Preventing Repeat Adolescent Pregnancies with Early Adoption of the Contraceptive Implant

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Context: *Even in intensive, adolescent-oriented programs, in which access to highly effective contraceptives is guaranteed, repeat adolescent pregnancies commonly occur.*

Methods: *To assess whether adoption of the contraceptive implant would lower the rate of repeat pregnancy, contraceptive use and pregnancy outcomes were tracked among 309 adolescent mothers—171 "early" implant users who began use within six months of delivery and 138 who either adopted another method or had used no method. Participants were interviewed at delivery and at six-month intervals through the second year postpartum. Multivariate logistic regression analyses were conducted to ascertain the likelihood of a repeat pregnancy within the first and second year postpartum.*

Results: *During the first year postpartum, although 7% of the early implant users had their implants removed, pregnancy rates were significantly (p<.0001) lower among early implant users (less than 1%) than among the other adolescent mothers in the sample (20%). By the end of the second year postpartum, 37% of early implant users had discontinued use. Nevertheless, their two-year pregnancy rate (12%) remained significantly lower (p<.0001) than that of the other adolescent mothers (46%). The multivariate analysis showed that early implant use was the only independent predictor of a repeat pregnancy within the first year postpartum, while early use, parity and number of risk factors for repeat pregnancy were independently associated with the likelihood of another pregnancy in the second year postpartum.*

Conclusions: *Although early implant insertion significantly decreased the rate of rapid, repeat adolescent pregnancies, the rates of removal and of pregnancy by the end of the second year postpartum were high. Thus, health care providers need to address the motivational components of adolescent pregnancy even among those who accept ostensibly long-term methods.*

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Repeat adolescent pregnancies commonly occur even in special postpartum programs that promote contraceptive use and ensure access to highly effective methods.[1] This problem is perplexing, because although the majority of adolescent mothers enrolled in such programs insist that they do not want to become pregnant again "any time soon," most become inconsistent contraceptive users, at best.[2] Factors associated with inconsistent contraceptive use and with an increased risk of repeat adolescent pregnancy include a range of demographic, psychosocial, pregnancy-related and reproductive intentions–related factors.[3]

None of these characteristics or environmental factors, however, include an inherent mechanism that necessarily leads to inconsistent contraceptive use or to repeat adolescent pregnancy. Thus, such traits are probably associated with repeat pregnancy because, collectively, they create an atmosphere that favors positive attitudes about adolescent pregnancy or fosters ambivalence about postponing further childbearing beyond adolescence. Indeed, the finding that the number of risk factors, rather than the presence of any single risk factor, is the best predictor of rapid, repeat conception during adolescence[4] implies an underlying etiologic mechanism similar to that explaining other adolescent risk behaviors.[5]

The literature suggests that extending multidisciplinary, adolescent-oriented maternity programs beyond the immediate postpartum period and providing care for both parents and their children reduces the complexity of providing contraceptive care and promotes more consistent method use.[6] However, given the frequency and rapidity with which repeat pregnancies occur, even in these intensive reproductive health care settings, it is unlikely that further efforts to increase availability of contraceptives will eliminate the risk of unintended pregnancy among adolescent mothers. New types of interventions are critical, because the incidence of adverse pregnancy-related, educational and vocational outcomes increases with each additional pregnancy during adolescence.[7]

Adolescents' use of the subdermal hormonal implant (marketed under the name Norplant) could alleviate this problem by preventing unintended conceptions and by providing constant protection during temporary lapses in the need for contraception that arise when teenagers briefly consider sexual abstinence or having another baby as a way of coping with other aspects of their lives.[8] Indeed, several recent studies indicate that adolescent mothers who use the implant experience only a fraction of the anticipated number of repeat pregnancies.[9]

These data are particularly encouraging because they do not appear to reflect background differences between implant users and users of other methods following delivery.[10] However, small sample sizes,[11] short, variable or unspecified follow-up periods,[12] and unacceptably high attrition rates[13] raise concern about the validity and generalizability of these findings. Furthermore, to date, no studies have been conducted in settings that specifically guarantee access to developmentally appropriate contraceptive counseling and to reliable contraceptives throughout the observation period.

