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New Low- and High-Tech Calendar Methods of Family Planning

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Abstract: *Calendar-based methods are not usually considered effective or useful methods of family planning among health professionals. However, new "high-" and "low"-tech calendar methods have been developed, which are easy to teach, to use, and may be useful in helping couples avoid pregnancy. The low-tech models are based on a fixed-day calendar system. The high-tech models are based on monitoring urinary metabolites of female reproductive hormones. Both systems have high levels of satisfaction. This article describes these new models of family planning and the research on their effectiveness. The author proposes a new algorithm for determining the fertile phase of the menstrual cycle for either achieving or avoiding pregnancy.*

Introduction

Approximately 2 to 3 million women in the United States use natural methods of family planning as their primary method for avoiding pregnancy.[1] Another 3 to 4 million women rely on natural markers of fertility to help them achieve pregnancy. The accuracy, ease of use, flexibility, and effectiveness of natural biologic markers to estimate the time of fertility in the menstrual cycle are important for these women and couples.

There is essentially a 6-day window of fertility in a woman's menstrual cycle.[2] The fertile window includes the 5 days before ovulation and the day of ovulation. A human egg lives only 12 to 24 hours after ovulation; sperm survive 3 to 5 days in estrogen-stimulated cervical mucus. The most fertile days are the 2 days preceding ovulation. However, the timing of the fertile window can vary from cycle to cycle, and almost every day in the menstrual cycle has some probability of fertility.[3,4] The length of the fertile window and day-specific probabilities of fertility within the window will also vary according to the age of the woman and her male partner, lifestyle factors (e.g., smoking), and the presence of cervical mucus.[5-8]

Natural family planning involves the use of natural biologic markers to estimate the beginning, peak, and end of the 6-day fertile window and to track the variability of the 6-day fertile window from cycle to cycle. Common natural markers of fertility are the cyclic changes in cervical mucus, changes in the cervix, and the postovulatory progesterone-stimulated shift in basal body temperature. New devices also permit self-monitoring of key reproductive hormones. This article describes new calendar-based systems of family planning, new hormonal monitoring devices, and proposes an algorithm to determine the fertile window that integrates hormonal monitoring

with calendar calculations.

Older Calendar Systems of Natural Family Planning

The first calendar systems of family planning were independently developed in the mid- to late-1920s by a Japanese gynecologist, Kyusaku Ogino, and an Austrian physician researcher, Herman Knaus.[9,10] Their calendar systems of family planning were simple and required users only to monitor the length of their menstrual cycles and follow a simple formula to determine the beginning and end of the fertile phase. To avoid pregnancy, couples would abstain from genital sexual relations during the fertile time.

The colloquial term "rhythm" that is commonly used for calendar systems of family planning most likely came from the title of a book written in the early 1930s by a Chicago physician, Leo Latz, titled "The Rhythm of the Fertility and Sterility in Women."[11] Latz's goal was to have a calendar system of family planning that could be quickly taught by health professionals in a 3-minute clinic visit. Latz developed simple rules for determining the alternating infertile and fertile times of the menstrual cycle. The simplest version of his rhythm formula required the woman user to consider days 12 to 19 of her cycle as fertile, and then add the difference between the longest and shortest of the last 8 to 12 cycles to the front end of the fertile phase. For example, if a woman's cycle varied from 26 to 31 days, she would add 5 days and have a fertile window from days 7 through 19.

