any unusual vaginal bleeding right away while you are using estradiol transdermal system (twice-weekly). Vaginal bleeding after menopause may be a warning sign of cancer of the uterus (womb). Your healthcare provider should check any unusual vaginal bleeding to find out the cause

- Do not use estrogen-alone to prevent heart disease, heart attacks, strokes, or dementia (decline in brain function)
- Using estrogen-alone may increase your chances of getting strokes or blood clots
- Using estrogen-alone may increase your chance of getting dementia, based on a study of women 65 years of age or older
- Do not use estrogens with progestins to prevent heart disease, heart attacks, strokes, or dementia
- Using estrogens with progestins may increase your chances of getting heart attacks, strokes, breast cancer, or blood clots
- Using estrogens with progestins may increase your chance of getting dementia, based on a study of women 65 years of age or older
- You and your healthcare provider should talk regularly about whether you still need treatment with estradiol transdermal system (twice-weekly)

### **What is estradiol transdermal system (twice-weekly)?**

Estradiol transdermal system (twice-weekly) is a prescription medicine patch (Transdermal System) that contains estradiol (an estrogen hormone). When applied to the skin as directed below, estradiol transdermal system (twice-weekly) releases estrogen through the skin into the bloodstream.

### **What is estradiol transdermal system (twice-weekly) used for?**

The estradiol transdermal system (twice-weekly) patch is used after menopause to:

- **Reduce moderate to severe hot flashes**

Estrogens are hormones made by a woman's ovaries. The ovaries normally stop making estrogens when a woman is between 45 and 55 years old. This drop in body estrogen levels causes the "change of life" or menopause (the end of monthly menstrual periods).

Sometimes, both ovaries are removed during an operation before natural menopause takes place. The sudden drop in estrogen levels causes "surgical menopause."

When the estrogen levels begin dropping, some women develop very uncomfortable symptoms, such as feelings of warmth in the face, neck, and chest or sudden strong feelings of heat and sweating ("hot flashes" or "hot flushes"). In some women, the symptoms are mild and they will not need treatment with estrogen therapy. In other women, symptoms can be more severe. You and your healthcare provider should talk regularly about whether or not you still need treatment with estradiol transdermal system (twice-weekly).

- **Help reduce your chances of getting osteoporosis (thin weak bones)**

Osteoporosis from menopause is a thinning of the bones that makes them weaker and easier to break. If you use estradiol transdermal system (twice-weekly) only to prevent osteoporosis from menopause, talk with your healthcare provider about whether a different treatment or medicine without estrogens might be better for you.

You and your healthcare provider should talk regularly about whether you should continue treatment with estradiol transdermal system (twice-weekly).

### **Who should not use estradiol transdermal system (twice-weekly)?**

Do not start using estradiol transdermal system (twice-weekly) if you:

- **have unusual vaginal bleeding**  
Vaginal bleeding after menopause may be a warning sign of cancer of the uterus (womb). Your healthcare provider should check any unusual vaginal bleeding to find out the cause.
- **currently have or have had certain cancers**  
Estrogens may increase the chances of getting certain types of cancers, including cancer of the breast or uterus. If you have or have had cancer, talk with your healthcare provider about whether you should use estradiol transdermal system (twice-weekly).
- **had a stroke or heart attack**
- **currently have or have had blood clots**
- **currently have or have had liver problems**
- **have been diagnosed with a bleeding disorder**
- **are allergic to estradiol transdermal system (twice-weekly) or any of its ingredients**  
See the list of ingredients in estradiol transdermal system (twice-weekly) at the end of this leaflet.
- **think you may be pregnant**  
Estradiol transdermal system (twice-weekly) is not for pregnant women. If you think you may be pregnant, you should have a pregnancy test and know the results. Do not take estradiol transdermal system (twice-weekly) if the test is positive and talk to your healthcare provider.

