Physician Assistants as Providers of Surgically Induced Abortion Services

Marlene B. Goldman, SM, ScD, Jane S. Occhiuto, RN, SM, Laura E. Peterson, BSN, SM, Jane G. Zapka, ScD, and R. Heather Palmer, MB, BCh, SM

Objectives. We compared complication rates after surgical abortions performed by physician assistants with rates after abortions performed by physicians.

Methods. A 2-year prospective cohort study of women undergoing surgically induced abortion was conducted. Ninety-one percent of eligible women (1363) were enrolled.

Results. Total complication rates were 22.0 per 1000 procedures (95% confidence interval [CI] = 11.9, 39.2) performed by physician assistants and 23.3 per 1000 procedures (95% CI = 14.5, 36.8) performed by physicians ($P = .88$). The most common complication that occurred during physician assistant–performed procedures was incomplete abortion; during physician-performed procedures the most common complication was infection not requiring hospitalization. A history of pelvic inflammatory disease was associated with an increased risk of total complications (odds ratio = 2.1; 95% CI = 1.1, 4.1).

Conclusions. Surgical abortion services provided by experienced physician assistants were comparable in safety and efficacy to those provided by physicians. (*Am J Public Health.* 2004;94:1352–1357)

The legal induced abortion rate rose during the 1970s, stabilized between 1980 and 1992, and has declined in the years since.[1,2] In 1997, 1 186 039 legal induced abortions were reported to the Centers for Disease Control and Prevention from all 52 US reporting areas, making abortion one of the most common surgical procedures for women of reproductive age.[1–3] The 1997 abortion rate of 20 abortions per 1000 women aged 15 to 44 years is the lowest recorded since 1975.[1] The majority of abortions are first-trimester procedures performed by physicians in an outpatient setting.[2]

Soon after its legalization, abortion became a safer procedure as a result of increased provider experience and training; improvements in the type of procedure used, including a change from sharp curettage to suction curettage; and improved access to services, enabling women to seek abortions at earlier gestational ages.[2,4,5] However, during the past 15 years the climate of controversy and episodes of violence directed toward women seeking abortions and the clinics that perform them have compromised the availability of competent care, and safe abortion has again become a critical public health issue.[6] One restrictive factor is the decreasing number of trained physicians who are willing to perform abortions.[7] For example, in 1996, 86% of counties had no abortion facilities, and 32% of US women aged 15 to 44 years resided in a county without an abortion provider.[8] According to a 1991–1992 survey of US obstetrics and gynecology residency programs, routine training in first-trimester abortion practice was provided by only 12% of programs (a decrease from 23% of residency programs in 1985), with 30% of programs providing no training in first-trimester abortions as part of their curricula.[9–11] However, in 1996, abortion training requirements were included as part of the Accreditation Council for Graduate Medical Education guidelines as a standard part of obstetrics and gynecology residency training. Perhaps as a result, a recent survey reported that 46% of programs now offer routine training.[12]

When access to safe abortion services declines and the number of trained physicians willing to perform abortions decreases, public health practitioners are faced with the prospect of an increase in morbidity and mortality from both legal and illegal abortion procedures. One solution to address limited access to services is to expand abortion practice to include provision by midlevel clinicians—that is physician assistants, nurse practitioners, and certified nurse midwives.[13–16] Physician assistants are licensed by each state to practice medicine with physician supervision. On graduation from an accredited physician assistant program, physician assistants take a national certification examination developed by the National Commission on Certification of Physician Assistants in conjunction with the National Board of Medical Examiners. Physician assistants complete 100 hours of continuing medical education every 2 years and take a recertification examination every 6 years. The scope of physician assistant practice varies, depending on the supervising physician and state law. In contrast with bachelor's-level nursing training, physician assistants are trained to conduct physical examinations, diagnose and treat illnesses, order and interpret medical tests, assist in surgical procedures, and, in many states, write prescriptions.[17,18]

The goal of the 2-year prospective study described here was to compare the frequency and type of complications after surgical abortion procedures performed at 2 clinics, 1 at which abortions were performed by physician assistants and 1 at which abortions were performed by physicians. The study also addressed access to abortion services, patients' and practitioners' experiences of care, and practitioners' conformance to clinical guidelines. The results of those analyses are reported elsewhere.[19]

METHODS

Study Population and Sites

All women who underwent an outpatient surgical abortion performed by a physician at the Feminist Health Center of Portsmouth, New Hampshire, or by a physician assistant at the Vermont Women's Health Center in Burlington, Vermont, between July 1996 and

October 1997 were eligible to participate (n=1505). Both clinics offered a broad range of reproductive health services in addition to surgical and nonsurgical abortions. Their physical settings, administrative procedures, staffing, back-up plans in case of serious complications, and interaction with their respective communities were similar.