Calendar-based methods of family planning were considered as effective as any available contraceptive in the first half of the 20th century.[12] It was not until the introduction of hormonal contraceptives in the late 1950s that the "rhythm" method of family planning fell into disfavor. In 1955, 22% of all married women (and 55% of Catholic married women) in the United States reported the use of calendar rhythm, and, even as late as 1965, 13% of all married women (36% among Catholic married women) reported the use of calendar rhythm.[13] Periodic abstinence methods are currently used by only 2% to 3% of all women in the United States between 15 and 44 years of age.[1]

Latz reported no pregnancies from more than 54,000 acts of intercourse during the infertile times indicated by his method, when followed correctly.[14] The methods and standards for determining effectiveness of family-planning methods, however, have changed considerably. Efficacy studies of family-planning methods are now based on cumulative pregnancy rates determined by survival analysis over a given time period (usually 12 months or 13 cycles of use) and are not based on the number of acts of intercourse. A modern meta-analysis of 8

effectiveness studies of calendar-based methods reported pregnancy rates of 15.0 to 18.0 per 100 users standardized to 12 months of observation.[15] These results are in the effectiveness range of barrier contraception and natural methods of family planning other than rhythm. This 12-month unintended pregnancy rate is comparable to that of the male condom[16,17] (see Table 1).

The variability of the menstrual cycle is often given as a reason why rhythm does not work well. Women are often instructed not to use calendar methods if their cycle length varies by more than 7 days.[11,15] In fact, most cycles in women between the ages of 20 and 40 do not vary by much. Treloar's data from more than 25,000 person-years of menstrual history showed that 75% of all cycles among women aged 20 to 40 varied less than 6 days.[18] Latz's data from 2000 women and 24,908 menstrual cycles indicated that 91% of cycles varied by 7 days or less.[19] Therefore, most cycles are compatible with the use of the Latz calendar-rhythm method. However, calendar methods do not work well with the cycle variability found during breastfeeding, after hormonal contraception, and during the perimenopausal ages.[20-24] New hormonal monitoring devices have the potential to enhance calendar systems for these special circumstances.

Calendar methods of family planning are simple, easy to use, and relatively effective when used correctly within the right parameters. Furthermore, new technology allows women to monitor the fertile and infertile phases of the menstrual cycle with greater accuracy by monitoring urinary metabolites of reproductive hormones. These hormonal markers of fertility are considered more accurate than monitoring cervical mucus and basal body temperature, the natural biologic markers of fertility used in the current systems of natural family planning.[25,26]

New Low-Tech Fixed-Day Methods

Researchers from the Georgetown University Institute for Reproductive Health developed a system called the Standard Days Method (SDM).[27] The SDM is essentially a modified form of calendar rhythm that has a "fixed" number of days of fertility for each cycle (i.e., days 8–19). The method is intended for women who have regular cycles between 26 and 32 days in length. The SDM uses a colored bead system (called CycleBeads) to help women and their partners track cycles and the days of fertility and infertility. The beads are in the form of a necklace with 32 beads. A red bead indicates the beginning of the cycle, followed by 6 brown beads marking infertile days, then 12 white beads marking the fertile period, and finally 13 more brown beads marking infertile days (Figure 1). A dark brown bead for day 27 indicates to users that if their menses begins before that date, their cycles are too short for the SDM. If they reach the last bead (day 32) and have not started their menses, they are asked to contact their provider. The rules for the CycleBead system

are simple: "on brown bead days you can have intercourse with very low probability of pregnancy" and "on white bead days you can get pregnant. Avoid unprotected intercourse to prevent a pregnancy."

The effectiveness of the SDM was prospectively tested in 3 developing countries (the Philippines, Peru, and Guatemala). Trained health workers instructed the participants in the SDM and contacted them monthly for the length of the study. Participants kept a calendar to record the beginning and end of their cycles, acts of intercourse, and any other method used to avoid pregnancy (e.g., condoms or withdrawal).

The 478 participants generated 4035 cycles of data. In 92% of the cycles, the method was used correctly (i.e., no intercourse on the "white bead" fertile days 8–19). In 5% of the cycles, women had intercourse with condoms or withdrawal during the fertile phase, and in 3% of the cycles, women had unprotected intercourse during the fertile phase. Forty-three women became pregnant while using the CycleBead system. Of these, 15 conceived when having intercourse on "method defined" infertile days. Most (65%) of the pregnancies occurred in cycles in which the participant reported intercourse during the 8- to 19-day fertile phase. Life Table calculations give a 1-year pregnancy rate of 4.8 per 100 (95%; CI 2.33–7.11) with correct use and 12.0 per 100 (88%; CI 8.74–15.33) with typical use of the method, which included all cycles and all pregnancies.

