Impact of elagolix on work loss due to endometriosis-associated pain: estimates based on the results of two phase III clinical trials

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Objective: To estimate the impact of elagolix on work loss due to endometriosis-associated pain.
Design: Post hoc analysis of data from the Elaris I and II clinical trials.
Setting: Not applicable.
Patient(s): Employed women ages 18–49 years with moderate-to-severe endometriosis-associated pain.
Intervention(s): In the two trials, participants were randomized to 6 months of treatment with placebo, elagolix 150 mg once a day, or elagolix 200 mg twice a day.
Main Outcome Measure(s): Data on planned work hours, presenteeism, absenteeism, and total work loss (absenteeism + presenteeism) at baseline and month 3 were collected using the Health-Related Productivity Questionnaire.
Result(s): This analysis included employed participants from EM-I (n = 672) and EM-II (n = 626). Between baseline and month 3, compared with participants treated with placebo, participants treated with elagolix 150 mg once a day gained > 2 hours total work/week (EM-I, 2.20 ± 1.03; EM-II, 2.65 ± 1.14). Participants treated with 200 mg twice a day gained > 4 hours total work/week (EM-I, 4.91 ± 1.04; EM-II, 4.64 ± 1.14). Both absenteeism and presenteeism were reduced, although most of the gain was due to reduced presenteeism. Estimated cost savings after 6 months of treatment with elagolix were > $1,500 U.S. at 150 mg once a day and > $3,300 U.S. at 200 mg twice a day.
Conclusion(s): Compared with placebo, treating moderate-to-severe endometriosis-associated pain with elagolix reduced absenteeism and improved productivity in employed women, which should result in cost savings.
Clinical Trial Number(s): NCT01620528 (EM-I) and NCT01931670 (EM-II). (Fertil Steril® 2019;112:545–51. Copyright ©2019 The Authors. Published by Elsevier Inc. on behalf of the American Society for Reproductive Medicine. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).)
El resumen está disponible en Español al final del artículo.

Key Words: Endometriosis, absenteeism, presenteeism, productivity

Endometriosis is a common problem for reproductive-age women, with a prevalence ranging from 6% to 10% in the United States (1, 2). Women with endometriosis can suffer intermenstrual bleeding, nonmenstrual pelvic pain, and pain during menstruation, intercourse, urination, and defecation (3). This can severely affect daily activities, social life, and intimate relationships, creating a heavy burden

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for women and their families (4, 5). One of the principal concerns for women with endometriosis is lost work (absenteeism) and reduced productivity while at work (presenteeism) (5–7). Women with endometriosis lose, on average, one half to one full day of work each week (2, 5–8). This is mainly driven by and correlates with the intensity of chronic pelvic pain, which can be severe (8, 9).

Elaris Endometriosis I (EM-I) and Elaris Endometriosis II (EM-II) were two multicenter, randomized controlled phase III clinical trials examining the effect of elagolix, a gonadotropin releasing hormone agonist, in women with moderate-to-severe endometriosis-associated pain (10). Each trial included more than 800 participants and compared responses to placebo, elagolix 150 mg once a day, and elagolix 200 mg twice a day. Clinical responses in dysmenorrhea and pelvic pain at 3 months, the coprimary endpoints, were significantly greater with elagolix than with placebo, improvements that were maintained at 6 months.

Included in the two trials was a validated patient-reported outcome measure, the Health-Related Productivity Questionnaire (HRPQ) (11), to document how illness and treatments affected the participants' ability to remain in the workforce and to perform work and daily activities at home. Here, we used the HRPQ data from EM-I and EM-II to estimate to what extent elagolix reduces work loss in women with moderate-to-severe endometriosis-associated pain.

MATERIALS AND METHODS

Study Design

This was a post hoc analysis of data from the EM-I (NCT01620528) and EM-II (NCT01931670) phase III clinical trials (10). EM-I and EM-II were conducted in accordance with the Declaration of Helsinki and Good Clinical Practice guidelines. Ethics committee approval and informed consent were obtained for the two trials.

EM-I was conducted at 151 sites in the United States and Canada between July 2012 and May 2014 and EM-II at 187 sites on five continents between November 2013 and July 2015. The protocols for the two trials were similar and had the same primary and co-primary objectives. Both trials included women 18–49 years of age with surgically confirmed endometriosis and moderate-to-severe endometriosis-associated pain. Participants were randomized to 6 months of treatment with placebo, elagolix 150 mg once a day, or elagolix 200 mg twice a day. The design and main results for the two trials have been published (10). Briefly, the study included the 6-month treatment period, with the primary efficacy assessment made after 3 months of treatment.

