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Prolonged Postpartum Length of Hospital Stay among Women with Disabilities

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Abstract

Background—Prior studies have found higher proportions of cesarean deliveries and longer postpartum hospital stays among women with disabilities compared to women without disabilities. However, no research has assessed how length of stay may differ for women with different types of disability while also considering mode of delivery.

Objective—To examine the association of disability status and disability type with length of stay, taking into account disability-related differences in mode of delivery.

Methods—We conducted a retrospective cohort study using linked maternal and infant hospital discharge and vital records data for all births in California between 2000 and 2012 (n=6,745,201). We used multivariable regression analyses to assess association of disability status and type with prolonged length of stay (>2 days for vaginal delivery or >4 days for cesarean) while controlling for covariates.

Results—Women with disabilities had significantly elevated adjusted odds of prolonged length of stay compared to women without disabilities (aOR=1.40, 95% CI=1.32–1.49). Adjusted odds were highest for women with vision disabilities (aOR=1.67, 95% CI=1.46–1.90), followed by women with IDD (aOR=1.53, 95% CI=1.30–1.80), and women with physical disabilities (aOR=1.41, 95% CI=1.32–1.50). Women with hearing disability had the lowest adjusted odds of prolonged length of stay (aOR=1.17, 95% CI=1.03–1.33).

Conclusions—Prolonged length of stay did not appear to be due solely to the higher proportion of cesarean deliveries in this population. Further research is needed to better understand the

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Conflict of Interest

The authors report no conflicts of interest.

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reasons for prolonged length of stay among women with disabilities and develop strategies to assist women with disabilities in preparing for and recovering from childbirth.

Keywords

Length of stay; Postpartum period; Persons with disabilities; Women's health

Introduction

Prior research has found that women with disabilities who give birth are more likely to have adverse outcomes compared to women without disabilities.^{1–15} Adverse outcomes include high proportions of deliveries by cesarean,^{7–15} from which women with disabilities may have greater difficulty recovering.^{16,17} There is also evidence that women with disabilities have poorer preconception health.¹⁸ These factors may contribute to longer postpartum hospital stays for women with disabilities.

A handful of previous studies have provided some information about length of stay for women with disabilities compared to women without disabilities. For example, one study found that women with intellectual disabilities were significantly more likely than women without intellectual disabilities to have delivery hospitalizations of three days or longer.⁶ Another study found that women with intellectual and developmental disabilities (IDD) had a significantly longer average length of stay than women without IDD.⁷ A study of women at risk of disability based on diagnoses of physical or mental conditions found that these women were three times as likely as other women to have a delivery stay longer than five days, including time both before and after delivery.¹⁰

Few of the existing studies have considered how mode of delivery might impact length of stay. One exception found that deaf women were more likely than women without deafness to have a length of stay of four days or more following a vaginal delivery; using the same length of stay categories, no significant differences were found in length of stay for cesarean deliveries.¹⁹ In contrast, women with spinal cord injury, paralysis, or spina bifida were more likely than women without these conditions to have delivery hospitalizations of four days or longer for both modes of delivery.¹⁴

No research to date has assessed how length of stay may differ for women with different types of disability (i.e., physical, hearing, vision, IDD) while also considering the role of mode of delivery. Stays for cesarean deliveries are typically longer than those for vaginal deliveries.^{20,21} Insurers are legally required to cover up to two days (48 hours) for vaginal deliveries and up to four days (96 hours) for cesarean deliveries.²² This difference is important to address in analyses, given that women with disabilities are more likely to deliver by cesarean. Therefore, the purpose of this study was to examine the association of disability status and disability type with length of stay, taking into account disability-related differences in mode of delivery.

Methods

We conducted a retrospective cohort study using linked maternal and infant hospital discharge and vital records data (birth certificates and death files) for all births in California between 2000 and 2012. The dataset included a total of 6,745,201 births. We excluded breech births (n=260,172), multiple gestations (n=140,910), and births with gestational age less than 23 weeks (n=7,549). Our analytic sample consisted of the remaining 6,336,570 births. This study was approved by the California Office of Statewide Health Planning and Development, and the Institutional Review Board of the authors' university.

