

Incidence of Emergency Department Visits and Complications After Abortion

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OBJECTIVE: To conduct a retrospective observational cohort study to estimate the abortion complication rate, including those diagnosed or treated at emergency departments (EDs).

METHODS: Using 2009–2010 abortion data among women covered by the fee-for-service California Medicaid program and all subsequent health care for 6 weeks after having an abortion, we analyzed reasons for ED visits and estimated the abortion-related complication rate and the adjusted relative risk. Complications were defined as receiving an abortion-related diagnosis or treatment at any source of care within 6 weeks after an abortion. Major complications were defined as requiring hospital admission, surgery, or blood transfusion.

RESULTS: A total of 54,911 abortions among 50,273 fee-for-service Medi-Cal beneficiaries were identified. Among all abortions, 1 of 16 (6.4%, n=3,531) was followed by an ED visit within 6 weeks but only 1 of 115 (0.87%, n=478) resulted in an ED visit for an abortion-related complication. Approximately 1 of 5,491 (0.03%, n=15) involved ambulance transfers to EDs on the day of the abortion. The major complication rate was 0.23% (n=126, 1/436): 0.31% (n=35) for medication abortion, 0.16% (n=57) for first-trimester aspiration abortion, and 0.41% (n=34) for second-trimester or later procedures. The total abortion-related complication rate including all sources of care including EDs and the original abortion facility was 2.1% (n=1,156): 5.2% (n=588) for medication abortion, 1.3% (n=438) for first-trimester aspiration abortion, and 1.5% (n=130) for second-trimester or later procedures.

CONCLUSION: Abortion complication rates are comparable to previously published rates even when ED visits are included and there is no loss to follow-up.

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LEVEL OF EVIDENCE: II

With 1.1 million induced abortions in the United States each year,¹ accurate estimates of abortion complications are paramount to assess and improve quality of care and determine how public policies can most effectively safeguard women's health. Although national abortion-related mortality data exist for the United States,² no surveillance system captures abortion-related morbidity. Studies find varying complication rates^{3–7} depending on the procedure, weeks of gestation, length of follow-up, and protocols used to detect complications. Furthermore, complication rates are underestimated by low follow-up rates.^{5,7–9}

Published complication rates are considered incomplete because they usually do not include those diagnosed at sites other than the original source of care.¹⁰

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Limited research focuses on emergency department (ED) use when examining postabortion care. Because the abortion care delivery system is concentrated in urban centers maldistributed across states,¹ women often travel

to obtain abortion care. Thus, women are likely to seek postabortion care at an ED near their home.

Using state Medicaid data, we examine reasons for postabortion visits, contributing to the literature