In Vermont, women seeking surgical abortions were seen on the same or a different day as the procedure for a preprocedure appointment that included counseling, laboratory testing, and giving consent; after the procedure, a follow-up visit was scheduled for 2 weeks later. At the procedure appointment, the client received a written report with follow-up instructions should she choose to see another practitioner for her follow-up visit. All procedures were performed by physician assistants.

In New Hampshire, the client chose either 1 appointment of 3 hours' duration or two 1.5-hour appointments on consecutive days. The client met individually with a counselor to give a medical history and discuss the pregnancy termination decision. She then participated in either an individual or a small-group discussion of the benefits and risks of the procedure, received follow-up information, and had the opportunity to ask questions. A consent form was then signed. Physicians performed all procedures.

During the study, procedures were performed by 3 physician assistants in Vermont and 3 physicians in New Hampshire; all had a minimum of 5 years of experience in surgical abortion procedures.

Type of Abortion Procedure

The physicians at the New Hampshire clinic conducted all abortion procedures with suction curettage with an electric pump as the vacuum source (standard vacuum curettage). At the Vermont clinic, the physician assistants performed abortions with either suction curettage with a manual syringe as the vacuum source (manual vacuum curettage, often called manual vacuum aspiration, or MVA) or standard vacuum curettage. On occasion, the physician assistants supplemented the MVA procedure with limited aspiration from a vacuum pump; we have called such procedures "mini-vacs." The choice of method was made by the clinician and was based on gestational age. Sharp curettage was used infrequently and at the discretion of the clinician. Both clinics selectively used laminaria for cervical dilation for women at 12 or more weeks of gestation. Abortions were usually performed through the twelfth week of gestation by the physicians at the New Hampshire clinic and through the fourteenth week of gestation by the physician assistants at the Vermont clinic. Gestational age was calculated by the examining clinician on the basis of the date of the last menstrual period, pelvic estimation, and, if appropriate, ultrasound. It was standard practice for the providers at both clinics to perform gross inspection of all aspirated tissue to identify women at risk for an ectopic pregnancy.

Both clinics screened for preexisting conditions, took an extensive reproductive history including histories of sexually transmitted diseases and contraceptive use, and performed procedures under local anesthesia only. The Vermont clinic conducted preprocedure gonorrhea and chlamydia screening and administered 100 mg of doxycycline and 5 mg of diazepam preoperatively. Discharge instructions addressed medication, aftercare, and symptoms of possible complications and included referral recommendations in the event that a complication was suspected. In Vermont, a postprocedure course of doxycycline was dispensed (100 mg twice a day for 7 days); in New Hampshire, a course of doxycycline was either prescribed or dispensed (100 mg twice a day for 5 days). Each woman was instructed to return to the clinic in 2 weeks for a postprocedure examination (included in the cost of the abortion) or to seek follow-up care elsewhere.

At both clinics, similar emergency protocols were in place. On-site emergency services in case of serious complications (e.g., laceration, significant bleeding) included supportive measures and transfer to emergency facilities at nearby hospitals.