This article presents the results of a study designed to determine the impact of implant use on the repeat pregnancy rate in a comprehensive adolescent-oriented maternity program. We hypothesized that even in this intensive reproductive health care setting, in which access to highly effective contraceptive alternatives is guaranteed, early postpartum insertion of the implant would significantly decrease the rate of repeat adolescent pregnancies.

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Data and Methods

Study Population

We examined data from adolescents who delivered during calendar years 1992 and 1993. We chose these particular years because the implant was extremely popular at that time, which antedated major concerns about side effects and the removal process. All study participants had obtained care through the Colorado Adolescent Maternity Program, a comprehensive, multidisciplinary adolescent-oriented program that provides prenatal, delivery, postpartum and infant care in Denver, Colorado.[14]* The study was approved by the Institutional Review Board at the University of Colorado Health Sciences Center.

The original study sample consisted of 354 predominantly poor and primiparous 13–18-year-olds. Our analyses are based on 87% of the sample whose contraceptive and reproductive behavior was tracked for at least 12 months following delivery (309 teenagers). We lost contact with 13% of the adolescent mothers (N=45), mostly because they had moved out of the region and left no address or contact person. Additionally, 285 (92%) of the 309 teenagers were followed through the end of the second year postpartum.

Among the 309 study participants tracked for at least one year, 55% (171) had had the contraceptive implant inserted early in the postpartum period (within six months of delivery, mean of 11.1 weeks postpartum, standard deviation of ±9.9 weeks). The remaining 45% had chosen another method (84 teenagers), did not practice contraception at all during that interval (52) or did not supply data on their postpartum contraceptive use (two).

An attrition analysis indicated that the young mothers who were lost to follow-up did not differ significantly from those who completed the study in their race, socioeconomic status or prior contraceptive or pregnancy experience. They did, however, differ in age, as those lost to follow-up were older than those who remained in the sample (mean age of 17.3 vs. 16.9 years, p=.05). Thus, since young maternal age is a risk factor for repeat adolescent pregnancy, our study could slightly overestimate the repeat pregnancy rate in this population.[15]

Data Collection

The study participants were interviewed following delivery but prior to discharge from the postpartum ward at the University Hospital in Denver. Interviews were conducted by a female research assistant who was not involved in the prenatal contraceptive counseling and who was unaware of the study hypothesis. A precoded, multiple-choice questionnaire was used to collect information on the teenagers' sexual and reproductive histories, on the social context of their pregnancies and on 21 factors that have been widely demonstrated to affect the consistency of contraceptive use and the rate of repeat adolescent pregnancy. These factors fall into the following four broad domains.

- *Two background social and demographic factors.*[16] These were: belonging to a minority race or ethnicity (i.e., being black or Hispanic), and living in poverty and being welfare-dependent (i.e., qualifying for Medicaid).
- *Thirteen psychosocial variables.*[17] These were: young maternal age (i.e., age 16 or younger); being behind or doing poorly in school; having dropped out of school; having no immediate plans to return to school following delivery; having no future career plans or goals; having three or more siblings; living alone or with a boyfriend or relatives rather than with a biological parent; remaining married after a first birth rather than divorcing or being unmarried; living in an environment where adolescent pregnancy is the norm; being unable to make child care arrangements; feeling depressed; having a new boyfriend (who is not the baby's father); and having a nonadolescent boyfriend or husband.
- *Three pregnancy outcome variables*.[18] These were: being unhappy or dissatisfied with the index pregnancy; preferring a child of the opposite sex of that of the index child; and having had a poor birth outcome, such as a premature delivery or another neonatal or obstetric complication.
- *Three factors concerning reproductive intentions and desires.*[19] These were: desiring more children; having a boyfriend who wants another child soon; and not having accepted a method of family planning upon discharge from the postpartum ward (which may indicate ambivalence about another pregnancy).

Since differences in these background variables could confound the relationship between early use and the likelihood of a second conception, we examined the effects both of each individual variable enumerated above and of the total number of variables (dichotomized into present or absent) on the decision to use the implant in the first six months after delivery.