The current analysis included women employed full or part time in the intent-to-treat groups of EM-I and EM-II. Outcome measures from the two trials utilized in the current analysis included participant baseline demographic characteristics (age, sex, race, and ethnicity) and HRPQ (11) at baseline and month 3.

Health-Related Productivity Questionnaire

The HRPQ is a self-reported, nine-item questionnaire used to evaluate health-related productivity (12) that has been validated for use in women with endometriosis (11). The HPRQ captures information on the impact of medical conditions on both employed and household work, although the current analysis examined only employed work. The following HPRQ data were extracted: employment status, hours of employment work scheduled during the last week, effect of health issues or their treatment on working scheduled hours (i.e., absenteeism), and effect of health issues or their treatment on work output (productivity) during the last week (i.e., presenteeism). Participants completed the HPRQ at baseline and monthly during the treatment period, although only the baseline and month 3 data were included in this analysis.

Calculations and Statistical Analysis

All analyses were performed using SAS version 9.4 (SAS Institute) in participants employed full or part time in the intent-to-treat populations of EM-I and EM-II. Missing data were not replaced or imputed, and results for the two clinical trials were calculated separately. Absenteeism was defined as time of work lost due to absence from work, and presenteeism was defined as time of work lost due to decreased productivity while present at work (11).

Mean hours of work lost per week and proportion of planned work lost were calculated for absenteeism and presenteeism from the HRPQ results at baseline (day 1) and month 3. Total work loss was calculated as the sum of absenteeism and presenteeism. Total hours of work loss per year were calculated as [total hours of work lost per week] × [average of 48 weeks worked per year in the United States] (8). Changes in work lost per week and in percent of planned work lost per week between baseline and month 3 were calculated for each treatment arm and type of work loss (absenteeism, presenteeism, and total) and compared between each elagolix dose and placebo by analysis of covariance with treatment arm as the main effect and baseline hours lost as a covariate. $P<.05$ was considered statistically significant. Hours of work gained per week and percent of planned work gained per week with each elagolix dose were calculated for each type of work loss as [change between baseline and month 3] − [change between baseline and month 3 with placebo].

Direct cost savings associated with treating endometriosis with elagolix 150 mg once a day were analyzed for 6-, 12-, and 24-month time frames and with 200 mg twice a day for a 6-month time frame to reflect the approved duration of elagolix (24 months for 150 mg once a day, 6 months for 200 mg twice a day) (13). Annual direct cost savings per participant associated with elagolix treatment were estimated as [hours gained with treatment] × [average hourly employer cost (including wages and benefits) in the United States]. Hours gained with treatment were estimated for each treatment arm and type of work loss as [average of 4.0 weeks worked per month in the United States] × [time frame in months] × [−1 × (change between baseline and month 3 in work lost per week for each elagolix dose) − (change between baseline and month 3 in work lost per week for placebo)] (8). The average hourly employer cost was calculated as [average hourly employer cost (including wages and benefits) in the

United States in June 2018 ($36.22)] × [a correction factor of 81.9% to account for the lower average earnings for women than men in the United States] (14, 15). No statistical tests were performed for cost calculations because no comparisons were made.

RESULTS

Participant Characteristics

This analysis included women employed full or part time in the intent-to-treat populations of EM-I (n = 672) and EM-II (n = 626). The majority of participants had full-time jobs (60.2% [524/871] in EM-I and 59.4% [484/815] in EM-II). The mean age of this population was 31.6 ± 6.2 years in EM-I and 33.5 ± 6.7 years in EM-II, and most participants were white (86.3% EM-I and 88.5% EM-II) and reported an ethnicity of not Hispanic or Latino (84.2% EM-I and 85.8% EM-II; Table 1).

Work Lost due to Endometriosis-Associated Pain at Baseline

At baseline, the participants reported losing an average of 15–16 hours of employment work the previous week (16.5 ± 11.4 hours in EM-I and 15.2 ± 11.3 hours in EM-II), representing, on average, more than 40% of their planned employed work hours (45.3% ± 27.2% in EM-I and 43.7% ± 27.7% in EM-II; Table 2). Most of this was due to presenteeism, which accounted for 12–13 hours/week (13.4 ± 9.9 hours in EM-I and 12.5 ± 10.1 hours in EM-II) and over one-third of their planned work hours (36.3% ± 23.2% in EM-I and 34.7% ± 23.8% in EM-II). Absenteeism represented approximately 3 hours/week (3.2 ± 5.4 hours in EM-I and 2.9 ± 5.6 hours in EM-II) and just under 10% of planned work hours (9.2% ± 15.6% in EM-I and 9.5% ± 18.7% in EM-II). This corresponds to a yearly average of 154 hours (EM-II) to 329 hours (EM-I) of absenteeism, 600 hours (EM-II) to 643 hours (EM-I) of presenteeism, and 730 hours (EM-II) to 792 hours (EM-I) of total work loss. Results were similar when analyzed for each treatment cohort in the two trials (data not shown).