Definition of Complications

Complications were defined according to National Abortion Federation guidelines[20] as follows:

- incomplete abortion, in which tissue from the pregnancy remains in the uterus, requiring a repeat abortion
- failed abortion (continued pregnancy), in which the abortion does not end the pregnancy, requiring a repeat abortion
- ectopic/extrauterine pregnancy, in which the signs and symptoms of pregnancy continue after abortion but no intrauterine pregnancy is detected
- perforation, a condition in which a puncture or tear in the wall of the uterus or other organ is present
- cervical laceration, a condition in which a tear in the cervix is present, requiring either sutures or vaginal packing
- infection, which is detected by a temperature elevated to 100.4°F or 38.0°C, lower abdominal pain or tenderness, and abnormal cervical discharge
- hemorrhage, defined as blood loss estimated as 500 cc or greater (defined as bleeding that was heavier than the heaviest day of a normal menstrual period or that soaked through more than 1 sanitary pad per hour) that is caused by failure of the uterus to contract and may require a blood transfusion
- other complications, including shock, coma, amniotic fluid embolism, anesthesia-related difficulties, and death.

Complications were further classified as either immediate or delayed. Immediate complications were defined as those that occurred during the procedure or before discharge from the clinic. Delayed complications were those that occurred up to 2 weeks after discharge. Complication categories are not mutually exclusive, since more than 1 complication could occur per procedure. The occurrence of a complication was documented in the medical record, including the follow-up report and the postabortion mail survey.

Data Collection and Statistical Analysis

For all participants, extensive demographic, medical, reproductive, contraceptive, operative, and follow-up data, including information on complications, was abstracted from the clinic medical record by trained researchers and directly entered into a Microsoft Access (Redmond, Wash) database. In addition, a self-administered questionnaire that gathered information on satisfaction with and access to care, postabortion sequelae, and fol-

low-up care was distributed at discharge with instructions to complete and return it within 3 weeks. Participants who gave permission to contact them and who had not returned the completed survey or an "opt-out" postcard within 4 weeks of the abortion were contacted by telephone or mail. Surveys were returned to the Harvard School of Public Health, where they were entered into the database. We conducted weekly reviews of recruiting and data entry procedures, with retraining of personnel to ensure the integrity of the study protocol. A 5% random sample of medical record abstracts was reviewed for systematic errors. The Access database was converted into SAS (SAS Institute Inc, Cary, NC) data sets for statistical analysis. Logistic regression analyses were conducted with the SAS CATMOD procedure to calculate odds ratios (ORs) and 95% confidence intervals (CIs).[21] Significant differences among proportions were evaluated with χ^2 analyses.[22] Statistical significance was set at $P \leq .05$. The study protocol was reviewed and approved by the Harvard School of Public Health human subjects committee.

RESULTS

Recruitment and Follow-Up

Of the 1505 women at both clinics who underwent a surgical abortion during the study period, 69 were not recruited and 73 declined to participate, resulting in a study population of 1363 women (90.6%) who were eligible and agreed to participate. At the Vermont clinic, where all abortions were performed by physician assistants, 96.7% of eligible clients were asked to participate, and of these, 97.9% agreed to do so. At the New Hampshire clinic, where abortions were performed by physicians, 94.6% of eligible clients were asked to participate and 93.1% of these agreed. Of the 1363 participating women, 1125 (82.5%) agreed to take home a questionnaire and return it in 3 weeks; 797 completed surveys were received (70.8%). The 566 participants who did not complete a survey were more likely to be younger ($P=.01$) and to use Medicaid or Medicare as their primary or only insurance ($P=.001$), but they were similar to respondents in terms of clinic site, state of residence, number of prior pregnancies, number of prior births, number of previous induced abortions, gestational age, and abortion method.

Twelve women in Vermont and 21 women in New Hampshire underwent more than 1 surgical abortion during the study period; only information from the first abortion procedure was included. Information on delayed complications and follow-up care was available from the survey questionnaire or the follow-up visit, as recorded in the medical record, for 71.5% of the study participants (75.1% in Vermont and 69.2% in New Hampshire). Thirty-one percent of women seeking abortions in Vermont and 17% of women seeking abortions in New Hampshire were established patients. Fifty percent of the Vermont clients and 36% of the New Hampshire clients returned to the clinic for a postabortion examination.