The authors concluded that the SDM with use of the CycleBead system was an effective method of family planning comparable to the male condom and significantly better than other barrier methods (Table 1). This simple and inexpensive method of family planning can be easily taught and understood in populations with a low literacy rate and with few material resources.

A similar fixed-day system was tested with couples in Guatemala.[28] This calendar system was based on an 11-day fertile phase (cycle days 9–19) and also used a beaded necklace to help couples keep track of their cycle days. After 12 months of use, 32 of 301 couples had become pregnant. Life Table analysis resulted in a 1-year typical use pregnancy rate of 11 per 100[29] (See Table 1). However, only 34% of these couples were sure that they did not have sexual relations during the fertile period. At 1, 3, and 12 months, 100% of the women reported satisfaction with the method.[29] Only 5 of their male partners reported being dissatisfied with the method due to having to cope with periodic abstinence.

A recently published study analyzed the theoretical use of the SDM for breastfeeding women. Although the SDM cannot be used for anovulatory breastfeeding women, the formula can be used once ovulation and menses resume. The researchers found, however, that the first few menstrual cycles after resumption of ovulation were too variable for the SDM to be effective as a

method of family planning.[23]

CycleBeads cost about $12.00 per kit (i.e., the beads plus instruction booklet). Information on how to use and teach the SDM for the purpose of avoiding pregnancy can be found at the Georgetown University Institute for Reproductive Health Web site (*http://www.irh.org*). CycleBeads do not need Food and Drug Administration approval for use because they are not a drug or medical device.

High-Tech Hormonal Monitoring

One of the developers of the first hormonal birth control pill, Carl Djerassi, predicted in 1990 that women would be able to monitor their own hormones to determine the fertile and infertile time of their menstrual cycles.[30] He called this "jet-age rhythm." In the late 1990s, Unipath Ltd. (Bedford, England) introduced 2 new electronic fertility monitors to help women determine their window of fertility.[31,32] The Persona was developed for women or couples wishing to avoid pregnancy, and the Clearplan Easy Fertility Monitor (CPEFM) was introduced for couples desiring pregnancy (Figure 2). The Persona monitor is available only in Europe and Canada. The CPEFM is sold in the United States but is not available in Europe. It was recently renamed the Clearblue Fertility Monitor (Inverness Medical Innovations).

Persona Hormonal Fertility Monitor

The Persona monitor consists of a handheld electronic device and disposable test strips.[32] The monitor detects urinary metabolites of luteinizing hormone (LH) and an estrogen, estrone-3-glucuronide (E3G), in early morning urine samples. The test strips have antibodies specific to E3G and LH impregnated into the latex wick-type structure. The more E3G metabolites there are in the urine, the lighter the blue E3G antibody line on the test strip becomes. The more LH metabolites in the urine, the darker a blue LH antibody line will appear on the test strip. An infrared light built into the monitor detects the changing color levels through a light refraction mechanism. The monitor thus eliminates the subjective reading of the test strips by the woman user.

The monitor uses a threshold level of urinary estrogen to determine the beginning of the fertile period and marks the end of the fertile period as 4 days past a threshold level of urinary LH. The monitor displays a "green" light to indicate infertile days and a "red" light to indicate fertile days. A "yellow" light indicates the need for another test strip. The Persona has a built-in calendar algorithm to determine the end of the fertile phase for those cycles when the LH surge is missed.