A research assistant used the same 21-item questionnaire to reinterview the study participants at six-month intervals for 1–2 years following delivery. An adolescent ceased to participate in the study if she became pregnant.

Analytic Techniques

We used univariate and bivariate analyses to describe the study population at the time of delivery and to define background differences between the adolescent mothers who chose to have the contraceptive implant inserted during the first six months postpartum and those who did not. Initial comparisons of the repeat pregnancy rate during the 1–2-year period following delivery were carried out with chi-square analyses.

We subsequently conducted a multivariate logistic regression to determine whether findings at the bivariate level would be supported after adjustment for background differences. Thus, those characteristics at the time of delivery that were significantly ($p<.05$) related to the adoption of the implant within six months of delivery or to a repeat conception during the study period were dichotomized (present or absent) and entered into a forward stepwise logistic regression model.

The variables were entered one at a time, based on the significance of their association with repeat adolescent pregnancy from the bivariate analysis. Adjusted odds ratios and their 95% confidence intervals were calculated from the logistic coefficients and standard errors for each variable in the models. We used the chi-square likelihood ratio to test for significance in the logistic regression model. All statistical analyses were performed with SPSS/PC+.[20]

Results

Bivariate Analyses

- *Participant characteristics.* The sample was racially diverse, as 50% of the study participants were white, 27% were black, 22% were Hispanic and 1% were of another

*As part of the program, three certified nurse midwives and a pediatrician trained in adolescent medicine provide prenatal, labor and delivery care, and the pediatrician and two physician assistants trained in pediatric adolescent medicine provide postnatal care to the teenage parents and to their children. In addition, the pediatrician, a social worker, a dietician and two home visitors maintain continuity between the prenatal and postnatal portions of the program. The program emphasizes the importance of consistent contraceptive use, of regular school attendance and of future-oriented family and career planning. The staff also try to eliminate common barriers to care and to identify and counter pressures that might make repeat pregnancy an attractive option. To achieve that goal, the program staff offer walk-in and short-wait (less than one week) appointments; they follow up missed appointments by telephone, mail or a home visit, and reschedule within one week; they schedule appointments to not conflict with school or work schedules; they provide clinic services and contraceptive supplies on a sliding-fee scale; they provide care and supplies free to uninsured and underinsured clients; and they give teenage clients free bus tokens or help them access other forms of transportation free.

Table 1. Percentage of recent adolescent mothers with selected background characteristics and risk factors for repeat pregnancy at enrollment, by contraceptive method chosen within six months of delivery, Colorado Adolescent Maternity Program, Denver, 1992–1993

Variable	All (N=309)	Implant (N=171)	Other/ no method (N=138)
BACKGROUND CHARACTERISTICS			
White	50	54	45
Black	27	23*	33
Hispanic	22	22	21
Other	1	1	1
Medicaid-eligible	94	96	92
Primigravida	75	71	80
Primipara	84	79**	91
≥1 teenage role models	81	78	85
≥3 teenage role models	43	40	46
Ever abused physically/sexually	27	27	26
Used alcohol/drugs at time of conception	8	3**	13
Ever used before conception:			
Pill	49	52	50
Condom/diaphragm	40	42	37
Injectable/implant	3	3	2
No method	31	31	31
Had problems/side effects with previous method	58	63*	51
RISK FACTORS			
Demographic			
Black/Hispanic	49	45	54
In poverty	94	96	92
Psychosocial			
First gave birth at ≤16	46	44	48
Behind in school	52	53	51
Dropped out of school	38	33	42
No plans to return to school after birth	16	15	18
No career plans	49	47	50
Has ≥3 siblings	43	43	42
Not living with biological parent(s)	46	45	46
Married	9	11	7
Poor/excessive social support encourages another pregnancy	8	7	9
Has no plans to put child in day care	4	3	5
Is depressed	15	12	17
Has new boyfriend	10	10	9
Boyfriend is ≥20 yrs. old	36	37	33
Pregnancy outcome			
Was unhappy/dissatisfied with pregnancy	37	38	34
Wanted child of opposite sex	18	7	20
Prematurity or other negative outcome	12	11	13
Reproductive intentions and desires			
Wants another child within 2 yrs.	3	1*	6
Boyfriend wants child within 2 yrs.	6	3*	9
Did not accept contraceptive prior to discharge	6	2**	11

