


Low-Income First-Time Mothers: Effects of APN Follow-up Using Mobile Technology on Maternal and Infant Outcomes

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Abstract

Background. Low-income mothers have greater challenges in accessing health care services due changes in the health care system and budget cuts. The purpose of this randomized clinical trial was to test a nurse practitioner (NP) intervention using cell phone and texting on maternal/infant outcomes. **Methods.** The sample included 129 mother-infant pairs. Intervention group mothers received NP 2-way cell phone follow-up intervention post-hospital discharge for 6 months. **Results.** Intervention mothers' perceived social support was significantly higher. Intervention infants received their first newborn follow-up visit significantly earlier (6 vs 9 days); significantly more infants were immunized at recommended times (2, 4, and 6 months of age); and there were fewer infant morbidities compared to controls. The intervention saved between \$51 030 and \$104 277 in health care costs averted. **Conclusion.** This easy-to-use, safe intervention is an effective way to reach a wide range of populations and demonstrated improved maternal/infant outcomes and decreased cost.

Keywords

general pediatrics, low-income mothers, nurse practitioner, follow-up care, mobile health

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Background

Low-income mothers in the United States have higher birth rates and higher infant morbidities compared to upper income mothers.¹ They also have greater challenges in accessing health care services. Recent legislation and budget cuts have forced many hospitals to eliminate community health care services, especially those for low-income mothers and infants.²⁻⁴ These services have been reduced with little evidence-based guidance or measures of the health impact on populations at risk including low-income mothers.⁵ As a result, these mothers and their newborns are not receiving timely routine follow-up and acute health care visits,⁶⁻⁸ and they have an increase in infant morbidities including increased rehospitalizations, mortality rates, and health care costs.^{8,9}

Postpartum follow-up care interventions after hospital discharge aimed to improve maternal and infant outcomes have included nurses providing home visits with or without telephone follow-up, follow-up visits using

nonnurse para professionals, hospital-based follow-up, and a combination of these.¹⁰⁻¹⁴ While most interventions have targeted high-risk mothers (ie, preterm, low birthweight infants; hypertensive and diabetic mothers; and mothers with complicated deliveries),¹⁵ few studies have targeted low-income culturally diverse first-time mothers of healthy full-term infants.⁷ In addition, most interventions have often been expensive and difficult to maintain in clinical practice over time.

Interventions for follow-up care with postpartum low-income first-time mothers using mobile technology (cell

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phone use and text messaging) by nurse practitioners (NPs) is a simple yet potentially effective method to improve care and maternal/infant health outcomes while controlling costs. This could be especially important in this group of mothers, many without health insurance, have difficulty accessing the health care system, financial struggles, and language barriers. Recently, interventions using mobile technology (cell phone use and text messaging) are increasingly being used in other populations for health promotion and assistance with chronic health problems.¹⁶⁻¹⁹ However, interventions are lacking using 2-way communication with health care providers via cell phone contact and texting with low-income first-time mothers.²⁰ Such an intervention delivered by NP providers who have specialized in the care of mothers and infants hold potential to improve both maternal and infant health and to decrease health care charges in this vulnerable group. Therefore, the purpose of this study was to test the effects of an NP 2-way communication cell phone and texting follow-up intervention for the first 6 months postbirth in low-income first-time mothers and their healthy full-term infants.

Methods

This randomized clinical trial tested the effects of a mobile technology intervention on maternal health outcomes (perceived stress, social support), infant health outcomes (routine medical follow-up visits, immunizations, weight gain), and health care charges between 2 groups of low-income, first-time mothers who delivered full-term newborns. Mothers in the control group received routine hospital discharge care. The NP follow-up intervention group received routine hospital discharge care in addition to a 2-way NP cell phone intervention that included cell phone contact and texting on post-hospital discharge days 3, 7, 14, 21, then monthly for 6 months. Additionally, intervention group mothers were able to contact the NPs by cell phone or texting Monday through Saturday 9 AM to 5 PM. Mothers were instructed to call their health care provider or 911 if they needed emergency assistance outside of these times. Both groups of mothers were followed for the first 6 months post-hospital discharge following delivery. The NPs were experienced pediatric nurse practitioners. Maternal and infant health outcomes data and health care charges were collected for 6 months postpartum after hospital discharge on both groups of mothers.