A prototype of the Persona monitor was tested with 710 women (median age 30 years,

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with regular menstrual cycles) who used the fertility monitor for a 1-year period and without any formal training for the purpose of avoiding pregnancy.[33] The subjects kept daily records of all acts of intercourse and their interpretation of the monitor's status. After 7209 cycles of use, there were 67 method-related pregnancies (i.e., a pregnancy resulted from having intercourse on a "green light" day), 92 user-related pregnancies (intercourse on "red light" days,), and 3 pregnancies of uncertain timing. A 13-cycle Life Table analysis yielded a method pregnancy rate of 12.1 per 100. Researchers reanalyzed the data to estimate effectiveness of the method if the algorithm were based on a lower threshold level of E3G and a longer fertile phase. With this more conservative formula, the method (i.e., correct use) pregnancy rate was estimated at 6.2 per 100. The revised algorithm and lower E3G threshold are used in the current version of the Persona monitor.

The current version of the Persona monitor was evaluated in 20 women who provided 200 cycles of data.[34] The women were monitored by ultrasound to observe follicle growth and had serial LH levels to estimate the theoretical fertile window and estimated day of ovulation. The beginning of the fertile window as determined by ultrasound agreed with the monitor's determination of the beginning of fertility (i.e., the first red day) in 94% of cycles. The ultrasound-estimated day of ovulation agreed with the Persona-estimated day of ovulation in 95.8% of cycles, and the first day of infertility after ovulation as detected by ultrasound agreed with the monitor (i.e., first green day after the red fertile days) in 97.5% of cycles. The researchers concluded that the Persona effectively recognized the fertile phase. Many women in Europe also use the Persona monitor in reverse to achieve a pregnancy.[35]

The Clearplan/Clearblue Easy Fertility Monitor (CPEFM)

The CPEFM was also designed to identify a woman's fertile window by tracking changing levels of E3G and identifying the LH surge.[31] The CPEFM has the same type of electronic chemical light refraction system as the Persona, but the CPEFM uses a higher threshold level for detecting E3G and thus has a shorter phase prior to the LH surge and an overall shorter fertile phase. The monitor targets the optimal days to achieve a pregnancy. The CPEFM indicates 3 levels of fertility (i.e., low, high, and peak). A small LCD window tells the user her daily fertility status, the day of her cycle, and whether a urine test is needed (testing is not required every day). Women test their first morning urine by placing the wick end of the test strip in the urine stream for 3 seconds. The test strip is then clipped into the monitor; results are given within 5 minutes. The monitor adapts to the individual user and will ask for a test strip depending on cycle history and the time of the LH surge. On average, a user will be asked to use 10 test strips per cycle. In addition, the monitor stores information about fertility status that can be downloaded and displayed on a

personal computer.

Low fertility is indicated on the monitor screen by 1 black bar. Two black bars indicate a high-fertility reading, which means the threshold level of urinary E3G has been detected. The monitor continues to provide a high reading until a threshold level of urinary LH is detected. At that time, 3 black bars indicate peak fertility. Approximately 80% of the time, the monitor provides up to 5 days of combined high and peak readings. At a minimum, the monitor indicates at least 2 days of peak fertility followed by 1 day of high fertility. Rarely, the day of the estrogen threshold coincides with the day of the LH surge, and the monitor will go directly from low to peak. Some women may only see low and high signals, particularly if they miss tests or have an anovulatory cycle.

The accuracy of the CPEFM was evaluated in 53 women who were also monitored with daily serum levels of LH and estradiol and periodic transvaginal ultrasounds to ascertain the precise day of ovulation.[36] Women provided 150 cycles of data using the CPEFM; 1 anovulatory cycle was noted. The CPEFM detected an LH surge in 135 (90.6%) of the remaining 149 cycles in which ovulation was confirmed by ultrasound. Ovulations detected by ultrasound occurred 97.0% of the time during a 3-day period that included the 2 peak days plus the next day high on the CPEFM.[18] There were no ultrasound-detected ovulations before the monitor peak days. In most (92%) cycles, the first high reading on the monitor coincided with the rise in serum estradiol rise. A Japanese version of the CPEFM was studied in 30 women. There were up to 5 days of high-fertility readings in 17 of 29 cycles (58.6%) before a laboratory determined urinary LH peak and up to 5 days of high-fertility readings before the monitor peak in 72.4% of the cycles (i.e., 21 of 29 cycles).[37] The authors concluded that the device will allow couples to use the information to time intercourse for the best prospects of achieving pregnancy.