*Difference is significant at p≤.05. **Difference is significant at p≤.01. *Notes:* Because of missing data, percentages are based on smaller sample sizes for the number of known teenage role models (100 missing responses), substance abuse at conception (22 missing responses) and the method used prior to conception (14 missing responses).

race or ethnicity (Table 1). Nearly all (94%) were eligible for Medicaid, 84% had just had their first birth and 81% knew at least one teenage parent.* Approximately 46% of the teenagers did not live with either biological parent and 38% were no longer enrolled in school at the time they entered the study (i.e., delivery).

There were relatively few significant differences in background characteristics at enrollment between those who began using the contraceptive implant soon after delivery and those who did not, although early implant users were significantly less likely than the other adolescent mothers to be black (23% vs. 33%, p=.05), to be giving birth for the first time (79% vs. 91%, p=.004) and to report having used illicit drugs or alcohol at the time of conception (3% vs. 13%, p=.006).

These group differences in substance use, however, did not persist during the adolescents' pregnancies; indeed, none of the teenagers in either group admitted to drug or alcohol use while they were pregnant.

Although there were no significant group differences in the type of contraceptive method used prior to conception, the early implant users were significantly more likely than others to have experienced problems or side effects with their past method (63% vs. 51%, p=.05). Specifically, they were significantly more likely to have had a problem remembering to use their method (36% vs. 24%, p=.02, not shown).

•*Risk factors for repeat pregnancy*. The 309 study participants had an average of five risk factors for repeat pregnancy (standard deviation ±2, range of 1–11). Early implant users differed significantly from the others in all three reproductive desires, although, on average, the new mothers and their boyfriends in both groups wanted to wait 5–6 years before having another child. Early users were significantly less likely than other adolescent mothers to want another child within two years (1% vs. 6%, p=.03) and to say that their boyfriend wanted another child within that period (3% vs. 9%, p=.02). Early implant users were also less likely than the others to have left the postpartum ward without plans to adopt a specific contraceptive method (2% vs. 11%, p=.002).

Most (87%) of the 171 early implant users already planned to use the implant; 79% of those who were asked said they would like to have the method inserted before leaving the hospital. Even though 45 (33%) of the other 138 adolescents also said they planned to use the implant, none of them did so immediately. Rather, at discharge, 22% of the comparison group† received a contraceptive injection, 28% received an oral contraceptive, 12% adopted a barrier method and 38% planned to rely on either no method or on abstinence.

On average, the teenagers in both groups reported having sex once a month during the first six months postpartum. The frequency of sexual activity rose over time. By the second half of the first year postpartum, early implant users had sex significantly more often than other young mothers (weekly vs. monthly, p=.002).

•*Contraceptive continuation and pregnancy.* There were no implant method failures at any time. Method failure rates for other contraceptives used by the adolescents in the nonimplant group could not be estimated, as perfect use could not be assured.

Table 2 presents data on the contraceptive and pregnancy status of the new mothers at the end of the first year postpartum. By that time, 93% of the original 171 early implant users still had their method in place. Among the 12 (7%) early implant users who discontinued use within the first year postpartum, most (62%) did so because of irregular vaginal bleeding and moodiness or depression, 39% cited dislike of the method, 31% reported headaches, 15% blamed weight gain and another 15% said they wanted to have another baby. Of the 12 young mothers who discontinued implant use, one became pregnant again during the first year postpartum.

Among the 132 teenagers in the comparison group for whom we have data, 14% chose the implant during the second half of the first postpartum year ("late" implant users), while 20% chose the injectable contraceptive, 14% the pill and 11% a barrier method. Nearly one-quar-

*The number of teenage parent role models was ascertained from responses to an item that asked: "Which of these people you know were pregnant or had a child during their teens?—my mom; my sister; my aunt; another relative I know well; or a close friend of mine.

†Data on the specific postpartum contraceptive choice for two adolescents in the comparison group are missing.