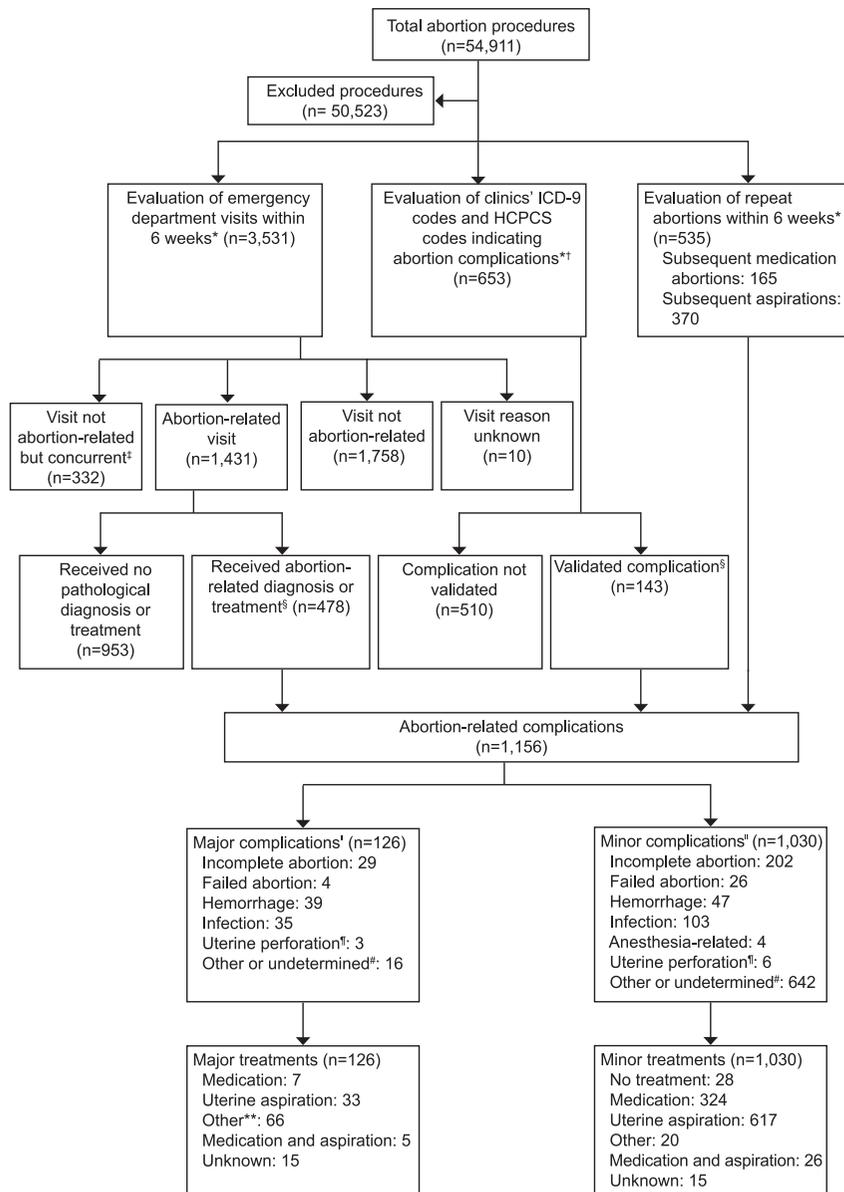


Fig. 1. Process of identification and classification of abortion complications and treatment. ICD-9, International classification of Diseases, 9th Revision; HCPCS, Healthcare Common Procedure Coding System. *Figures presented in the evaluation categories are not mutually exclusive. For example, a complication may have been identified through the evaluation of both emergency department visits and ICD-9 codes and, thus, are represented in both categories. †Includes diagnosis and treatment codes for antibiotics commonly used to treat abortion-related infections, genital tract and pelvic infection, hemorrhage, damage to pelvic organs or tissues, shock, embolism, laparoscopy, laparotomy, and hysterectomy surgeries, and blood transfusions. ‡Includes medical problems that were diagnosed and treated around the time of the abortion procedure such as ectopic pregnancy, molar pregnancy, preexisting medical condition, or concurrent problems present at the time of the procedure. §Confirmed as a complication based on the additional diagnosis or treatment codes, including laboratory tests ordered and medications. ¶Major complications were defined as serious unexpected adverse events requiring hospital admission, surgery, or blood transfusion. Minor complications were all other expected adverse events. ††Includes one diagnosis of cervical injury requiring suture repair. ‡‡For major complications, this diagnosis includes undetermined diagnoses that required blood transfusions and surgery. For minor complications, the majority of this diagnosis consisted of cases treated with repeat abortion, but the exact diagnosis could not be determined. This category also includes diagnoses such as non-anesthesia-related allergic reactions and seizures. **Major treatments include combinations of treatments including blood transfusion (n=50) and surgery (n=13).

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on ED use among patients with public insurance.^{11,12} Then, using a standardized methodology for identifying and classifying complications, we estimate the incidence of postabortion complications diagnosed, treated, or diagnosed and treated at all clinical sites to see whether the rate of complications in a closed system with complete follow-up differs from the rates found in other studies.

MATERIALS AND METHODS

We used patient-level billing data from Medi-Cal, California's State Medicaid program. Medi-Cal provides pregnant low-income women immediate, temporary Medicaid coverage. California is one of 17 states that covers abortion and subsequent care for

women enrolled in Medicaid. In 2011 an estimated 512 facilities in California performed 181,730 abortions,¹ approximately 51% of which were covered by Medi-Cal.¹³

The study was approved by the institutional review boards of the University of California, San Francisco and the California Health and Human Services Agency.