TABLE 1

Baseline sociodemographic characteristics of participants included in the analysis.[a]

Characteristic	EM-I (n = 672)	EM-II (n = 626)
Age, mean (SD)	31.6 (6.2)	33.5 (6.7)
Race, n (%)		
White	580 (86.3)	554 (88.5)
Black or African American	63 (9.4)	58 (9.3)
Asian	7 (1.0)	5 (0.8)
American Indian or Alaska Native	4 (0.6)	2 (0.3)
Multiracial	15 (2.2)	4 (0.6)
Native Hawaiian or other Pacific Islander	3 (0.4)	3 (0.5)
Ethnicity, n (%)		
Hispanic or Latino	106 (15.8)	89 (14.2)
Not Hispanic or Latino	566 (84.2)	537 (85.8)

[a] Women employed full or part time in the intent-to-treat populations of EM-I and EM-II.

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TABLE 2

Work lost due to absenteeism and presenteeism at baseline.

Type of work loss	Mean (SD) EM-I	Mean (SD) EM-II
Absenteeism		
n	661	609
Hours lost per week	3.2 (5.3)	2.9 (5.6)
% Planned work lost per week[a]	9.2 (15.6)	9.5 (18.7)
Hours lost per year, mean (SD)[b]	154 (254)	139 (269)
Presenteeism		
n	658	600
Hours lost per week	13.4 (9.9)	12.5 (10.1)
% Planned work lost per week[a]	36.3 (23.2)	34.7 (23.8)
Hours lost per year, mean (SD)[b]	643 (475)	600 (485)
Total		
n	661	609
Hours lost per week	16.5 (11.4)	15.2 (11.3)
% Planned work lost per week[a]	45.3 (27.2)	43.7 (27.7)
Hours lost per year, mean (SD)[b]	792 (537)	730 (542)

[a] 100% × [hours lost per week ÷ hours planned work per week].
[b] [Hours lost per week] × [48 weeks/year in the United States] (8).