First-time low-income mothers who met the study inclusion criteria were enrolled from the Mother Baby Unit at Jackson Memorial Hospital in Miami, Florida. Inclusion criteria were the following: low-income (annual income <\$18 530 for a 3-person and \$14 710 for

a 2-person household from the US Department of Health and Human Services),²¹ first-time mothers, 18 years or older, understood spoken English or Spanish, access to a cell phone, delivered a singleton healthy full-term infant (≥ 36 weeks), any racial/ethnic group. Only infants with limited access to health care (ie, delayed discharge due to delay in Medicaid, no pediatrician) were included. Exclusion criteria were the following: infants <36 weeks, multiple births, infants with medical conditions (feeding intolerance, hypoglycemia, congenital abnormalities), and mothers with medical conditions (diabetes, hypertension, delivery complications).

The study was approved by the university and the clinical site institutional review boards. Eligible mother-infant pairs meeting the study inclusion criteria were identified by the attending physician and NPs on the Mother Baby Unit where they briefly explained the study. For mothers interested in participating, a research assistant (RA) explained the study further to the mothers in their preferred language (English or Spanish) and obtained informed consent. The bilingual (English, Spanish) RA, a bachelor's prepared registered nurse, was trained in the study protocol, recruitment process, and consent procedures by the principal investigator. Following the signing of informed consent, mothers were randomized to a control or intervention group using a table of random numbers. After randomization, the RA collected the mothers' demographic information and reviewed the data collection time points with the mothers.

The RA collected data on maternal and infant health outcomes in both groups on post-hospital discharge day 3 and months 1 through 6 by reading the questions to the mothers in their preferred language by telephone. Data on health care utilization for both groups were collected from the mothers by phone on month 6. Time points for data collection were based on the common occurrence of infant morbidities within the first 6 months of life and by the recommended routine infant follow-up visits by the American Academy of Pediatrics (AAP). Infants are recommended to have their first pediatrician appointment for well child assessment by 3 to 5 days of age (48-72 hours post-hospital discharge) and at 1 month. Additional follow-up for well visits including immunizations are on months 2, 4, and 6.²²

Control Group mothers were provided with routine hospital discharge care. The mother baby nurse provided them with instructions on postpartum maternal care (ie, breast feeding, episiotomy/cesarean care, and infant care [ie, feeding, bathing, sleep positions, signs and symptoms of emergent conditions]) prior to discharge. The mothers are also provided printed papers in their language with instructions on infant care and a follow-up

appointment with a clinic affiliated with the hospital or an appointment with a pediatrician the mother chose prior to delivery. The mothers were contacted by the RA by telephone on beginning on the third post-hospital day, then monthly to month 6 to administer the Perceived Stress Scale (PSS) and the Multidimensional Scale of Perceived Social Support (MSPSS). If the mother voiced a health concern for herself or her infant, the RA directed the mother to contact her physician or use the 911 emergency system if the mother perceived the complaint as an emergency.

Intervention Group mothers received routine hospital care as described above. In addition, they received the NP follow-up intervention using 2-way cell phone contact and texting beginning on the third post-hospital discharge day and then on days 7, 14, 21, and monthly to month 6 to assess health problems or concerns regarding the infant. These contact points were established based on the common occurrence times of infant morbidities during the first 6 months of life that result in acute care visits or rehospitalizations.^{23,24} Mothers also able to contact the NPs by cell phone or texting with any infant health concerns. If a health care concern was stated, the NP used the AAP Pediatric Telephone Protocol²⁵ to implement care. The NPs documented the mother's concern and the care provided using the protocol in a clinical interaction log. If the mother voiced a serious infant complaint such as fever, excessive crying, vomiting, lethargy, or seizure-like activity, the mother was instructed to contact the 911 emergency systems. If there was no health concern, the NPs documented the mother's reply in the log. Backup pediatricians were available to the NPs for consultation on infant health concerns. All NPs were trained in using the 2-way follow-up cell phone contact and texting intervention including the AAP Pediatric Telephone Protocols²⁵ by the principal investigator.

The mothers' health (stress and social support) was measured using the PSS and the MSPSS by contacting the mothers by cell phone on post-hospital discharge day 3 and months 1 to 6. PSS was used to measure maternal stress. The PSS measures which situations of life are appraised as stressful.²⁶ Questions include items about thoughts and feelings and how often they were experienced within the last month. Mothers were asked to rate each of the PSS's 10 items using a 5-point rating scale that ranged from 0 "never" to 4 "very often." Overall total scores have a range of 0 to 40. Higher summative scores indicate greater perceived stress.