Medi-Cal is administered on a fee-for-service or managed care arrangement, split approximately in half across the two. Only the fee-for-service billing records contain complete information for care provided to a particular beneficiary; therefore, we received data only for those beneficiaries with fee-for-service coverage. We obtained billing records for every fee-for-service beneficiary who had an abortion

Table 1. Characteristics of Women With Abortions Covered by Medi-Cal, 2009–2010: Abortion-Related Complications, Complication Rates, and Adjusted Relative Risk, by Beneficiary Characteristics

Characteristic	Medi-Cal-Funded Abortions* (N=54,911)	Abortion-Related Complications† (n=1,156)	Abortion-Related Complication Rate/100 Abortions (95% CI)	Adjusted RR‡ (95% CI)	P
Age (y)	25.1±6.5				
19 or younger	11,446 (20.8)	173 (15.0)	1.51 (1.30–1.75)	0.87 (0.71–1.07)	.20
20–24	18,051 (32.9)	371 (32.1)	2.06 (1.86–2.27)	Reference	—
25–29	12,481 (22.7)	290 (25.1)	2.32 (2.07–2.60)	1.07 (0.91–1.26)	.40
30–39	11,508 (21.0)	296 (25.6)	2.57 (2.30–2.88)	1.20 (1.02–1.40)	.03
40 or older	1,400 (2.6)	25 (2.2)	1.79 (1.21–2.63)	0.83 (0.55–1.26)	.55
Race or ethnicity					
Non-Hispanic white	12,614 (23.0)	337 (29.1)	2.67 (2.40–2.97)	Reference	—
Non-Hispanic black	7,144 (13.0)	140 (12.1)	1.96 (1.66–2.31)	0.90 (0.73–1.12)	.35
Hispanic	23,110 (42.1)	471 (40.7)	2.04 (1.86–2.22)	0.76 (0.65–0.89)	<.001
Asian	2,771 (5.1)	62 (5.4)	2.24 (1.75–2.86)	0.87 (0.65–1.16)	.34
Other§	2,602 (4.7)	60 (5.2)	2.31 (1.79–2.96)	0.91 (0.68–1.21)	.50
Abortion procedure type					
Medication	11,319 (20.6)	588 (50.9)	5.19 (4.79–5.60)	5.96 (5.11–6.94)	<.001
1st-trimester aspiration	34,755 (63.3)	438 (37.9)	1.26 (1.14–1.38)	Reference	—
2nd trimester or later	8,837 (16.1)	130 (11.2)	1.47 (1.22–1.72)	0.98 (0.79–1.23)	.88
Site of procedure					
Hospital	1,667 (3.0)	84 (7.3)	5.04 (4.09–6.20)	4.74 (3.40–6.61)	<.001
Outpatient clinic	30,778 (56.1)	583 (50.4)	1.89 (1.75–2.05)	Reference	—
Physician's office or group	22,466 (40.9)	489 (42.3)	2.18 (1.99–2.38)	1.70 (1.32–2.17)	<.001
Residence type					
Urban	43,566 (90.5)	935 (80.9)	2.15 (2.01–2.29)	Reference	—
Rural	4,587 (9.5)	132 (11.4)	2.88 (2.43–3.40)	1.23 (1.00–1.52)	.05
Year of abortion					
2009	28,823 (52.5)	559 (48.4)	1.94 (1.79–2.11)	Reference	—
2010	26,088 (47.5)	597 (51.6)	2.29 (2.11–2.48)	1.03 (0.91–1.16)	.69

CI, confidence interval; RR, relative risk.

Data are mean±standard deviation or n (%) unless otherwise specified.

* The unit of analysis is women's abortions; the same woman may be represented more than once here if she had multiple abortions during the study period. Plus-minus values are mean±standard deviation. Data on age were missing for 25 abortions, data on woman's race or ethnicity were missing for 6,670 women, and data on woman's residence type were missing for 6,758 abortions.