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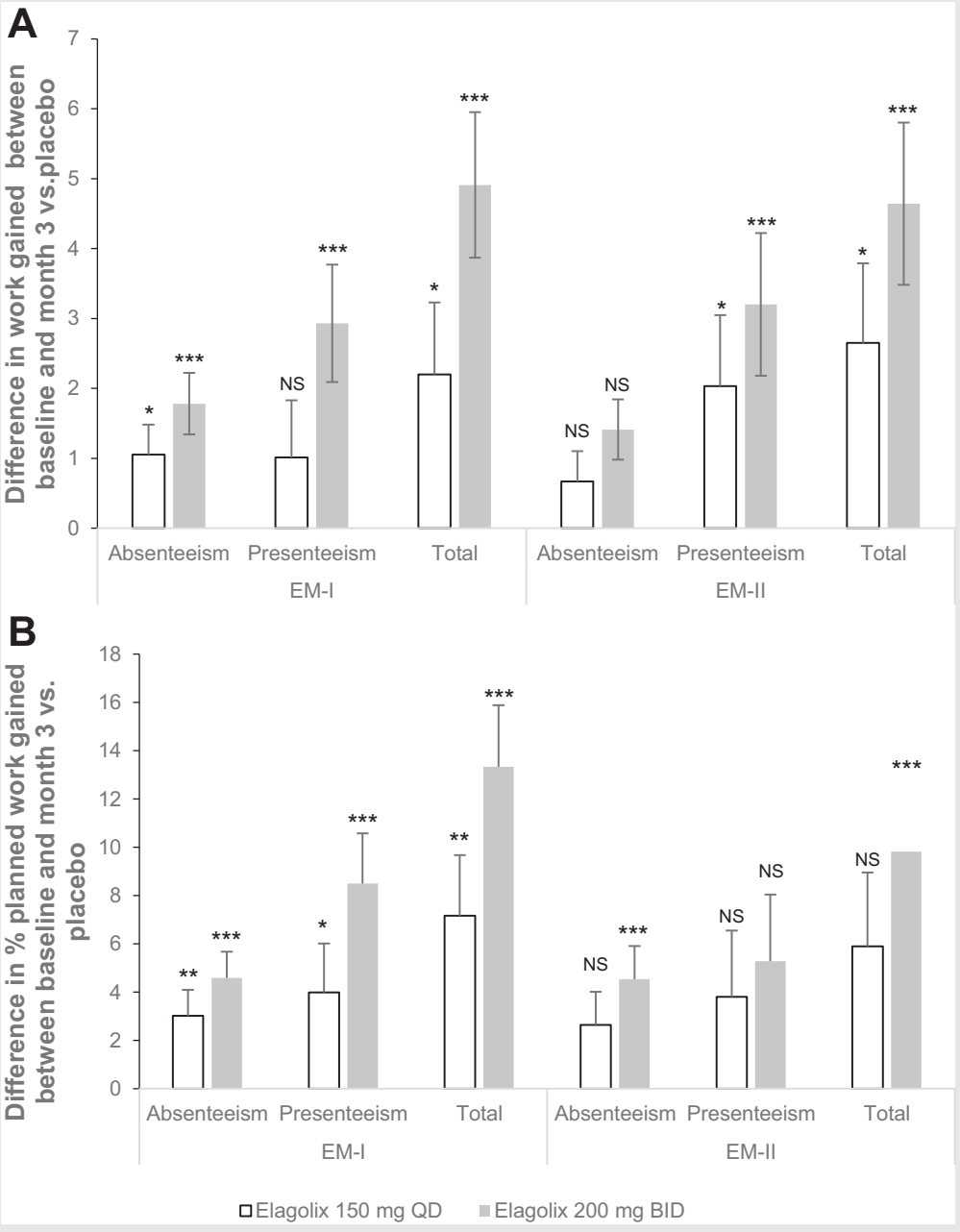
Gain in Work between Baseline and 3 Months of Treatment with Elagolix 150 mg Once a Day and 200 mg Twice a Day

Work gains between baseline and after 3 months of treatment with elagolix 150 mg once a day and 200 mg twice a day are summarized in Figure 1. Detailed values are provided in Supplemental Tables 1 to 3.

Total work. Between baseline and month 3, compared with placebo, participants treated with elagolix 150 mg once a day gained, on average (±SE), a total of 2.20 ± 1.03 hours of work/week in EM-I (P=.032), corresponding to a gain of 7.2% ± 2.5% of planned work (P=.005), and a total of 2.65 ± 1.14 hours of work/week in EM-II (P=.020), corresponding to a gain of 5.9% ± 3.0% of planned work (P=.053). At the 200 mg twice a day dose, compared with placebo, participants gained a total of 4.91 ± 1.04 hours/week in EM-I (P<.001), corresponding to a gain of 13.3% ± 2.6% of planned work (P<.001), and a total of 4.64 ± 1.14 hours/week in EM-II (P<.001), corresponding to a gain of 9.8% ± 3.0% of planned work (P=.001).

Presenteeism. In most cases, reduced presenteeism accounted for more than half of the work gained between baseline and month 3. At the 150 mg once a day dose of elagolix, average work gains due to reduced presenteeism between baseline and month 3 compared to placebo were 1.01 ± 0.82 hours/week in EM-I (P=.22), corresponding to a gain of 4.0% ± 2.0% of planned work (P=.049), and 2.03 ±

FIGURE 1



Work hours per week gained **(A)** and proportion of planned work hours per week gained **(B)** between baseline and month 3 for each elagolix dose vs. placebo. **(A)** Mean difference in hours of worked gained was defined as −1 × difference between each elagolix dose and placebo for the change in hours of work lost between baseline and month 3. **(B)** Mean difference in planned work hours gained was defined as −1 × difference between each elagolix dose and placebo for the change in proportion of work hours lost between baseline and month 3. In both panels, *P* values were for calculated by analysis of covariance with treatment arm as the main effect and baseline hours lost as a covariate. **P*<.05; ***P*<.01; ****P*<.001 for test of difference between each elagolix dose group and placebo. Calculations and exact *P* values are provided in Supplemental Tables 1 and 2. NS, not significant.