Social Support was measured using the MSPSS, which measures perceptions about support from family, friends, and significant others.²⁷ The MSPSS is a 12-item instrument with a 7-point Likert-type scale ranging from

1 "very strongly disagree" to 7 "very strongly agree." Total overall scores have a range from 12 to 84. Higher summative scores indicate higher levels of perceived support.

Infant Health was measured by contacting mothers on day 3 and months 1 to 6 to document the timing of routine well infant checks (immunizations and weight gain), acute care visits (urgent care, emergency department visits), and any infant hospitalizations. Data were recorded on a standard form indicating when immunizations were received, weight gain appropriate or not for age, and date, type, and reason for acute care visits.

The total health care costs for infant emergency room visits, acute care visits, and rehospitalizations over the first 6 months postdischarge were calculated using 2 measures. First, a conservative approach was used, where the cost of an emergency room visit is \$450, the base charge for an emergency room visit at Jackson Memorial Hospital. The cost of a night in the hospital was obtained from the Kaiser Family Foundation's estimate of hospital operating costs per inpatient day,²⁸ then adjusted for inflation to current-year dollars according to the medical care component of the Consumer Price Index.²⁹ The other estimates were obtained directly from the Medical Expenditure Panel Survey.³⁰ These estimates were also adjusted to current year dollars using the medical care component of the Consumer Price Index.²⁹ According to the Medical Expenditure Panel Survey, the average reimbursement for an emergency room visit was \$1009, and the average reimbursement for a night in the hospital was \$4558. In both cases, the cost of an urgent care visit was assumed to be \$100.

The cost of the NP follow-up intervention was calculated by adding all recorded NP intervention time including cell phone contact, texting, charting, physician consultation, a 2-hour NP training in the study protocol, and the cost of cell phones. The value of NP time was calculated based on the mean NP annual salary in South Florida plus fringe benefits.³¹ An hourly rate (\$42.22) was calculated by dividing annual salary and benefits by 52 weeks and then dividing by 40 hours per week. A cost-benefit analysis was conducted to determine whether the health care costs averted as a result of the intervention outweighed the intervention costs.

Results

A convenience sample of 141 mothers was recruited; 12 mothers were lost to contact postdischarge due to disconnected cell phones. The final sample of mothers was a total of 129 first-time mothers: 63 mothers were in the intervention group and 66 mothers were in the control group. See Table 1. Mothers ranged in age from 18 to 42 years, with a

Table 1. Demographic Characteristics of the Total Sample: Intervention and Control Groups.

	Total (N = 129)	APN (n = 63)	Control (n = 66)	Statistics
Age in years, M (SD)	25.3 (5.6)	25.0 (5.4)	25.7 (5.8)	$t = 0.81$
Race/ethnicity, n (%)				$\chi^2 = 0.23$
African American	23 (17.8%)	9 (14.3%)	14 (21.2%)	
Haitian	33 (25.6%)	13 (20.6%)	20 (30.3%)	
Hispanic	70 (54.3%)	40 (63.5%)	30 (45.5%)	
Non-Hispanic White	3 (2.3%)	1 (1.6%)	2 (3.0%)	
Partner status, n (%)				$\chi^2 = 0.72$
Not partnered	90 (69.8%)	43 (68.3%)	47 (71.2%)	
Partnered	39 (30.2%)	20 (31.7%)	19 (28.8%)	
Years with partner, M (SD) ^a	2.9 (2.8)	2.8 (2.8)	2.9 (2.8)	$t = 0.08$
Years in the United States, M (SD)	8.9 (8.9)	7.0 (7.6)	10.7 (9.4)	$t = 2.11^*$
Language, n (%)				$\chi^2 = 0.26$
English	70 (54.3%)	31 (49.2%)	39 (59.0%)	
Spanish	59 (45.7%)	32 (50.8%)	27 (41.0%)	
Employed, n (%)				$\chi^2 = 0.34$
Yes	27 (20.9%)	11 (17.5%)	16 (24.2%)	
No	102 (79.1%)	52 (82.5%)	50 (75.8%)	
Education ^a , n (%)	N = 121	n = 60	n = 61	$\chi^2 = 0.70$
High school or less	75 (58.2%)	41 (68.3%)	34 (55.8%)	
Some college	35 (27.1%)	14 (23.3%)	21 (34.4%)	
College graduate or more	11 (8.5%)	5 (8.3%)	6 (9.8%)	
Income ^a , n (%)	N = 121	n = 58	n = 63	$\chi^2 = 0.54$
<10000	89 (69.0%)	44 (75.9%)	45 (71.4%)	
\$10000-\$19999	27 (20.9%)	13 (22.4%)	14 (22.2%)	
\$20000-\$39999	5 (3.9%)	1 (1.7%)	4 (6.4%)	
Medical care coverage, n (%)	N = 129			$\chi^2 = 0.13$
Public	30 (23.3%)	11 (17.5%)	19 (28.8%)	
None	99 (76.7%)	52 (82.5%)	47 (71.2%)	
Infant gender, n (%)				$\chi^2 = 0.24$
Male	71 (55.0%)	38 (60.3%)	33 (50.0%)	
Female	58 (45.0%)	25 (39.7%)	33 (50.0%)	
Birth weight, M (SD)	7.08 (1.0)	7.1 (0.9)	7.0 (1.1)	$t = 0.15$
Gestational age, M (SD)	39.1 (1.3)	39.9 (1.5)	39.3 (1.1)	$t = 1.42$