† Cases may not add up to 1,156 as a result of missing data.

‡ Adjusted for age, race or ethnicity, abortion procedure type, site of procedure, residence type, and year of abortion.

§ Other includes Alaskan, American Indian, Hawaiian, Samoan, unknown, or other race or ethnicity.



Table 2. Reasons for Emergency Department Visits Within 6 Weeks of Initial Abortion

Characteristic of Visit	Total ED Visits (n=3,531)	Proportion of ED Visits (95% CI)
Reason for visit		
Not abortion-related	1,758	49.8 (48.14–51.44)
Abortion-related	1,431	40.5 (38.92–42.15)
Not abortion-related but concurrent*	332	9.4 (8.48–10.41)
Unknown	10	0.3 (0.15–0.53)
Abortion-related ED visit	1,431	40.5 (38.92–42.15)
Received treatment [†]	478	33.4 (31.00–35.89)
Did not receive treatment [‡]	953	66.6 (64.11–69.00)
Abortion procedure type		
Medication	770	21.8 (20.47–23.20)
1st-trimester aspiration	2,266	64.2 (62.57–65.74)
2nd trimester or later	495	14.0 (12.91–15.20)

ED, emergency department; CI, confidence interval.

* These are medical problems that were diagnosed, treated, or diagnosed and treated at the time of the abortion procedure (eg, ectopic or molar pregnancy, preexisting medical condition, or concurrent problems present at the time of the procedure).

[†] These are cases in which a patient received an abortion-related diagnosis or treatment and therefore were considered a complication.

[‡] These are cases in which a patient presented with abortion-related symptoms but did not receive a pathologic diagnosis or treatment (eg, observation only).

in 2009 and 2010 and all billing records for all clinical encounters for each of those beneficiaries up to 6 weeks after the abortion. Each clinical encounter results in multiple ($\bar{x}=12$) billing records; thus, we acquired 659,361 records.

Data included an encrypted beneficiary identification number, date of birth, race or ethnicity, city, state, zip code, date(s) of service, type of facility,

diagnosis (International Classification of Diseases, 9th Revision [ICD-9] codes), procedure or treatment (Healthcare Common Procedure Coding System, Current Procedural Terminology [CPT] codes), facility type, and amount paid per treatment. For each abortion, we calculated the beneficiary's age and urban or rural residence (determined by zip code).

Abortions were identified using Healthcare Common Procedure Coding System codes (59840–59841, 59850–59852 and 59855–59857, X7724, Z0336); these codes also indicated the abortion type: 1) “medication abortions,” which includes use of mifepristone and misoprostol up to 9 weeks of gestation; 2) “first-trimester aspiration,” which includes both manual and electric aspiration abortions as well as dilation and curettage “in the first 12–14 weeks of gestation”¹⁴; and 3) “second-trimester or later procedures.” Included in this latter category are medical and surgical abortions performed using multiple abortion techniques such as dilation and evacuation, with or without osmotic dilators and misoprostol as well as full or partial inductions used “after 12–14 weeks of gestation.”¹⁴ The billing data that we had did not allow us to make a determination of weeks of gestation nor the specific technique used.

We searched for additional claims made to Medical up to 6 weeks after the abortion for each abortion identified. Postabortion ED visits (not including urgent care) within 6 weeks were identified using codes associated with ED use (Healthcare Common Procedure Coding System codes: 99281–99285, and Z7502). Clinically trained reviewers evaluated all available billing data (including all ICD-9 and Healthcare Common Procedure Coding System or CPT procedure codes) for each beneficiary who had an ED visit and assigned the visit to one of three categories: 1) not abortion-related; 2) not abortion-related but for a concurrent problem (diagnosed, treated, or diagnosed and treated at the time of the abortion); and 3) abortion-related. An ED visit was classified as abortion-related based on the constellation of ICD-9