**What should I tell my healthcare provider before I use estradiol transdermal system (twice-weekly)?**

**Before you use estradiol transdermal system (twice-weekly), tell your healthcare provider if you:**

- **have any unusual vaginal bleeding**  
Vaginal bleeding after menopause may be a warning sign of cancer of the uterus (womb). Your healthcare provider should check any unusual vaginal bleeding to find out the cause.
- **have any other medical conditions**  
Your healthcare provider may need to check you more carefully if you have certain conditions such as asthma (wheezing), epilepsy (seizures), diabetes, migraine, endometriosis, lupus, angioedema (swelling of the face and tongue), or problems with your heart, liver, thyroid, kidneys, or have high calcium levels in your blood.
- **are going to have surgery or will be on bed rest**  
Your healthcare provider will let you know if you need to stop using estradiol transdermal system (twice-weekly).
- **are breast feeding**  
The hormone in estradiol transdermal system (twice-weekly) can pass into your breast milk.

**Tell your healthcare provider about all the medicines you take** including prescription and nonprescription medicines, vitamins and herbal supplements. Some medicines may affect how estradiol transdermal system (twice-weekly) works. Estradiol transdermal system (twice-weekly) may also affect how your other medicines work. Keep a list of your medicines and show it to your healthcare provider and pharmacist when you get a new medicine.

## **How should I use estradiol transdermal system (twice-weekly)?**

### **For detailed instructions, see the step-by-step instructions for using estradiol transdermal system (twice-weekly) at the end of this Patient Information**

- Use estradiol transdermal system (twice-weekly) exactly as your healthcare provider tells you to use it
- Estradiol transdermal system (twice-weekly) is for skin use only
- Change your estradiol transdermal system (twice-weekly) patch 2 times a week or every 3 to 4 days
- Apply your estradiol transdermal system (twice-weekly) patch to a clean, dry area on your lower abdomen or buttocks. This area must be clean, dry, and free of powder, oil or lotion for your patch to stick to your skin
- Apply your estradiol transdermal system (twice-weekly) patch to a different area of your abdomen or your buttocks each time. Do not use the same application site 2 times in the same week.
- Do not apply estradiol transdermal system (twice-weekly) to your breasts
- If you forget to apply a new estradiol transdermal system (twice-weekly) patch, you should apply a new patch as soon as possible.
- You and your healthcare provider should talk regularly (every 3 to 5 months) about your dose and whether you still need treatment with estradiol transdermal system (twice-weekly).

### **How to Change estradiol transdermal system (twice-weekly)**

- When changing the patch, peel off the used patch slowly from the skin
- After removal of estradiol transdermal system (twice-weekly), patients usually have either no adhesive residue or light adhesive residue. If any adhesive residue remains on your skin after removing the patch, allow the area to dry for 15 minutes. Then, gently rub the area with oil or lotion to remove the adhesive from your skin
- Keep in mind, **the new patch must be applied to a different area of your abdomen or buttocks.** This area must be clean, dry, cool and free of powder, oil or lotion.

## **What are the possible side effects of estradiol transdermal system (twice-weekly)?**

**Side effects are grouped by how serious they are and how often they happen when you are treated.**

### **Serious, but less common side effects include:**

- heart attack
- stroke
- blood clots
- dementia
- breast cancer
- cancer of the lining of the uterus (womb)
- cancer of the ovary
- high blood pressure
- high blood sugar

- gallbladder disease
- liver problems
- changes in your thyroid hormone levels
- enlargement of benign tumors (“fibroids”)

**Call your healthcare provider right away if you get any of the following warning signs or any other unusual symptoms that concern you:**

- new breast lumps
- unusual vaginal bleeding
- changes in vision or speech
- sudden new severe headaches
- severe pains in your chest or legs with or without shortness of breath, weakness and fatigue
- swelling
- rash

**Less serious, but common side effects include:**

- headache
- breast pain
- irregular vaginal bleeding or spotting
- stomach or abdominal cramps, bloating
- nausea and vomiting
- hair loss
- fluid retention
- vaginal yeast infection
- redness and/or irritation at patch placement site

These are not all the possible side effects of estradiol transdermal system (twice-weekly). For more information, ask your healthcare provider or pharmacist for advice about side effects. Tell your healthcare provider if you have any side effects that bother you or does not go away. **You may report side effects to Mylan Pharmaceuticals Inc. at 1-877-446-3679 (1-877-4-INFO-RX) or to FDA at 1-800-FDA-1088.**