Table 2. Percentage distribution of recent adolescent mothers, by contraceptive and pregnancy status at the end of the first year postpartum, according to method adopted in first six months

Method/pregnancy at one year postpartum	All (N=303)	Implant (N=171)	Other/ no method (N=132)
Implant	58.4	93.0	13.6
Injectable	9.6	1.8	19.7
Pill	7.6	2.2	14.4
Barrier	5.0	0.6	10.6
None	10.6	1.8	22.0
Pregnant	8.9	0.6	19.7
Total	100.0	100.0	100.0

Note: Contraceptive data are unknown for six women who did not adopt implant use within the first six months. Although they were known not to have been pregnant at the end of the first postpartum year, they are not included in the table.

ter of these women (22%), however, were not using any method.

Accordingly, differences in the proportions who experienced another pregnancy within one year were dramatic: While only one (0.6%) of the 171 early implant users conceived again so soon, 26 adolescents (20%) in the comparison group did so (p<.0001). Within the nonimplant group, there was no significant difference between the repeat pregnancy rate among the users of methods other than the implant (20%) and the women who did not use a method (14%).

Data on contraceptive behavior during the second year postpartum were available for 285 teenagers—161 (94%) of the 171 early implant users and 124 (90%) of the 138 members of the comparison group. There was no significant group difference in loss to follow-up (p=.17). During the second year postpartum, 48 (30%) of the 161 early implant users for whom data were available had the device removed, bringing the total removal rate to 37% (60 of 161) by the end of the second year. Ultimately, 20 (33%) of these 60 young women who had the device removed became pregnant again within two years of delivery.

During the second year postpartum, an additional 11 (9%) of the 124 comparison group members for whom we have data chose the implant. Furthermore, five of the 18 (28%) "late implant users" who adopted implant use within the second half of the first year postpartum chose to have their implants removed by the end of the second year postpartum.

Significant differences in the proportions experiencing a repeat pregnancy persisted during the second postpartum year: Only 19 (12%) of the 160 nonpregnant early implant users who were followed through the end of the second postpartum year became pregnant again, compared with 31 (32%) of the 98 remaining nonpregnant adolescents in the comparison group (p<.0001). Thus, by the end of the second year postpartum, a total of 20 early implant users (12%) had experienced another pregnancy, compared with 57 (46%) of the other 124 teenagers (p<.0001).

Overall, the teenagers who conceived again had a significantly higher number of risk factors for repeat pregnancy than their peers who remained nonpregnant: On average, the teenagers who became pregnant again in the first and second year postpartum reported seven and six risk factors, respectively, whereas those who remained nonpregnant for at least two years had only five of these factors. Specifically, the adolescents who became pregnant again within two years were significantly more likely than those who did not to have dropped out of school (59% vs. 36%, p=.02) and to be either black or Hispanic (67% vs. 47%, p=.05).

Multivariate Analyses

The multiple logistic regression analyses examined the relationship between early postpartum implant use and the likelihood of a repeat pregnancy during the first and second year postpartum. These analyses controlled for the statistically significant background variables (race, parity, substance use at conception, desire for another pregnancy soon and problems with previous contraceptive use) and for significant differences between the teenagers who became pregnant again and those who did not (the total number of risk factors for repeat pregnancy, race and school status).

Only early implant use significantly predicted the likelihood of a repeat conception within the first year postpartum (Table 3): Adolescents who chose another method or no method were 35 times more likely than early implant users to become pregnant within that time frame.

By the second year postpartum, adolescent mothers who did not adopt the implant within six months of giving birth were 8.6 times more likely than those who did to conceive again. The likelihood of conceiving again within this time frame was also significantly higher among adolescent mothers who had had other children and among those who had more than five risk factors for a repeat pregnancy.

Discussion and Conclusions

Despite numerous attempts at prevention, repeat adolescent pregnancy remains a significant public health problem in the United States.[21] Material and monetary incentives and disincentives have been tried, but none of these approaches have been very successful.[22] Indeed, postpartum implant insertion is one of the few interventions that have been consistently associated with a significant reduction in the repeat pregnancy rate among U.S. teenagers.[23]

The results of our analysis confirm and strengthen the importance of the implant by showing that even within the context of a comprehensive, adolescent-oriented maternity program designed to eliminate common barriers to contraceptive use, early postpartum implant insertion was associated with a significant reduction in the repeat pregnancy rate. Group differences in the repeat pregnancy rate persisted through the end of the second year postpartum, despite the fact that some women who initially did not adopt the implant did so later on, and some early users had their implant removed.