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1.02 hours/week in EM-II (*P*=.047), corresponding to a gain of 3.8% ± 2.7% of planned work (*P*=.17). At the 200 mg twice a day dose, work gains due to decreased presenteeism were 2.93 ± 0.84 hours/week in EM-I (*P*<.001), corresponding to a gain of 8.5% ± 2.1% of planned work (*P*<.001), and 3.20 ± 1.02 hours/week in EM-II (*P*=.002), corresponding to a gain of 5.3% ± 2.8% of planned work (*P*=.055).

Absenteeism. At the 150 mg once a day dose of elagolix, average work gains due to reduced absenteeism between baseline and month 3 compared with placebo were 1.05 ±

0.43 hours/week in EM-I (P=.016), corresponding to a gain of 3.0% ± 1.1% of planned work (P=.005), and 0.67 ± 0.43 hours/week in EM-II (P=.12), corresponding to a gain of 2.6% ± 1.4% of planned work (P=.056). At the 200 mg twice a day dose, work gains due to reduced absenteeism were 1.78 ± 0.44 hours/week in EM-I (P<.001), corresponding to a gain of 4.6% ± 1.1% of planned work (P<.001), and 1.14 ± 0.43 hours/week in EM-II (P<.001), corresponding to a gain of 4.5% ± 1.4% of planned work (P=.001).

Estimated Cost Savings Associated with Treating Endometriosis Using Elagolix 150 mg Once a Day and 200 mg Twice a Day

Direct cost savings associated with treating endometriosis with elagolix 150 mg once a day were estimated for 6-, 12-, and 24-month time frames and with 200 mg twice a day using a 6-month time frame to reflect the approved duration of elagolix (24 months for 150 mg once a day and 6 months for 200 mg twice a day) (13). For each patient treated with elagolix 150 mg BD instead of placebo, the average cost saving was estimated to be over $1,500 for a 6-month treatment ($1,566 for EM-I and $1,886 for EM-II), over $3,100 for a 12-month treatment ($3,132 for EM-I and $3,773 for EM-II), and over $6,200 for a 24-month treatment ($6,264 for EM-I and $7,546 for EM-II) (Table 3). Cost savings associated with taking elagolix 200 mg twice a day for 6 months were over $3,300 ($3,495 for EM-I and $3,303 for EM-II).

DISCUSSION

Women with endometriosis frequently experience chronic pelvic pain, which has been considered to be as severe as pain due bone metastases (16). This can disrupt their daily lives, social life, and intimate relationships, creating a heavy burden for women and their families (4, 5). Lost work and reduced productivity while at work are principal concerns of women with endometriosis (5–9).

The current analysis, based on data collected from two phase III clinical trials including more than 600 employed women in each, demonstrated that elagolix significantly reduced work loss and improved productivity while at work in women with endometriosis. Total gains in work were about 5 hours/week in women treated with elagolix 200 mg twice a day and about 2 hours/week in women treated with elagolix 150 mg once a day. This corresponded to a gain in planned work of at least 10% in women treated with elagolix 200 mg twice a day and at least 6% in women treated with elagolix 150 mg once a day. This is a larger improvement than reported in a study of minimally invasive laparoscopic surgery, which reduced the mean absence from work from 2.0–0.5 hours/week (17). Based on the current study, compared with placebo, taking elagolix for 6 months to treat moderate-to-severe pain associated with endometriosis is estimated to save, on average, over $3,300 U.S. in wages and benefits at the 200 mg twice a day dose and over $1,500 U.S. at the 150 mg once a day dose.

Before treatment with elagolix, employed participants reported losing, on average, more than 40% of their planned work hours, mostly due to presenteeism. Total annual average work losses were more than 700 hours, including more than 600 hours of presenteeism. Absenteeism accounted for nearly one-half day of work per week, or about 140–150 hours annually, in line with other studies (2, 5–8). Work loss mostly due to presenteeism was also reported in an international survey of more than 1,000 women with surgically diagnosed endometriosis, although average work losses per week were lower (1.1 hours/week due to absenteeism, corresponding to 2.9% of planned work, and 5.3 hours/week due to presenteeism, corresponding to 14.0% of planned work) (8). Also, a pair of smaller surveys in Puerto Rico found that

TABLE 3

Differences in hours of work gained after treatment with elagolix vs. placebo and estimated average cost savings in U.S. dollars.