Table 3. Major and Minor Abortion-Related Complication Rates by Procedure Type

Complication Type	Medication Abortion (n=11,319)		1st-Trimester Aspiration (n=34,755)	
	Rate/100 (95% CI)	n	Rate/100 (95% CI)	n
Major	0.31 (0.21–0.41)	35	0.16 (0.12–0.21)	57
Minor	4.88 (4.49–5.28)	553	1.10 (0.99–1.21)	381
Total complications	5.19 (4.79–5.60)	588	1.26 (1.14–1.38)	438

CI, confidence interval.



and Healthcare Common Procedure Coding System or CPT procedure codes for that visit. For example, in many cases, it was a combination of an ICD-9 code for an abortion, postabortion complication, or abdominal pain that indicated that the visit was abortion related along with a Healthcare Common Procedure Coding System or CPT procedure code for a pregnancy test, pelvic examination, transvaginal ultrasonography, abdominal ultrasonography, or dose of misoprostol.

Each abortion-related visit was then classified as 1) woman received an abortion-related diagnosis, treatment, or both; or 2) woman presented with abortion-related symptoms such as abdominal pain or cramping but received no pathologic diagnosis or treatment. When ED visits took place for multiple reasons, only the reason most closely related to the abortion was recorded (Fig. 1).

Additionally, we identified all ambulance transfers (Healthcare Common Procedure Coding System codes: X0030, X0034, X0036, X0400, X0402, X0412) and all self-referred ED visits on the day of the abortion regardless of whether the visit resulted in an abortion-related diagnosis or treatment.

The process of identifying and classifying abortion complications involved several steps. We defined a complication as any postabortion adverse event that received an abortion-related diagnosis or treatment at any source of care, including EDs and the original abortion facility within 6 weeks of an abortion procedure. To identify complications, the clinically trained reviewers evaluated all: 1) abortion-related diagnoses and treatments identified through the ED visit analysis described previously (excluding visits having no pathologic diagnosis or treatment); 2) ICD-9 codes that indicate abortion-related complications (635.00–635.82) and Healthcare Common Procedure Coding System or CPT codes for laparoscopy, laparotomy, and hysterectomy surgeries (49000, 49320, 49329, 58150, 58578, 58960), blood transfusions

(86970, P9016–P9021, P9048, 390), and antibiotics commonly used to treat abortion-related infections and sepsis at least 1 day after the abortion; and 3) subsequent medication abortions and aspirations within 6 weeks.

The reviewers examined each case identified through this process and applied a systematic classification scheme developed by several of this study's authors and used in a recent study of abortion safety.³ The classification system comprised a list of known abortion complications with standard definitions that included specific criteria (signs, symptoms, laboratory findings) to indicate the complication diagnosis. To validate the system, first, outside experts who work with the U.S. Agency for Health Research & Quality Evidence-Based Practice Centers and from abortion-related research or service delivery reviewed the classification system. Second, a Data and Clinical Safety Monitoring Committee reviewed incident data to further clarify complication definitions and criteria.

For this study, the clinician reviewers categorized each identified case into one of seven diagnoses: incomplete abortion, failed abortion, hemorrhage, infection, uterine perforation, anesthesia-related, and other or undetermined. The clinically trained reviewers examined all available billing data for the beneficiary, including laboratory tests ordered and medications, to validate each diagnosis. For example, to confirm a diagnosis of failed abortion, they checked for additional confirmatory evidence such as codes for aspiration or prenatal care. For diagnoses of hemorrhage, the reviewers looked for treatments such as aspiration, Methergine, or blood transfusion. One diagnosis category was assigned per abortion; when the billing records indicated more than one diagnosis, the highest level diagnosis was selected. Cases identified based on subsequent medication abortion, misoprostol dose, or aspiration within 6 weeks of the initial abortion without any ICD-9 code indicating a complication were categorized as "other or undetermined."