Demographic and Reproductive Characteristics

On average, the New Hampshire clients were more likely than the Vermont clients to self-pay, to reside out of state, to be nulliparous, and to have had no previous induced abortions (Table 1). The majority of procedures at both clinics were performed within the first 12 weeks of gestation (86.6% in Vermont, 97.2% in New Hampshire), but the physician assistants at the Vermont clinic performed more second-trimester procedures than did the physicians at the New Hampshire clinic. All procedures performed by the physicians in New Hampshire were standard vacuum curettage, whereas more than half of the physician assistant procedures (virtually all of those performed at 8 weeks' gestation or earlier) were manual vacuum curettage. The cannula sizes used by the 2 clinics differed. In Vermont, 95% of the manual vacuum curettage procedures performed at 8 weeks' gestation or earlier were performed with a 5- or 6-mm cannula. By contrast, in New Hampshire 96% of the standard vacuum curettage procedures performed at 8 weeks' gestation or earlier were performed with a 7-, 8-, or 9-mm cannula.

Complication Rates

A total of 37 complications were reported from 31 procedures (12 by Vermont physician assistants and 19 by New Hampshire physicians) (Table 2). Five Vermont women and 1 New Hampshire woman experienced more than 1 complication. The proportion of procedures with 1 or more complication in Vermont was 2.2% and was 2.3% in New Hampshire. The most common complication in Vermont was incomplete abortion (41% of all complications; 6 of 7 instances occurred during an MVA procedure), and in New Hampshire the most common complication was infection not requiring hospitalization (80% of all complications). One perforation during an MVA procedure at 8 weeks' gestation was observed in a procedure performed by a physician assistant. No cervical lacerations or infections requiring hospitalization were observed at either clinic.

The total rate of complications in Vermont was 22.0 per 1000 physician assistant procedures (95% CI=11.9, 39.2); in New Hampshire the rate was 23.3 per 1000 physician procedures (95% CI=14.5, 36.8), a difference that was not statistically significant ($P=.88$) (Table 3). The rates for immediate and delayed complications were similar at both clinics.

No statistically significant differences in complications were noted between the 2 clinics with respect to gestational age, although data were very limited because of the small number of complications observed at both sites (Table 4). In Vermont, 8 physician assistant procedures performed at 8 weeks' gestation or earlier resulted in a complication (2.8% of all physician assistant procedures at 8 weeks' gestation or earlier). Seven of these procedures were MVA procedures, and 1 was a mini-vac procedure. Five of these complications were incomplete abortions, 2 of which were accompanied by hemorrhaging; the sixth was delayed hemorrhaging, the seventh was a perforation accompanied by hemorrhage, and the eighth was a failed abortion (the mini-vac). The only procedure performed at 9 to 10 weeks' gestation in which the patient experienced a complication was an MVA procedure that resulted in an incomplete abortion. In New Hampshire, infections were reported in 12 of the 14 standard vacuum curettage procedures performed by physicians at 10 weeks of gestation or earlier that had a complication.

In multivariate analyses, after we controlled for clinic, abortion method, and patient characteristics at the 2 clinics (gestational age, parity, number of prior induced

TABLE 1—Demographic and Reproductive Characteristics of Study Participants, by Clinic Site and Type of Service (N = 1363): 1996–1997

Characteristic	Vermont—Physician Assistants (n = 546), No.[a] (%)	New Hampshire—Physicians (n = 817), No.[a] (%)	*P*
Age, y			
< 20	118 (21.4)	205 (25.1)	
20–24	129 (23.8)	188 (23.0)	
25–29	121 (22.2)	171 (20.9)	
30–34	76 (13.9)	122 (14.9)	
35–39	62 (11.4)	93 (11.4)	
40–44	36 (6.6)	35 (4.3)	
≥ 45	4 (0.7)	3 (0.4)	.381
Pay status			
Self-pay	241 (45.7)	679 (84.5)	
Insurance	155 (29.4)	125 (15.5)	
Medicaid/Medicare[b]	131 (24.9)	–	.001
State resident			
Yes	462 (84.9)	558 (68.4)	
No	82 (15.1)	258 (31.6)	.001
Gravidity			
1	176 (32.1)	340 (41.6)	
2	110 (20.2)	174 (21.3)	
3	95 (17.4)	119 (14.6)	
≥ 4	165 (30.3)	184 (22.5)	.001
Parity			
0	271 (49.5)	492 (60.4)	
1	131 (24.0)	139 (17.1)	
2	103 (18.9)	124 (15.2)	
3	28 (5.1)	44 (5.4)	
≥ 4	13 (2.4)	16 (2.0)	.001
No. of previous induced abortions			
0	311 (56.9)	524 (64.3)	
1	132 (24.2)	216 (26.5)	
2	55 (10.1)	52 (6.4)	
≥ 3	48 (8.8)	23 (2.8)	.001
Gestational age at procedure, weeks			
≤ 8	288 (52.8)	417 (51.3)	
9–10	118 (21.6)	263 (32.3)	
11–12	67 (12.3)	114 (14.0)	
13–15	68 (12.4)	19 (2.3)	
≥ 16	1 (0.2)	0 (0)	.001
Type of procedure			
Manual vacuum curettage	275 (51.2)	0 (0)	
Standard vacuum curettage	186[c] (34.8)	808 (99.1)	
Standard vacuum curettage with laminaria	75 (14.0)	7 (0.9)	.001