The CPEFM is currently sold and marketed only in the United States for women and couples who want to achieve pregnancy.[38] The Persona monitor, designed for couples wanting to avoid pregnancy, is not available in the United States. The information provided by the CPEFM monitor could be used inversely as an aid for avoiding pregnancy if there were additional checks for the beginning (and sometimes end) of the fertile window. Because the monitor provides a 5-day warning (of high readings) before the dirst peak day in only 20% of the cycles monitored, it will miss the beginning of the 6-day fertile window in approximately 80% of cycles. Once the peak reading is noted, if intercourse is delayed for 3 full days after the peak, theoretically there should be less than a 3% chance of an unintended pregnancy. However, another marker of fertility is needed to detect the beginning of the fertile phase.

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Use of the CPEFM along with the daily monitoring of cervical mucus can be used to define the fertile phase and avoid pregnancy. A recent European study that compared a "double-check" method (cervical mucus and a calendar count) with a single-check method (cervical mucus only) to determine the beginning of the fertile phase found that the double-check method was more effective in helping couples avoid pregnancy.[39] In this study, 1046 users of the double-check method provided 16,865 cycles of data and had a 13-cycle typical use pregnancy rate of 2.6 per 100, whereas 214 users of the single-check method (who provided 1495 cycles of data) had a 13-cycle pregnancy rate of 8.6 per 100.

One problem with using multiple markers of fertility is that the method becomes more complex, and confusion may result if signs of fertility are not correlated (e.g., if the day of peak cervical mucus does not match the monitor peak). Teaching women how to observe the varying changes in cervical mucus and to differentiate this mucus from other vaginal fluids can be difficult and time consuming. The difficulty of using both markers might decrease compliance and lead to discontinuation.

A simpler double-check method might be to use a calendar formula with the monitor for determining the beginning and end of the fertile phase. A calendar formula is clear, simple, and objective. A simple, conservative double check for the beginning of the fertile phase could be the earliest first peak day of the last 6 to 12 cycles (as indicated by the monitor) minus 6 days.

In addition, a calendar formula could be used with the CPEFM as a double check for the end of the fertile phase because the monitor will miss the LH surge in 8% to 10% of cycles and not give a peak reading.[38] When this happens, the monitor requests additional days of testing, usually with high readings but no peak and thus no definite end of the fertile phase. A simple solution would be to use a calendar formula to mark the end of the fertile phase when there is no peak reading. A conservative double check for the end of the fertile phase could be the latest peak day from the last 6 to 12 cycles plus 3 full days.

The Marquette University College of Nursing Institute for Natural Family Planning has developed an algorithm that is being used along with the CPEFM by couples seeking to avoid pregnancy. The algorithm is based on a 6-day window of fertility in a woman's menstrual cycle and the fact that there is a low probability of fertility in the first 5 days of the menstrual cycle.[2,3] The probability that a woman would be in the fertile window by day 5 of the menstrual cycle is only about 4%.[3]

The proposed Marquette fertility algorithm is for women who have cycles between 21 and 42 days. The CPEFM is designed to track the variability of menstrual cycles within that range.[38]

Women who are on antibiotics, thyroid medications, or fertility medications are cautioned because these can interfere with the testing of urine for E3G and LH. Women over 42 years of age may be (or may soon be) in perimenopause; their menstrual cycles will be more variable and harder to track with the CPEFM.