2nd Trimester or Later (n=8,837)		Total (N=54,911)		P	
Rate/100 (95% CI)	n	Rate/100 (95% CI)	n	Medication Abortion vs 1st-Trimester Abortion	1st-Trimester Abortion vs 2nd Trimester or Later
0.41 (0.27–0.54)	36	0.23 (0.19–0.27)	126	.003	<.001
1.09 (0.87–1.30)	96	1.88 (1.76–1.99)	1,030		
1.47 (1.22–1.72)	130	2.11 (1.99–2.23)	1,156	<.001	.12



Table 4. Distribution of Abortion-Related Complication Diagnoses by Type of Procedure and Type of Treatment

Characteristic	Complication Diagnosis			
	Incomplete Abortion	Failed Abortion	Hemorrhage	Infection
Abortion procedure type [†]				
Medication abortion (11,319)	99 (0.87)	15 (0.13)	16 (0.14)	26 (0.23)
1st-trimester aspiration (34,755)	116 (0.33)	14 (0.04)	44 (0.13)	94 (0.27)
2nd trimester or later (8,837)	16 (0.18)	1 (0.01)	26 (0.29)	18 (0.20)
Total (54,911)	231 (0.42)	30 (0.05)	86 (0.16)	138 (0.25)
Type of treatment [§]				
No treatment	0 (0.00)	5 (16.67)	0 (0.00)	0 (0.00)
Medication	2 (0.87)	0 (0.00)	20 (23.27)	100 (72.46)
Uterine aspiration	198 (85.71)	22 (73.33)	22 (25.58)	8 (5.80)
Both medication and aspiration	18 (7.79)	0 (0.00)	5 (5.81)	8 (5.80)
Other	13 (5.63)	3 (10.00)	34 (39.53)	6 (4.35)
Undetermined	0 (0.00)	0 (0.00)	5 (5.81)	16 (11.59)
Total	231 (100.0)	30 (100.0)	86 (100.0)	138 (100.0)

Data are n (%).

* Includes one diagnosis of cervical injury requiring suture repair.

[†] For major complications, this diagnosis includes undetermined diagnoses that required blood transfusions and surgery. For minor complications, the majority of this diagnosis consisted of cases treated with repeat abortion, but the exact diagnosis could not be determined. This category also includes diagnoses such as nonanesthesia-related allergic reactions and seizures.

[‡] Row percentages reported.

[§] Column percentages reported.

^{||} Includes treatments such as blood transfusion (n=50 for major complications), surgical repair (n=13 for major complications), and tamponade.

Cases with the ICD-9 code “635.8 Abortion with unspecified complication” were also categorized as other or undetermined. To produce the most conservative estimate, we included undetermined diagnoses in the overall complications estimate.

Each complication was then classified as receiving one of six treatment categories: no treatment, medication (including mifepristone and misoprostol, misoprostol alone, or other medications), uterine aspiration, both medication and aspiration, other treatment, or undetermined. Abortion-related complications were classified as major if they required hospital admission (vender codes 50, 60), surgery, or blood transfusion with all others classified as minor.

The data analysis was done in several steps. Using Stata 13, first we described the sample characteristics: age, race, residence, abortion procedure type, facility type, and year of abortion. Second, we estimated ED visits on the day of the abortion and within 6 weeks and present reasons for visits. Third, we estimated the abortion-related complication rate by the sample characteristics and the relative risk of a complication adjusted for all other characteristics using a generalized linear mixed model that accounts for lack of independence between multiple abortions by the same woman and those performed by the same health care provider; *P* values were determined from z tests

derived from the model. Women who had missing data for any characteristic were retained in the model. Fourth, we compared major and minor complications by abortion procedure type using Pearson χ^2 tests. Finally, we described complication diagnoses by abortion procedure type and treatment. The abortion was the unit of analysis because 8.3% (n=4,165) of women in the data set had more than one abortion. Statistical significance was set at *P*<.05 for all comparisons; 95% confidence intervals (CIs) are reported.

RESULTS

Among the 659,361 records received, we identified 54,911 abortions among 50,273 fee-for-service Medi-Cal beneficiaries in 2009 and 2010. The largest proportions of women were ages 20–29 years, Hispanic, urban, had a first-trimester aspiration abortion, and were seen at an outpatient clinic (Table 1).