Abbreviations: APN, advance practice nurse intervention; M, mean; SD, standard deviation.

^aNot all mothers answered question.

* $P < .05$.

mean age of 25.3 years. Most mothers were partnered and more than half were Hispanic. Most mothers spoke English, had at least a high school education, and all had an annual income of less than \$18000/year. Most mothers were unemployed and most were awaiting coverage by Medicaid for themselves and their infants. There were no significant differences in the demographic characteristics between the groups except for the number of years in the United States. The intervention group had a mean of 7.0 years in the United States compared to 10.7 years in the control group. More infants were male. Infants' birth weight ranged from 5.01 to 9.4 pounds and had a mean of 7.08 pounds. The mean gestational age was 38 weeks and ranged from 36 to 41 weeks. There were no significant differences in infant demographic characteristics.

There was no significant difference in perceived maternal stress between groups. See Table 2. Stress scores were highest at day 3 post-hospital discharge and then decreased monthly from months 1 to 6 with no significance difference between groups.

There was a significant difference between groups in mothers' perceived social support. See Table 2. Intervention group mothers' perceived social support scores were significantly higher in months 1, 4, 5, and 6 compared to control group mothers' scores. In both groups perceived social support was high on day 3 post-hospital discharge. Mothers social support scores in the NP follow-up group continued to increase monthly over the 6 months compared to controls whose scores continued to decline monthly.

Table 2. Maternal and Infant Health Outcomes: Post-Hospital Discharge (PHD).

Maternal Outcomes	APN (n = 63)	Control (n = 66)	Statistic
Perceived Stress Scale (PSS)			
Day 3	13.5 (5.4)	12.3 (8.6)	t = 1.02
Month 1	12.0 (5.0)	12.0 (7.4)	t = 0.46
Month 2	12.0 (5.0)	11.6 (7.0)	t = 0.30
Month 3	11.7 (5.6)	11.3 (8.5)	t = 0.26
Month 4	11.9 (6.0)	11.0 (8.1)	t = 0.54
Month 5	10.9 (5.2)	11.6 (8.3)	t = 0.40
Month 6	10.0 (6.1)	11.9 (7.9)	t = 1.07
Multidimensional Scale of Perceived Social Support (MSPSS)			
Day 3	71.0 (14.9)	68.9 (15.6)	t = 1.15
Month 1	72.6 (12.9)	65.5 (15.7)	t = 2.54*
Month 2	70.6 (13.9)	69.0 (13.4)	t = 0.53
Month 3	73.0 (12.4)	70.1 (12.8)	t = 1.02
Month 4	74.0 (13.2)	68.3 (13.1)	t = 2.00*
Month 5	75.2 (11.1)	67.7 (15.3)	t = 2.49*
Month 6	74.5 (12.6)	67.3 (17.1)	t = 2.10*
Infant Outcomes	APN	Control	Statistic
First well visit PHD, M days (SD)	6.2 days (5.6)	9.0 days (9.3)	t = 2.03*
Range	1-30 days	1-45 days	
Infant well visits received late, n (%)			
First well visit PHD, >48-72 hours	39 (61.9%)	40 (60.6%)	$\chi^2 = 0.23$
Month 1	10 (15.9%)	18 (27.3%)	$\chi^2 = 3.03$
Month 2	9 (14.3%)	18 (27.3%)	$\chi^2 = 3.56^*$
Month 4	8 (13.7%)	17 (25.7%)	$\chi^2 = 2.73$
Month 6	5 (7.9%)	13 (20.6%)	$\chi^2 = 3.56^*$
Immunizations: % up to date, n (%)			
Month 2	48 (76.2%)	41 (62.1%)	$\chi^2 = 5.01^*$
Month 4	38 (60.1%)	29 (43.9%)	$\chi^2 = 5.07^*$
Month 6	37 (58.7%)	28 (42.4%)	$\chi^2 = 5.78^*$
Infant morbidity, n (%)			
Emergency room	15(23.8%)	28(42.4%)	$\chi^2 = 5.02^*$
Urgent care	2(3.6%)	2(2.2%)	$\chi^2 = 0.03$
Hospitalizations	0(0.0%)	4(2.2%)	$\chi^2 = 3.94^*$