**What can I do to lower my chances of a serious side effect with estradiol transdermal system (twice-weekly)?**

- Talk with your healthcare provider regularly about whether you should continue taking estradiol transdermal system (twice-weekly)
- If you have a uterus, talk to your healthcare provider about whether the addition of a progestin is right for you  
The addition of a progestin is generally recommended for a woman with a uterus to reduce the chance of getting cancer of the uterus (womb).
- See your healthcare provider right away if you get vaginal bleeding while using estradiol transdermal system (twice-weekly)
- Have a pelvic exam, breast exam and mammogram (breast X-ray) every year unless your healthcare provider tells you something else

If members of your family have had breast cancer or if you have ever had breast lumps or an abnormal mammogram, you may need to have breast exams more often

- If you have high blood pressure, high cholesterol (fat in the blood), diabetes, are overweight, or if you use tobacco, you may have higher chances of getting heart disease  
Ask your healthcare provider for ways to lower your chances of getting heart disease.

**How should I store and throw away used estradiol transdermal system (twice-weekly) patches?**

- Store at room temperature 20° to 25°C (68° to 77°F)
- Do not store estradiol transdermal system (twice-weekly) patches outside of their pouches. Apply immediately upon removal from the protective pouch
- Used patches still contain estrogen. To throw away the patch, fold the sticky side of the patch together, place it in a sturdy child-proof container, and place this container in the trash. Used patches should not be flushed in the toilet

**KEEP estradiol transdermal system (twice-weekly) and all other medicines out of the reach of children**

**General information about safe and effective use of estradiol transdermal system (twice-weekly)**

Medicines are sometimes prescribed for conditions that are not mentioned in patient information leaflets. Do not use estradiol transdermal system (twice-weekly) for conditions for which it was not prescribed. Do not give estradiol transdermal system (twice-weekly) to other people, even if they have the same symptoms you have. It may harm them.

This leaflet summarizes the most important information about estradiol transdermal system (twice-weekly). If you would like more information, talk with your healthcare provider or pharmacist. You can ask your healthcare provider or pharmacist for information about estradiol transdermal system (twice-weekly) that is written for health professionals.

For more information, call Mylan Pharmaceuticals Inc. at 1-877-446-3679 (1-877-4-INFO-RX).

**What are the ingredients in estradiol transdermal system (twice-weekly)?**

**Active ingredient:** estradiol

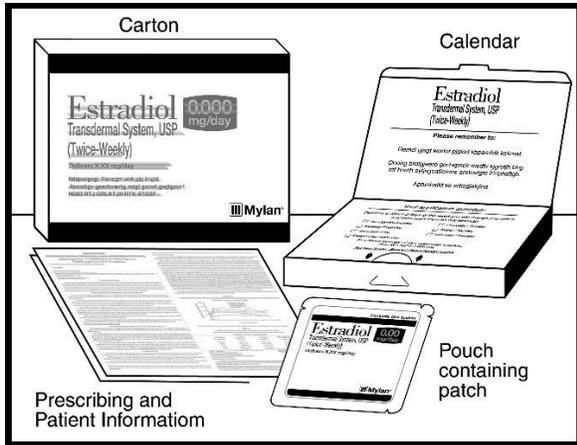
**Inactive ingredients:** a translucent polyolefin backing film, brown ink, silicone and acrylic adhesives, dipropylene glycol, povidone, oleyl alcohol, and a polyester release liner

**Instructions for Use  
Estradiol Transdermal System, USP (Twice-Weekly)  
(es" tra dye' ol)**

Read this PATIENT INFORMATION before you start using estradiol transdermal system (twice-weekly) and each time you get a refill. There may be new information. This information

does not take the place of talking to your healthcare provider about your menopausal symptoms or your treatment.

You will need the following supplies (See **Figure A**).