Our dependent variable was postpartum length of stay. Maternal length of stay was derived from the discharge record and was calculated as the difference between admittance and discharge dates. From this continuous variable (measured in days), we created a dichotomous variable indicating whether or not length of stay was prolonged. In keeping with existing literature for the general population, we defined prolonged length of stay as hospital stays longer than two days following a vaginal delivery or longer than four days following a cesarean delivery.^{23–25}

Our primary independent variables were disability status and type, which we categorized based on ICD-9 codes from the mother's discharge file, using a published disability coding scheme.¹¹ We classified disability as either present or absent, and (when present) into subgroups of physical, hearing, vision, or intellectual/developmental disabilities (IDD). The diagnosis codes used for each disability category are shown in the Appendix. A woman could be included in more than one disability group if she had multiple disability codes recorded on her discharge record.

Sociodemographic covariates were drawn from the birth certificate and included maternal race/ethnicity (non-Hispanic White as referent, non-Hispanic Black, Hispanic, non-Hispanic Asian, non-Hispanic Other), maternal education (completion of high school/GED and at least 16 years of age as the referent), and advanced maternal age (<35 years at birth as referent). We identified insurance status (public insurance as referent, private insurance, none) from the discharge record. Pregnancy related covariates included trimester of prenatal care initiation, gestational diabetes, gestational hypertension or preeclampsia, and preterm birth. We coded trimester of prenatal care initiation based on month of pregnancy in which care was initiated, as documented on the birth certificate (first trimester as referent versus second/third). We identified gestational diabetes using ICD-9 codes 648.0 or 648.8 in the discharge record). Gestational hypertension or preeclampsia was identified if documented on either the birth certificate or the discharge file (ICD-9 codes 642.3–642.5). We extracted gestational age from the birth certificate data to create a preterm birth variable (<37 weeks gestation). We also controlled for the following maternal comorbidities: chronic diabetes (ICD-9 code 250), chronic hypertension (ICD-9 codes 410.0 or 642.0–642.2 or documentation on birth certificate), and mental health diagnosis as identified by ICD-9 codes 295–298, 300, or 311.¹¹ We included year of delivery as a categorical variable (2012 as referent).

We conducted descriptive analyses to examine maternal length of stay as a continuous variable, overall and stratified by mode of delivery, in relation to presence and type of disability. We also conducted multivariable logistic regression analyses to assess association of disability status and type with our dichotomous prolonged length of stay variable while controlling for covariates. To facilitate interpretation of our multivariable findings, we calculated predicted probability of prolonged length of stay while adjusting for covariates. We conducted complete case analyses; the total amount of missing data on covariates did not exceed 10%. In the regression models, standard errors were adjusted for hospital level clustering. We used Stata (release 14, StataCorp, College Station, TX) for all analyses.

Results

Deliveries to women with disabilities comprised 0.53% (33,744/6,336,570) of our analytic sample. Compared to women without disabilities, higher proportions of women with disabilities were non-Hispanic White (40.7% vs 27.5%), high school graduates (81.3% vs 74.8%), and age 35 or above (23.7% vs 16.8%). Women with disabilities also had higher proportions with chronic diabetes (3.6% vs 0.7%), chronic hypertension (2.5% vs 0.8%), and mental health diagnoses (7.6% vs 1.3%) than women without disabilities ($p < 0.001$ for all; see Table 1). Chronic diabetes was especially prevalent among women with vision disabilities (30.5%).