The instructions and use of the Marquette fertility algorithm are as follows:

Couples who are using the CPEFM as an aid to avoid pregnancy are asked to avoid intercourse on all high and peak days and to use the following algorithm for determining the fertile interval:

Fertility begins on day 6 on the first 6 cycles.

After 6 cycles, fertility begins on the earliest day of peak fertility (as indicated on the monitor during the last 6 cycles) minus 6 days.

Fertility ends 3 full (24-hour) days following the last peak day. After 6 cycles, fertility ends 3 full days after the last day of peak fertility (as indicated on the monitor during the last 6 cycles) or 3 full days after the last peak day of the current cycle, whichever comes first.

The instructions are to be used only for those women who have cycles between 21 and 42 days in length. If there are 2 or more cycles that fall out of that range, see your professional natural family planning teacher for advice. To avoid pregnancy, do not have intercourse, withdrawal, or genital contact, during the fertile time. To achieve pregnancy, have intercourse on the high and peak days.

Figure 3 shows a sample chart that combines information from the CPEFM and this algorithm as used by couples at the Marquette University Institute for Natural Family Planning.

Efficacy of the CPEFM With Cervical Mucus as a Double Check

The Marquette University College of Nursing Institute for Natural Family Planning has been collecting data in an ongoing study of couples using the CPEFM along with another marker of fertility (i.e., cervical mucus) as a double check to avoid pregnancy. The first 100 users of the CPEFM produced 376 cycles of data, which were used to evaluate the theoretical effectiveness of the monitor based on its ability to predict the 6-day fertile window.[40] Of these cycles, 346 or 92% had a CPEFM peak recorded. The average length of the fertile phase in these 346 cycles, as defined by the monitor (i.e., all high days plus the 2 peak days), was 5.7 days (SD 3.1).[40] Approximately 22.0% of the cycles had 4 days of high fertility before the first peak day. Data provided by the manufacturer of the monitor (Unipath) showed similar results. Ninety women of

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reproductive age provided 374 cycles of data.[38] The average length of the fertile phase (high plus peak days) was 6.01 days (SD 2.33), and 22% of the cycles had 4 days of high fertility before the first peak day. The study using the Japanese version of the monitor showed that 27.8% of cycles had at least 5 high days before the first peak day.[37] In summary, in approximately 72% to 78% of cycles, the CPEFM would miss first days of the 6-day fertile phase. Thus, for the CPEFM to be used as an aid for avoiding pregnancy, a double check for the beginning of the fertile phase is needed.

A preliminary 6- and 12-month Life Table analysis of the first 116 users of the CPEFM plus cervical mucus as a double check in the Marquette study has been calculated. Use of the CPEFM with cervical mucus as a double check for the beginning and end of the fertile phase had a 6-month Life Table analysis cumulative survival (i.e., no pregnancies) rate of 100% with correct use and a 12-month correct use survival rate of 99% at 12 months (95% CI 0.96–1.00). The preliminary 6-month typical use "nonpregnancy" survival rate, which included all unintended pregnancies, was 96% (95% CI 0.92–1.00), and the 12-month typical use rate was 93% (95% CI = 0.89–0.97). There have been 2 correct use pregnancies and 13 total unintended pregnancies so far. Only 4 couples have discontinued the study: 2 who wanted to achieve a pregnancy and 2 who were lost to follow-up. This study will continue until all 200 participants complete 12 months of use or have an unintended pregnancy.

The CPEFM is sold and marketed solely as a device to help couples achieve pregnancy and monitor fertility. The monitor is FDA approved only for this purpose; using the information provided by the monitor for avoiding pregnancy is an off-label use. However, women do use the monitor in a reverse manner as an aid to monitoring their fertility. Health professionals can teach couples how to use the monitor in much the same way the basal body thermometer has been used to help couples identify the approximate time of ovulation to either achieve or avoid pregnancy. The CPEFM provides women with fertility information by using 2 urinary metabolites of female reproductive hormones (i.e., E3G and LH), recognized by the European Society for Reproduction and Embryology as the best (available) self-indicators of fertility and ovulation.[41]

The CPEFM will not appeal to all users or potential users of natural methods of family planning. One study found high acceptability when the monitor was used to achieve a pregnancy, especially when successful.[42,43] The CPEFM requires some reading ability and is expensive; the device costs approximately $160, and a package of 50 tests strips costs $50. On average, the woman using the CPEFM will require 10 test strips per cycle, but in some cycles, 20 strips will be needed.