Elagolix dose/study	Type of work loss	Hours gained per week between baseline and month 3 for elagolix vs. placebo[a]	Estimated average cost savings in U.S. dollars (wages and benefits)[b] 6 months[c]	12 months[c]	24 months[c]
150 mg once a day					
EM-I	Absenteeism	1.05	747	1,495	2,990
	Presenteeism	1.01	719	1,438	2,876
	Total	2.20	1,566	3,132	6,264
EM-II	Absenteeism	0.67	477	954	1,908
	Presenteeism	2.03	1,445	2,890	5,780
	Total	2.65	1,886	3,773	7,546
200 mg twice a day					
EM-I	Absenteeism	1.78	1,267	—	—
	Presenteeism	2.93	2,086	—	—
	Total	4.91	3,495	—	—
EM-II	Absenteeism	1.41	1,004	—	—
	Presenteeism	3.20	2,278	—	—
	Total	4.64	3,303	—	—

Note: A dash (—) indicates not calculated.

[a] −1 × [(mean change between baseline and month 3 for elagolix) – (mean change between baseline and month 3 for placebo)] (Supplemental Table 1).

[b] Estimated as [hours gained per week between baseline and month 3 vs. placebo] × [average hourly employer cost (including wages and benefits) in the United States] × [number of months] × [average of 4.0 weeks worked per month in the United States] × [correction factor of 81.9% to account for the lower average earnings for women than men in the United States] (8, 15).

[c] Time frames reflect the approved duration for each dose level of elagolix (13).

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approximately two-thirds of women with surgically diagnosed endometriosis reported that pelvic pain limited their ability to work, and two-thirds or more reported that, when at work, it caused them to work at lower quality or efficiency (6, 7). One of the Puerto Rican surveys further found that endometriosis limited women's career growth, reduced their ability to earn promotions and bonuses, and, in some cases, caused them to quit or be fired from their jobs (7).

The current analysis used data from two randomized, placebo-controlled clinical trials, which allowed us to control for patient expectations, which can be substantial for pain and other subjective outcomes (18). The study also benefitted from using a questionnaire specifically designed for collecting data on work loss due to endometriosis (11). A limitation of the current study was that, as in any clinical trial, the participants may have not represented the full population or real-world behaviors. The study also did not directly examine the relationship between pain and work loss, although the two have been shown to correspond (8). Another limitation is that cost estimates were based on U.S. national averages and could differ by country and work setting. They may also differ for patients receiving elagolix for more than 3 months or for patients who have completed treatment.

Conclusion

This study showed that, compared with placebo, treating moderate-to severe endometriosis-associated pain with elagolix reduced work loss and improved productivity, which should translate to cost savings. The results also emphasize the impact of endometriosis-associated pain on women's ability to work.

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Impacto de elagolix en pérdida de trabajo debido a dolor asociado a endometriosis: estimaciones basadas en los resultados de dos ensayos clínicos fase III

Objetivo: Estimar el impacto de elagolix en pérdida de trabajo debido a dolor asociado a endometriosis.

Diseño: Análisis post hoc de datos de los ensayos clínicos Elaris I y II.

Ámbito: No aplica.

Paciente(s): Mujeres empleadas de 18-49 años de edad con dolor asociado a endometriosis moderada a severa.

Intervención(es): En los dos ensayos, las participantes fueron randomizadas a 6 meses de tratamiento con placebo, elagolix 150 mg una vez al día, o elagolix 200 mg dos veces al día.

Principal(es) medida(s) de resultado: Datos sobre horas de trabajo planeadas, presentismo, ausentismo, y pérdida total de trabajo (ausentismo + presentismo) al inicio y en el mes 3 fueron recolectados usando el Cuestionario de Productividad Relacionado a Salud.

Resultado(s): Este análisis incluyó participantes empleadas de EM-I ($n = 672$) y EM-II ($n = 626$). Entre el inicio y el mes 3, comparado con participantes tratadas con placebo, participantes tratadas con elagolix 150 mg una vez al día ganaron > 2 horas totales de trabajo/semana (EM-I, 2.20 ± 1.03; EM-II, 2.65 ± 1.14). Participantes tratadas con 200 mg dos veces al día ganaron > 4 horas totales de trabajo/semana (EM-I, 4.91 ± 1.04; EM-II, 4.64 ± 1.14). Ambos ausentismo y presentismo fueron reducidos, aunque la mayoría de la ganancia fue debida a la reducción del presentismo. El ahorro estimado de costos después de 6 meses de tratamiento con elagolix fue $>$ \$ 1,500 U.S. con 150 mg una vez al día y $>$ \$ 3,300 U.S. con 200 mg dos veces al día.

Conclusión(es): Comparado con placebo, el tratamiento del dolor asociado a endometriosis moderada a severa con elagolix reduce el ausentismo y mejora la productividad en mujeres empleadas, lo cual resultaría en ahorro de costos.