Compared to lengths of stays for women without disabilities, the mean length of stay for women with disabilities was approximately half a day longer for vaginal delivery (2.47 days versus 2.01 days), nearly three-fourths of a day longer for primary cesarean delivery (4.63 days versus 3.90 days), and nearly two-thirds of a day longer for repeat cesarean delivery (3.78 days versus 3.13 days). Length of stay was positively skewed in all groups. Medians also indicated differences by disability status: overall, median length of stay was one day longer for women with disabilities than for women without disabilities (Table 2). Among disability groups, mean length of stay was longest for women with vision disabilities and shortest for women with hearing disabilities for each mode of delivery (Table 2). Similarly, prolonged length of stay was more common among women with disabilities overall compared to those without disabilities (32.3% vs. 20.4%), and was most common among women with vision disabilities (46.8%) (Figure 1).

In our multivariable regression analyses, women with disabilities had significantly elevated adjusted odds of prolonged length of stay compared to women without disabilities ($OR = 1.40$, 95% $CI = 1.32-1.49$). Adjusted odds of prolonged length of stay were highest for women with vision disabilities, followed by women with IDD, and women with physical disabilities (Table 3). Women with hearing disability had the lowest adjusted odds of prolonged length of stay of any disability group, but odds were still significantly elevated compared to women without disabilities. The adjusted predicted prevalence of prolonged length of stay was attenuated for all groups compared to the unadjusted prevalence shown in Figure 1. The adjusted prevalence of prolonged length of stay remained significantly higher in all disability groups except hearing, compared to the no disability group (Figure 2).

Discussion

Length of post-delivery stay has received relatively little attention compared to other pregnancy outcomes among women with disabilities. This is the first study to examine length of stay by presence and type of disability while taking mode of delivery into account. We found that women with disabilities had longer post-delivery hospital stays for each mode of delivery. Using a standard definition of prolonged length of stay that incorporates information about mode of delivery,²⁴ we found significantly higher adjusted odds of prolonged length of stay in each disability group.

The proportion with prolonged length of stay was especially high for women with vision disabilities. This group also had high proportions with comorbidities, including chronic diabetes, gestational diabetes, chronic hypertension, and gestational hypertension. Adjusting for these comorbidities and sociodemographic characteristics attenuated the association between vision disability and prolonged length of stay somewhat. However, even with adjustment, the odds of prolonged length of stay were higher for women with vision disabilities than for any other group, suggesting there are additional factors affecting length of stay for women with vision disabilities.

Women with IDD had the next highest odds of prolonged length of stay. Prior research has found that women with IDD have higher adjusted odds of cesarean delivery than other disability groups.^{11,13} Thus, if we were looking only at overall length of stay in days, we would expect a relatively long average length of stay for women with IDD. However, we also found that women with IDD had the second longest average length of stay after non-operative vaginal delivery. Previous research has found that prenatal health risks (e.g. obesity, smoking) are more prevalent among women with IDD compared to those without.^{8,26} These characteristics may contribute to longer recovery times from both vaginal and cesarean deliveries for women with IDD.

Prior literature has noted the possibility that women with physical disabilities may encounter greater challenges in recovering from cesarean delivery and have a longer recovery time than women without disabilities.^{16,17} Our findings confirm that hospital stays for cesarean deliveries tend to be longer for women with physical disabilities compared to women without disabilities. Further, consistent with one other recent study,¹⁴ we found that length of stay following vaginal delivery was also prolonged. Delays in recovery may be related to medical complications and to prenatal health risks. For example, previous research has reported elevated prevalence of both underweight and obesity among women with physical disabilities compared to women without disabilities; women with physical disabilities were also more likely to smoke during pregnancy.¹⁴

Women with diagnoses associated with hearing loss had the lowest odds of prolonged length of stay of any of our disability groups. However, their odds for prolonged length of stay did differ significantly from women without disabilities. This is consistent with a previous study of deaf women, which found increased risk of having a length of stay of four days or more following vaginal delivery.¹⁹ Prolonged length of stay in this group may be related to communication barriers if sign language interpreters are not consistently available.¹⁹ Prior

research also has found that women with diagnoses of deafness or hearing loss are more likely to receive delayed and insufficient prenatal care compared to women without disabilities.²⁷ Inadequate care during pregnancy may place women at greater risk of problems that could contribute to longer post-delivery hospitalizations.