The CPEFM also has potential for use by women who are amenorrheic while breastfeeding. A breastfeeding protocol using the CPEFM has been developed and is being evaluated at Marquette University. The protocol is based on creating artificial 20-day cycles and testing daily for a threshold level of E3G.

Conclusion

In the United States, 2% to 3% of women between the ages of 15 and 44 who are contraceptive users use natural methods, and of these, at least half use calendar rhythm.[1] Many users of calendar systems of family planning, however, use self-devised erroneous methods, are unaware of the basic rules of established methods, and are unaware of the fertile phase.[44,45] Providing these women with simple, easily used, and well-researched calendar systems would be a benefit. The SDM and the CPEFM, enhanced with the Marquette fertility algorithm, are both easy for women to use and easy to teach in a busy clinic-based practice. However, efficacy is as important as ease of use in helping women achieve their family-planning intentions. The 88% typical use effectiveness of the SDM (over 13 cycles of use) for avoiding pregnancy and the preliminary 12-month 93% typical use effectiveness of the CPEFM/cervical mucus double-check method are encouraging. More research on both methods is needed, especially with women who have special fertility circumstances (e.g., breastfeeding, posthormonal use, and perimenopause).

The more costly CPEFM may appeal to those with more resources. The CPEFM may also appeal to those looking for a more objective, new, and scientific method of family planning. The SDM and CPEFM, although less efficacious than some contraceptive methods, will appeal to women who prefer nonhormonal, nonintrusive, nonbarrier family-planning methods for personal reasons. Both the SDM and the CPEFM are new approaches to calendar-based family-planning methods that could be incorporated into a midwifery and women's health practice.

Notes

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Appendix
Table 1
Unintended Pregnancy Rates of Selected Family Planning Methods

Method	Pregnancy Rate*
Sympto-thermal (calendar + temperature + mucus)	10.2 per 100[#]
Fixed-day calendar methods (SDM)	11.0-12.0 per 100[%]
Condom (male)	15.0[^]
Variable calendar methods	15.0-18.0[$]
Ovulation method (cervical mucus only)	16.0[>]
Diaphragm	16.0[^]
Cervical sponge	16.0-32.0[^]
Spermicides	29.0[^]

*Standardized to 100 users per 13 cycles of use.
[#]Meta-analysis of 15 sympto-thermal studies published since 1974.[16]
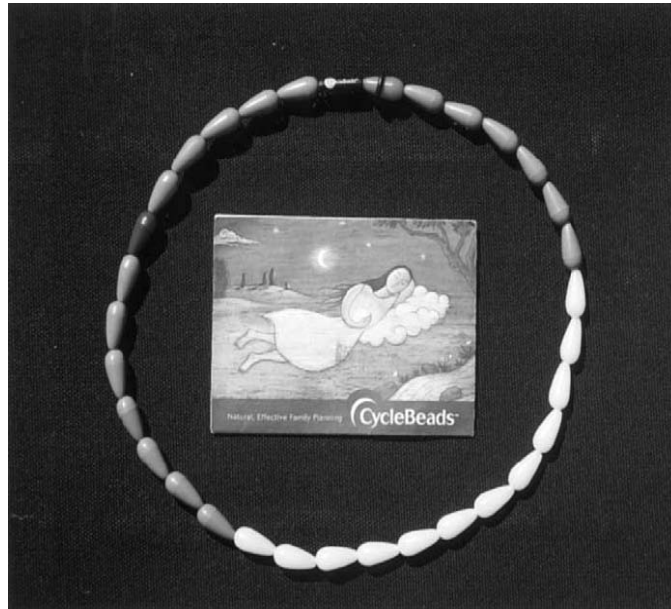[%]Unintended pregnancy rates from 2 fixed-day studies.[27,29]
[^]Unintended pregnancy rates as reported by Trussell in *Contraceptive Technoglogy*.[17]
[$]Kambic and Lamprecht analysis of 8 calendar method studies.[15]
[>]Meta-analysis of 23 ovulation method studies.[16]