Among all 54,911 abortions, one in 1,036 (0.10%, n=53) were followed by an ED visit on the day of the abortion, including 1 of 5,491 (0.03%, n=15) transferred by ambulance for immediate care, although not all resulted in an abortion-related diagnosis or treatment.

Among all abortions (N=54,911), 1 of 16 (6.4%, n=3,531) was followed by an ED visit within 6 weeks of the abortion. Of these, 49.8% (n=1,758) were



Complication Diagnosis			
Uterine Perforation*	Anesthesia-Related	Other or Undetermined†	Total (N=54,911)
0 (0.00)	0 (0.00)	432 (3.82)	588 (5.19)
2 (0.01)	2 (0.01)	166 (0.48)	438 (1.26)
7 (0.08)	2 (0.02)	60 (0.68)	130 (1.47)
9 (0.02)	4 (0.01)	658 (1.20)	1,156 (2.11)
1 (11.11)	0 (0.00)	22 (3.34)	28 (2.42)
0 (0.00)	4 (100.0)	205 (31.16)	331 (28.63)
0 (0.00)	0 (0.00)	400 (60.79)	650 (56.23)
0 (0.00)	0 (0.00)	2 (0.30)	31 (7.44)
5 (55.56)	0 (0.00)	23 (3.50)	86 (2.68)
3 (33.33)	0 (0.00)	6 (0.91)	30 (2.60)
9 (100.0)	4 (100.0)	658 (100.0)	1,156 (100.0)

unrelated to the abortion, 9.4% (n=332) were conditions unrelated to but concurrent with the abortion, and 40.5% (n=1,431) were abortion-related. Among abortion-related visits, two thirds (66.6%, n=953) were cases in which a patient presented with abortion-related symptoms but did not receive a pathologic diagnosis or treatment. Thus, 1 of 115 (0.87%, n=478) abortions resulted in an ED visit receiving a diagnosis, treatment, or diagnosis and treatment. Among all abortion-related ED visits (n=1,431), 21.8% (n=770) followed a medication abortion, 64.2% (n=2,266) followed a first-trimester aspiration abortion, and 14.0% (n=495) followed a second-trimester or later procedure (Table 2).

Among all abortions (N=54,911), 1,156 (2.1%, 95% CI 1.99–2.23) resulted in an abortion-related complication diagnosed or treated at any source of care, including EDs and the original abortion facility. The unadjusted complication rate was 5.2% (n=588) for medication abortions, 1.3% (n=438) for first-trimester aspiration abortions, and 1.5% (n=130) for second-trimester or later procedures. Adjusted results indicate that women ages 30–39 years were 1.20 (95% CI 1.02–1.40) times as likely to have a complication compared with women ages 20–24 years, and Hispanic women were significantly less likely to have a complication compared with white women. Medication abortions were 5.96 (95% CI 5.11–6.94) times as likely to result in a complication as first-trimester aspiration abortions. Women receiving abortion care at hospitals or physician's offices or groups were significantly more likely to have a complication than women receiving care at outpatient clinics (Table 1).

The rate of major complications among all 54,911 abortions was 0.23% (95% CI 0.19–0.27)

(n=126, 1/436), 0.31% (n=35) among women who had medication abortions, 0.16% (n=57) among women who had first-trimester aspiration abortions, and 0.41% (n=34) among women who had second-trimester or later procedures (Table 3). Among all women, 0.20% (n=108) were admitted to hospitals, 0.02% (n=13) had surgery, and 0.09% (n=50) received blood transfusions (data not shown). These three categories are not mutually exclusive; some women were admitted to a hospital and had surgery, received a blood transfusion, or had surgery and a blood transfusion.

The most common complications were other or undetermined diagnoses (1.20%, n=658), comprised mostly of undetermined diagnoses that lead to repeat abortion, and incomplete abortions (0.42%, n=231) (Table 4). The majority of incomplete abortions (85.7%, n=198) and failed abortions (73.3%, n=22) were treated with uterine aspiration. The majority of hemorrhage cases were treated by other treatments (including blood transfusion) (39.5%, n=34) or medication (23.3%, n=20). All anesthesia-related cases were treated with medication as were the majority of infections (72.5%, n=100).