[a]Numbers may not add to totals because of missing values.
[b]Available in Vermont only.
[c]Includes 14 mini-vac procedures.

abortions, and history of bladder or kidney infection), women with a history of pelvic inflammatory disease had an increased risk of total complications, compared with women with no history of pelvic inflammatory disease (OR = 2.1; 95% CI = 1.1, 4.1).

DISCUSSION

We used National Abortion Federation criteria to compare rates of complications in surgical abortions performed by physician assistants in Vermont and by physicians in New Hampshire. We found that at both clinics the rate of complication was very low, with only 2% of procedures affected by complications. No statistically significant differences between procedures performed by physicians and those performed by physician assistants were observed, either in total complications or by timing of the complication. A slightly lower total complication rate was observed for physician assistant procedures, even though physician assistants performed more second-trimester procedures than did physicians. The type of complication observed differed. At early gestational ages, the manual vacuum curettage procedures with 5- or 6-mm cannulas performed by the physician assistants resulted in a greater number of incomplete abortions than did the standard vacuum curettage procedures with larger cannulas, which were conducted by the physicians. However, the physician-performed procedures resulted in more instances of infection. Adopting the physician assistant protocol of preprocedure screening for gonorrhea and chlamydia, administering a preoperative dose of doxycycline, extending the postprocedure antibiotic regimen to 7 days, and dispensing the prescribed pills at the clinic may reduce the occurrence of infection.

The low occurrence of complications raises the question of adequate power to detect a difference, even in a study as large as this one. However, the complication rates observed were consistent with those reported in previous studies. In the only other study to compare physician assistant and physician abortion practice, Freedman et al.[23] reported 29.1 complications per 1000 procedures, 27.4 for abortions performed by physician as-

TABLE 2—Abortion Complications, by Clinic Site and Time of Occurrence: 1996–1997

Complication	Vermont—Physician Assistants, No. (%)			New Hampshire—Physicians, No. (%)		
	Immediate	Delayed	Total	Immediate	Delayed	Total
Incomplete abortion	1	6	7 (1.3)	1	2	3 (0.4)
Continued pregnancy[a]	–	1	1 (0.2)	–	0	0
Ectopic pregnancy[a]	–	1	1 (0.2)	–	0	0
Perforation[b]	1	–	1 (0.2)	0	–	0
Cervical laceration	0	0	0	0	0	0
Infection, with hospitalization[a]	–	0	0	–	0	0
Infection, outpatient treatment[a]	–	2	2 (0.4)	–	16	16 (2.0)
Hemorrhage	1	4	5 (0.9)	0	1	1 (0.1)
Seizure, shock, death	0	0	0	0	0	0

Note. Five Vermont women and 1 New Hampshire woman experienced more than 1 complication. Percentages are based on 546 procedures in Vermont and 817 in New Hampshire.
[a]By definition, considered a delayed complication only.
[b]By definition, considered an immediate complication only.