Figure 1
CycleBeads used with the Standard Days Method (SDM) of family planning

Figure 2
ClearPlan Easy Fertility Monitor

Figure 3
Example of a chart combining information from the ClearPlan Easy Fertility Monitor plus a simple algorithm developed at Marquette University

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LAST 6 CYCLES   SHORTEST__27_ LONGEST__31_   EARLIEST P IN LAST 6 CYCLES_14_ LATEST P IN LAST 6 CYCLES __17__   DATE BEGINNING CHART:__TWO__

CYCLE DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Cyle 1 Date							FERTILE WINDOW →																																
Clearplan Recording	3	3	2	1	L	L	L	L	L	H	H	H	H	H	P	P	H	L	L	L	L	L	L	L	L	L	L	L	L											
Intercourse = I		I		I	I														I		I			I	I		I													
Cycle 2 Date						FERTILE WINDOW →																																		
Clearplan Recording	2	3	3	2	L	L	L	L	L	L	L	H	H	H	H	P	P	H	L	L	L	L	L	L	L	L	L	L	L											
Intercourse = I			I	I		I												I				I			I															
Cycle 3 Date						FERTILE WINDOW →																																		
Clearplan Recording	3	3	3	2	1	L	L	L	L	L	L	L	L	L	L	L	P	P	H	L	L	L	L	L	L	L	L	L												
Intercourse = I			I	I	I														I			I	I		I															
Cycle 4 Date						FERTILE WINDOW →																																		
Clearplan Recording	2	3	3	2	1	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L									
Intercourse = I			I																		I		I	I					I											
Cycle 5 Date					FERTILE WINDOW →																																				
Clearplan Recording	3	3	2	2	L	L	L	L	L	L	L	L	P	P	H	L	L	L	L	L	L	L	L	L	L	L	L													
Intercourse = I		I	I														I	I	I		I		I		I	I														
Cycle 6 Date				FERTILE WINDOW →																																						
Clearplan Recording	2	3	2	2	L	L	H	H	H	H	H	H	H	P	P	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	pregnant +									
Intercourse = I		I								I		I	I	I	I	I				I		I			I															

TO AVOID PREGNANCY: Do not have intercourse during fertile window:
1. Fertility BEGINS on day 6 during the first 6 cycles; After 6 cycles of charting then
2. Fertility BEGINS on the earliest day of Peak during the last 6 cycles minus 6 days
3. Fertility ENDS on the last PEAK day plus THREE full days; After 6 cycles
4. Fertility ENDS on the last PEAK day of the last 6 cycles plus THREE full days

TO ACHIEVE PREGNANCY = Have Intercourse on High and Peak days

Couple Intention Recording: (Place a check next to your intention before beginning each cycle)
Cycle 1: Avoid__X_ Achieve_____   Cycle 2: Avoid__X__Achieve_____
Cycle 3: Avoid__X_ Achieve_____   Cycle 4: Avoid__X__Achieve_____
Cycle 5: Avoid__X_ Achieve_____   Cycle 6: Avoid_____Achieve__X__

Coding System:
Menses = 3 heavy; 2 moderate; 1 light
Low Fertility   = L
High Fertility   = H
Peak Fertility   = P
Fertile Window = →

MARQUETTE UNIVERSITY FERTILITY MONITOR CHART