Our multivariable analyses adjusted for several factors that may contribute to delivery complications. However, we did not control for delivery complications themselves in our regression models, as these complications are directly on the causal pathway to longer length of stay. That is, prolonged length of stay usually occurs because of delivery complications necessitating longer than typical recovery time for a given mode of delivery.^{25,28} While it was beyond the scope of this study, future research could explore how length of stay may differ for women with and without disabilities who have similar types of delivery complications (including no such complications).

Although length of stay was longer for women with disabilities for each mode of delivery, our descriptive analyses indicated the difference between women with and without disabilities was largest for cesarean deliveries. Recent research has found that women with disabilities are more likely to have cesarean deliveries without any indication of labor and without documentation of a medical reason for cesarean delivery, compared to women without disabilities.¹³ If women with disabilities receive cesareans when they could potentially deliver vaginally, it appears that their recovery time may be unnecessarily prolonged to an even greater extent than would be the case for women without disabilities. This finding underscores the need to carefully consider whether a cesarean delivery is truly necessary for a given woman with a disability.

In addition to mode of delivery and delivery complications, many factors may play into decisions regarding readiness for discharge. Examples of these factors include the mother's clinical and sociodemographic characteristics (e.g. primiparity, history of chronic illness, prenatal and/or obstetric complications, inadequate prenatal care and education, home environment, family stability, access to support), as well as the infant's health status, and establishment of feeding and care routines.²⁹ Women with disabilities and their infants may need – or be perceived to need – more time to ensure the safety of the dyad. Women with disabilities are more likely to have chronic conditions and prenatal complications, as indicated by our own data and by a recent meta-analysis.¹⁵ Compared to women without disabilities, women with disabilities also are significantly more likely to have low birthweight infants,^{1–11,14,15} which is associated with increased maternal length of stay in the general population.²⁵ Beyond these clinical characteristics, women with disabilities may face attitudinal barriers to leaving the hospital. In qualitative research, women with disabilities have described having to prove that they were capable of caring for their infants.³⁰ This may be especially true for women with IDD, who are dramatically more likely than women without IDD to lose custody of their infants immediately postpartum.³¹

Limitations of our study include the challenges of defining disability based solely on diagnoses, given that the extent of functional limitation associated with any given diagnosis may vary substantially.³² Potential misclassification of women without functional limitations into the disability category or women with functional limitations into the no disability

category would bias our results to toward the null, resulting in underestimation of the magnitude of differences between women with and without disabilities. Further, our data were restricted to ICD-9 codes present in the delivery record; we did not have access to potentially relevant diagnoses from a woman's prior medical history. Thus, we likely identified disabilities that were perceived as important to clinical management of pregnancy and delivery. Our results may not be generalizable to less obvious or severe disabilities.

Our study also had important strengths. We utilized data from the most populous state in the country, providing a large number of births for analysis. This enabled us to analyze length of stay by disability type and differentiating by mode of delivery. We found that longer post-delivery hospital stays among women with disabilities were not solely due to the higher proportion of cesarean deliveries among women with disabilities. Instead, lengths of stay were longer among women with disabilities for each type of delivery. Further research is needed to better understand the reasons for prolonged length of stay among women with disabilities and develop strategies to assist women with disabilities in preparing for and recovering from childbirth. Moreover, given that the difference in length of stay between women with and without disabilities was largest for cesarean deliveries, it is important to ensure that women with disabilities only undergo cesarean when it is truly medically necessary.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Unadjusted prevalence of prolonged length of stay by disability status and type^a

^aAll disability groups significantly differed from the no disability group at $p < .001$.

^bIDD: Intellectual and developmental disabilities

^cProlonged length of stay: >2 days for vaginal delivery or >4 days for cesarean delivery

Figure 2.