**Figure A**

**Step 1: Pick the days you will change your patch.**

- You will need to change your patch 2 times a week or every 3 to 4 days. Use the calendar printed inside your carton to choose the 2 days you will change your patch (See **Figure B**).
- **Remember to change your patch on the same 2 days you marked on your calendar.** If you forget to change your patch on the correct date, apply a new patch as soon as you remember, and continue to follow your original schedule



**Figure B**

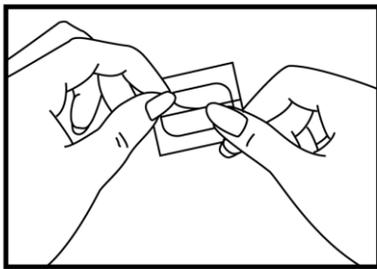
**Step 2: Remove the estradiol transdermal system (twice-weekly) patch from the pouch.**

- Remove the patch from its protective pouch by tearing at the notch (**do not** use scissors, See **Figure C**).
- Do not remove your patch from the protective pouch until you are ready to apply it



**Figure C**

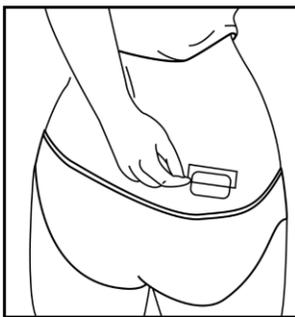
**Step 3: Remove half of the adhesive liner (See Figure D).**



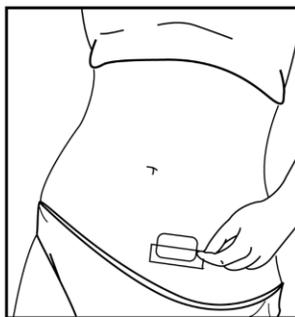
**Figure D**

**Step 4: Placing the patch on your skin.**

- Hold the part of the patch that still has the adhesive liner on it
- **Avoid touching the sticky half of the patch with your fingers**
- Apply the exposed sticky half of the patch to 1 of the areas of skin shown below (See **Figures E and F**).



**Figure E**



**Figure F**

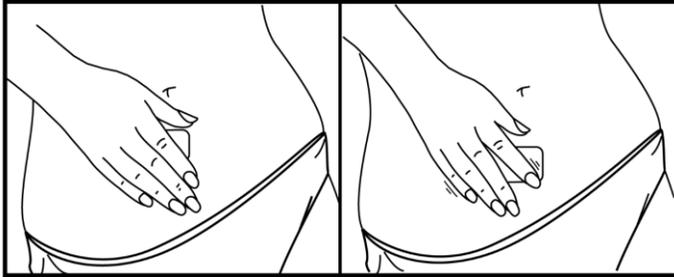
**Note:**

- Avoid the waistline, since clothing and belts may cause the patch to be rubbed off
- Do not apply the patch to your breasts
- Only apply the patch to skin that is clean, dry, and free of any powder, oil, or lotion

- You should not apply the patch to injured, burned, or irritated skin, or areas with skin conditions (such as birth marks, tattoos, or that is very hairy)

**Step 5: Press the patch firmly onto your skin.**

- Remove the remaining half of the adhesive liner and press the entire patch into place with the palm of your hand for 10 seconds
- Rub the edges of the patch with your fingers to make sure that it will stick to your skin (**See Figure G**).



**Figure G**

**Note:**

- Showering will not cause your patch to fall off
- If your patch falls off reapply it. If you cannot reapply the patch, apply a new patch to another area (**See Figures E and F**) and continue to follow your original placement schedule
- If you stop using your estradiol transdermal system (twice-weekly) patch or forget to apply a new patch as scheduled, you may have spotting, or bleeding, and recurrence of symptoms

**Step 6: Throwing away your used patch.**

- When it is time to change your patch, remove the old patch before you apply a new patch
- To throw away the patch, fold the sticky side of the patch together, place it in a sturdy child-proof container, and place this container in the trash. Used patches should not be flushed in the toilet

This Patient Information and Instructions for Use have been approved by the U.S. Food and Drug Administration.



Manufactured for:  
**Mylan Pharmaceuticals Inc.**  
Morgantown, WV 26505 U.S.A.

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