DISCUSSION

We observed a 2.1% abortion-related complication rate after nearly 55,000 abortions diagnosed or treated at all sources of care. The majority were minor. Rates of transfers to an ED, hospital admissions, surgeries, and blood transfusions were low. The complication rate is much lower than that found during childbirth¹⁵ and comparable to that found in the literature^{3,7} even when ED visits are included and there is no loss to follow-up.



We observed the highest rate of complications among women obtaining medication abortions (5.2%, n=588), the vast majority of which were minor and expected. This rate may be overestimated with aspirations performed presumptively or to alleviate bleeding or cramping symptoms.¹⁶ Nevertheless, this rate is consistent with intervention rates found in other studies.^{17,18}

The complication rate for second-trimester or later procedures is lower than other studies.^{4,19} This may be because the second-trimester or later category includes a large number of abortions performed earlier in the second trimester when complication rates are closer to those in the first trimester. Only 1.4% of all abortions nationally occur after 20 weeks of gestation²⁰; our data should not be used to make determinations about the complication rate among the small number of procedures performed later in pregnancy.

We found a high rate (6.4%) of ED visits after abortion, half of which were not abortion-related. This finding is consistent with previous research and could reflect Medi-Cal beneficiaries' use of the ED as the health care provider of first resort.¹¹ Additionally, the Medi-Cal fee-for-service population has been noted as having greater health risks and more costly use compared with the Medi-Cal managed care population.²¹

Two thirds of abortion-related ED visits did not result in a diagnosis or treatment, representing visits primarily for symptoms, not complications. Strategies to reduce ED visits include increasing the number and types of Medi-Cal primary care providers, particularly in underserved areas, who can provide abortion care, postabortion care, or both, and improving health care provider-patient communication on nonurgent post-procedure side effects.

This study examines postabortion ED visits and complications up to 6 weeks and across multiple facilities without loss to follow-up, addressing a common methodologic limitation of other studies. In other studies, follow-up periods ranged from 2 to 4 weeks with most considering follow-up a return visit to the original abortion facility. When reported, loss to follow-up varies widely: 9% at 1 week,⁷ 2–34% at 2 weeks,^{5,8,9} and between 8 and 65% in studies where duration is not specified.^{22,23} Additionally, this study has the sample size necessary to robustly estimate rare events.

Using billing codes to identify complications has methodologic limitations. Administrative data sets often contain erroneous codes²⁴; however, our clinical reviewers examined all related billing records for patients with complications for inconsistencies and errors. Also, by relying on Medi-Cal codes, we could not assess whether any of the complications lead to deaths or detect complications not documented by

billing codes. It is possible that complications seen or treated at the original abortion facility did not result in any Medi-Cal reimbursements, thereby underestimating the complication rate.

We were unable to determine the exact week of gestation of each abortion, which is known to be a strong predictor of complication risk.⁶ Additionally, repeat abortions performed within 6 weeks were assumed to be for the same pregnancy, but they may have been for new pregnancies. This, too, may lead to overestimating the complication rate, although the proportion of new pregnancies is likely too small to have much effect.

Regarding generalizability to the national abortion population, demographically, our sample had higher rates of Hispanics, lower rates of blacks,²⁵ and presumably higher rates of low-income women. Medi-Cal beneficiaries may have more health problems than the general population²¹ and given that the sample had insurance coverage, they may differ from women whose follow-up care is self-pay. These differences would mean that the reported complication rate is overestimated.

These new data can inform policy debates regarding abortion regulation in the United States. State legislatures have passed regulations such as ambulatory surgical center requirements (23 states), transfer agreement laws (eight states), and hospital admitting privileges requirements (13 states)²⁶ with the stated intent to increase safety. Given that in practice their ultimate effect often is the closure of abortion facilities,²⁷ there is a need to consider the public health effect of these policies, weighing any theoretical incremental reduction in patient risk that may occur against any increases in risk that may occur with reduced access to abortion care.

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