Estimated adjusted^a prevalence of prolonged length of stay by disability status and type

^aAdjusted for age, race/ethnicity, education, insurance, prenatal care initiation, gestational diabetes, gestational hypertension/preeclampsia, preterm birth, chronic diabetes, chronic hypertension, mental health diagnosis, and birth year

^bIDD: Intellectual and developmental disabilities

^cProlonged length of stay: >2 days for vaginal delivery or >4 days for cesarean delivery

*Statistically significantly different from no disability group at $p < .05$.

Table 1.

Sample characteristics

		Disability Status		Disability Type			
	Cohort	No Disability	Any Disability	Physical	Hearing	Vision	IDD ^a
n (%)	6,336,570	6,302,826 (99.47)	33,744 (0.53)	27,823 (0.44)	2,744 (0.04)	1,897 (0.03)	1,655 (0.03)
Race/ethnicity							
White	1,735,797 (27.55)	1,722,146 (27.48)	13,651 (40.70)	11,374 (42.20)	915 (33.53)	604 (32.09)	597 (36.31)
Black	341,140 (5.41)	388,508 (5.40)	2,632 (7.85)	2,116 (7.65)	179 (6.56)	188 (9.99)	197 (11.98)
Hispanic	3,408,740 (54.10)	3,394,726 (54.17)	14,014 (41.78)	11,312 (40.89)	1,297 (47.53)	838 (44.53)	721 (43.86)
Asian	688,888 (10.93)	686,363 (10.95)	2,525 (7.53)	1,941 (7.02)	295 (10.81)	217 (11.53)	100 (6.08)
Other	126,274 (2.00)	125,553 (2.00)	721 (2.15)	619 (2.24)	43 (1.58)	35 (1.86)	29 (1.76)
High school/GED ^b	4,420,404 (71.80)	4,394,049 (71.75)	26,355 (81.27)	21,988 (82.01)	2,049 (79.17)	1,469 (80.80)	1,130 (72.20) ^c
Insurance							
Public	3,040,788 (47.99)	3,025,782 (48.01)	15,006 (44.47)	11,752 (42.24)	1,565 (57.03)	861 (45.39)	1,061 (64.11)
Private	3,161,553 (49.90)	3,143,207 (49.88)	18,346 (54.37)	15,741 (56.58)	1,152 (41.98)	1,020 (53.77)	573 (34.32)
None	133,324 (2.10)	132,933 (2.11)	391 (1.16)	329 (1.18)	27 (0.98)	16 (0.84)	21 (1.27)
Maternal age ≥ 35	1,068,944 (16.87)	1,060,938 (16.83)	8,006 (23.73)	6,638 (23.86)	619 (22.56)	528 (27.83)	308 (18.61) ^c
Prenatal care in 1 st trimester	5,277,703 (84.76)	5,249,184 (84.75)	28,519 (86.37)	23,721 (87.06)	2,206 (82.37)	1,631 (87.59)	1,260 (79.10)
Gestational diabetes	438,016 (6.91)	434,031 (6.89)	3,985 (11.81)	2,915 (10.48)	310 (11.30)	696 (36.69)	159 (9.61)
Gestational hypertension/preeclampsia	334,649 (5.28)	331,765 (5.26)	2,884 (8.55)	2,140 (7.69)	202 (7.36)	429 (22.61)	184 (11.12)
Preterm birth	530,812 (8.72)	526,465 (8.69)	4,347 (13.47)	3,430 (12.84)	297 (11.50)	456 (25.04)	260 (17.25)
Chronic hypertension	51,388 (0.81)	50,549 (0.80)	839 (2.49)	622 (2.24)	44 (1.60)	146 (7.70)	51 (3.08)
Chronic diabetes	44,502 (0.70)	43,289 (0.69)	1,213 (3.59)	638 (2.29)	43 (1.57)	579 (30.52)	24 (1.45)
Mental health diagnosis	81,784 (1.29)	79,221 (1.26)	2,563 (7.60)	2,182 (7.84)	131 (4.77)	134 (7.06)	151 (9.12)

^aIDD: Intellectual and developmental disabilities^bGED: General educational development^cNot significantly different from women without disabilities ($p > .05$); all other differences between disability groups and women without disabilities were statistically significant at $p < .001$

Table 2.