TABLE 3—Complications per 1000 Procedures, by Time of Occurrence and Clinic Site: 1996–1997

Time of Complication	Complication Rate (95% Confidence Interval)		
	Vermont—Physician Assistants	New Hampshire—Physicians	Difference (Physician Assistants – Physicians)
Immediate	3.7 (0.6, 14.7)	1.2 (0.1, 7.9)	2.4 (–3.2, 8.0)
Delayed	18.3 (9.3, 34.6)	22.0 (13.5, 35.3)	–3.7 (–18.8, 11.4)
Total	22.0 (11.9, 39.2)	23.3 (14.5, 36.8)	–1.3 (–17.3, 14.8)

TABLE 4—Procedures With Complications, by Gestational Age and Abortion Method: 1996–1997

Gestational Age at Procedure, weeks	Vermont—Physician Assistants, No. (%)	New Hampshire—Physicians, No. (%)
Manual vacuum curettage[a]		
≤8	7 (2.7)	–
9–10	1 (6.7)	–
11–12	0	–
13–15	–	–
≥16	–	–
Standard vacuum curettage		
≤8	1[b] (3.8)	8 (1.9)
9–10	0	6 (2.3)
11–12	2[c] (3.1)	4[c] (3.5)
13–15	1[c] (1.5)	0
≥16	0	0
Total	12 (2.2)	19[d] (2.3)

Note. Percentages are based on 546 procedures in Vermont and 817 in New Hampshire.
[a]Manual vacuum curettage was not performed in New Hampshire. Vermont performed this procedure only at less than 12 weeks' gestation.
[b]Mini-vac procedure.
[c]Includes 1 standard vacuum curettage with laminaria in New Hampshire and 2 in Vermont.
[d]Gestational age was missing for 1 New Hampshire procedure with a complication.

sistants, and 30.8 for procedures by physicians. Comparable proportions in this study were 22.0 per 1000 physician assistant procedures (95% CI=11.9, 39.2) and 23.3 per 1000 procedures performed by physicians (95% CI=14.5, 36.8). The rate of immediate complications in a 1996 Canadian study was 6.8 complications per 1000 procedures, compared with 2.2 per 1000 procedures overall (95% CI=0.6, 7.0) in our study.[24] The Canadian study included procedures performed in an inpatient setting and at later gestational ages, 2 factors reported to increase the risk of complications.[25]

Strengths of our investigation were that all clients were enrolled at the time they visited the clinic, permitting information to be collected prospectively; that there were high enrollment and response rates, minimizing the opportunity for biases related to selection factors or differential information gathering; and that a comparison clinic similar in many respects except for the clinicians' training was available. However, although it is unlikely that information on immediate complications was missed, some underreporting of delayed complications was possible, because not all women returned to the clinic for follow-up care or completed a follow-up survey. It should be noted, however, that we observed lower rates of infection in Vermont, where follow-up was more complete.

These results indicate that surgically induced abortion is safe, with only relatively minor complications reported in almost 1400 procedures. An experienced physician assistant service provided abortion services comparable in safety and efficacy to those of a physician service. These results support the idea that a potential solution to the shortage of providers would be to expand the training of physician assistants to include surgical abortion, thereby enhancing the ability of the medical community to provide needed reproductive health services to women. ■

About the Authors

Marlene B. Goldman is with the Department of Obstetrics, Gynecology, and Reproductive Biology, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Mass. Jane S. Occhiuto is with the Department of Epidemiology and Laura E. Peterson and R. Heather Palmer are with the Department of Health Policy and Management, Harvard School of Public Health, Boston, Mass. Jane G. Zapka is with the Division of Preventive and Behavioral Medicine, University of Massachusetts Medical School, Worcester, Mass.

Requests for reprints should be sent to Marlene B. Goldman, SM, ScD, Department of Obstetrics and Gynecology, Beth Israel Deaconess Medical Center, 330 Brookline Ave, Boston, MA 02215 (e-mail: mgoldman@bidmc.harvard.edu).

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Contributors

M.B. Goldman and R.H. Palmer developed the study and obtained funding support. M.B. Goldman supervised all aspects of study implementation, conducted the data analysis, and wrote the article. J.S. Occhiuto and L.E. Peterson supervised field operations and conducted data analyses. J.G. Zapka contributed to the design and conception of the study. All authors helped formulate the study objectives, contributed to the analysis and interpretation of the data, and reviewed drafts of the article.

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Human Participant Protection

This research project was reviewed and approved by the Human Subjects Committee at the Harvard School of Public Health.

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