The bivariate data indicate that the decision to become an early implant user was not an epidemiologically random event in this population, since adolescent mothers who chose the implant within six months of giving birth might have already been at a lower risk for repeat pregnancy relative to their peers (i.e., they were less

Table 3. Odds ratios (and 95% confidence intervals) from regression models predicting likelihood of a repeat pregnancy within the first year postpartum (N= 309) and within the second year postpartum (N=285)

Characteristic	Odds ratio
1ST YEAR POSTPARTUM†	
Early method use	
Method other than implant/no method	35.2 (4.48–276.4)
Implant	1.00
Model chi-square 33.3, p<.0001.	
2ND YEAR POSTPARTUM‡	
Early method use	
Method other than implant/none	8.58 (4.31–17.06)
Implant	1.00
Parity	
Had had other child	3.95 (1.70–9.22)
Primiparous	1.00
No. of risk factors for repeat conception	
>5	1.99 (1.10–3.63)
≤5	1.00
Model chi-square 57.9, p<.0001.	

†Other factors that were included in the model but did not reach statistical significance were having at least six risk factors for repeat pregnancy, having dropped out of school by the time of delivery, giving birth for the first time, being black or Hispanic, having used drugs or alcohol at conception, wanting another child within two years and having had prior contraceptive problems.
‡Other variables that were controlled for in the model but did not reach statistical significance included having dropped out of school by the time of delivery, being black or Hispanic, having used drugs or alcohol at conception, wanting another child within two years and having had prior contraceptive problems.

likely to be black or Hispanic, to have used drugs and alcohol prior to conception, and to state that they or their boyfriend wanted another child soon).

The results of the multivariate analyses make it unlikely, however, that these background differences were responsible for the resulting differences in pregnancy rates. Rather, controlling for variables known to affect inconsistent contraceptive use and repeat adolescent pregnancy showed that these factors accounted for only a small portion of the differences in the repeat pregnancy rate, compared with early postpartum implant insertion. Indeed, when all of the variables were taken into account, only the adoption of the implant in the first six months was independently associated with the likelihood of a repeat adolescent pregnancy during the first postpartum year.

Although our study hypothesis was supported, we were concerned by the frequency and rapidity with which these young women had their implants removed and subsequently became pregnant. Indeed, so many of the early implant users had their method removed by the end of the second year postpartum (37%, or 60 of 161) that the number of traditional social and demographic risk factors for repeat pregnancy once again emerged as a significant, independent predictor of a repeat conception. Since access to equally effective methods was guaranteed to all participants in this study, the fact that a total of 77 repeat pregnancies occurred nonetheless emphasizes the need to give more attention to the motivational component of repeat adolescent pregnancy, even among those young mothers who adopt effective methods of contraception.[24]

As researchers preoccupied with the societal costs of adolescent pregnancy, we tend to disregard the potential benefits of childbearing for an individual teenager (such as a closer relationship with her boyfriend and family, an improved sense of self as a woman and mother, the love her baby gives her and the love she has for her child). To the extent that the lack of motivation to prevent conception influenced these adolescents' decision to discontinue implant use, the efficacy of contraceptive counseling may be improved by addressing those aspects of these young women's lives that could undermine their motivation to use contraceptives—rather than focusing on method side effects, for example.

We reiterate that efforts to promote alternative behaviors that fulfill the same needs in young women as pregnancy does, but that are far less compromising, take time to be effective. Our results demonstrate that even relatively short-term use of a highly effective, long-acting method such as the implant helps prevent rapid, repeat pregnancies during adolescence. Preventing such subsequent pregnancies is critical, since they tend to undermine the effectiveness of more comprehensive programs that are designed to help teenage parents discover life options that will motivate them to postpone further childbearing beyond adolescence.

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