Mean and median length of stay for each mode of delivery, by disability status and type

	Cohort	Disability Status		Disability Type			
		No disability	Any disability	Physical	Hearing	Vision	IDD ^c
Overall (all modes of delivery)							
Mean LOS ^a (95% CI of mean) ^b	2.43 (2.43, 2.43)	2.43 (2.42, 2.43)	3.27 (3.22,3.32)	3.23 (3.18, 3.28)	2.82 (2.70, 2.94)	4.67 (4.36, 4.99)	3.59 (3.33, 3.84)
Median LOS (IQR ^d)	2 (2–3)	2 (2–3)	3 (2–4)	3 (2–4)	2 (2–3)	3 (2–5)	3 (2–4)
Vaginal delivery							
Percent of births	68.15	68.23	52.67	52.74	61.66	40.04	47.68
Mean LOS (95% CI)	2.01 (2.01, 2.02)	2.01 (2.01, 2.01)	2.47 (2.42, 2.51)	2.47 (2.42, 2.52)	2.22 (2.10, 2.34)	2.91 (2.65, 3.16)	2.62 (2.39, 2.85)
Median LOS (IQR ^d)	2 (1–2)	2 (1–2)	2 (2–3)	2 (2–3)	2 (2–3)	2 (2–3)	2 (2–3)
Operative vaginal delivery							
Percent of births	4.95	4.95	4.33	4.20	4.92	4.66	5.30
Mean LOS (95% CI)	2.22 (2.21, 2.22)	2.22 (2.21, 2.22)	2.76 (2.56, 2.96)	2.80 (2.55, 3.05)	2.22 (2.06,2.38)	3.39 (2.59,4.20)	2.73 (2.48, 2.98)
Median LOS (IQR)	2 (2–3)	2 (2–3)	2 (2–3)	2 (2–3)	2 (2–3)	2 (2–3)	3 (2–3)
Primary cesarean delivery							
Percent of births	14.02	13.96	25.98	25.88	18.67	35.49	31.71
Mean LOS (95% CI)	3.91 (3.90, 3.92)	3.90 (3.89, 3.91)	4.63 (4.50, 4.76)	4.47 (4.34, 4.60)	4.36 (4.02, 4.69)	6.75 (6.01, 7.49)	5.06 (4.40, 5.72)
Median LOS (IQR)	4 (3–4)	4 (3–4)	4 (3–5)	4 (3–4)	4 (3–5)	4 (4–6)	4 (3–5)
Repeat cesarean delivery							
Percent of births	12.88	12.86	17.01	17.18	14.75	19.81	15.30
Mean LOS (95% CI)	3.14 (3.13, 3.14)	3.13 (3.13, 3.14)	3.78 (3.64, 3.92)	3.75 (3.59, 3.91)	3.59 (3.10, 4.09)	4.73 (4.15, 5.31)	3.62 (3.26, 3.99)
Median LOS (IQR)	3 (2–3)	3 (2–3)	3 (3–4)	3 (2–4)	3 (2–4)	3 (3–5)	3 (3–4)

^aLOS: length of stay, in days^bCI: confidence interval^cIDD: intellectual and developmental disabilities^dIQR: Inter-quartile range

Table 3:

Adjusted odds of prolonged length of stay, by disability status and type

Disability Type ^a	Odds Ratio ^b	95% Confidence Interval		p value
		Lower Bound	Upper Bound	
Any	1.40	1.32	1.49	<0.001
Physical	1.41	1.32	1.50	<0.001
Hearing	1.17	1.03	1.33	0.018
Vision	1.67	1.46	1.90	<0.001
IDD ^c	1.53	1.30	1.80	<0.001

^aReference: No disability^bAdjusted for age, race/ethnicity, education, insurance, prenatal care initiation, gestational diabetes, gestational hypertension/preeclampsia, preterm birth, chronic diabetes, chronic hypertension, mental health diagnosis, and birth year^cIDD=intellectual/developmental disability