Abbreviations: APN, advance practice nurse intervention; M, mean; SD, standard deviation.

* $P < .05$.

There was a significant difference between groups in the mean number of days infants received their first well newborn follow-up visit. The NP follow-up group received their first well newborn visit in a mean of 6 days compared to 9 days for the controls. The majority of all study newborns received their well-baby clinic visit later than the recommendation of the AAP (48 to 72 hours post-hospital discharge).²²

There was a significant difference between groups in infant immunizations. A significantly greater number of infants in the NP follow-up group were immunized at the recommended times (2, 4, and 6 months of age) compared to the controls. There was no difference

in the number of infants with appropriate weight gain for age between groups.

There was a significant difference in infant morbidity by group. The NP follow-up group had fewer emergency room visits and no hospitalizations compared to controls. See Table 2. Most emergency visits were for non-urgent complaints including colds, coughs, and feeding questions. Hospitalizations and urgent care complaints were for fever, rash, urinary tract infection, and upper respiratory infections.

There were a total of 681 cell phone calls; 630 by the NPs to the mothers and 51 calls to the NPs by the mothers. The NPs was contacted via texting 29 times by the

Table 3. APN Time and Health Care Charges.

	Cell Phone Calls	Texts
Total calls	681	—
APN routine contact	630	0
Mothers initiated contact	51	29
APN time (M/SD), minutes	5788 (15.8/7.3)	0
APN cost \$42.22/h (0.70/min)	\$4052.00	0
Cell phone	\$1330	
Total	\$5382	

Healthcare Charges	APN	Control
Emergency room	\$6750-15 135	\$12 600-28 252
Urgent care	\$200	\$200
Hospitalizations	\$0	\$45 180-91 160
Total	\$6750-15 335	\$57 780-119 612

Abbreviations: APN, advance practice nurse intervention; M, mean; SD, standard deviation.

mothers (see Table 3). The majority of these calls and texts were for infant care concerns, problems with delayed Medicaid, and needing assistance in locating a health care facility that would accept newborns with delayed Medicaid. The mean NP time per telephone/texting call was 15.8 minutes.

There were significant differences in total health care charges. The total cost of the NPs' intervention was \$5382 (see Table 3). The control group reported 28 emergency room visits, 2 urgent care visits, and 20 nights hospitalized, while the NP follow-up group reported 15 emergency room visits, 2 urgent care visits, and zero nights hospitalized. Estimated health care costs for the control group were \$57980 using the conservative method and \$119612 using national averages. NP follow-up group estimated health care costs were \$6950 using the conservative approach and \$15335 using national averages. The intervention is estimated to save between \$51030 and \$104277 in health care costs averted. Compared to the intervention cost of \$5382, the total net savings ranged from \$45648 to \$98895. Average savings per study participant therefore ranged from \$725 to \$1570.

Discussion

Recent federal budget cuts and changes in health care reimbursement are posing significant challenges for mothers and their infants in accessing care. In the 2015 House Budget Committee proposal over the next 10 years, hospitals and health care systems are facing cuts approaching half a trillion dollars.³² These budget reductions are forcing hospitals to eliminate many community health care services, especially those in

maternal child health.^{3,4,33} States are being pressured to expand Medicaid,³⁴ which provides health coverage for the poor, yet pays for services at a much lower rate.³⁵ In addition, a recent report indicates that 38% of physicians either do not see Medicaid patients or limit the number they accept³⁶ due to cuts in reimbursement rates.³⁷ Federal budget cuts are in addition to the 2006 Deficit Reduction Act³⁸ in which children born in the United States are no longer automatically entitled to health insurance through Medicaid without providing documentation of citizenship and has resulted in delayed or denied Medicaid coverage for infants and children and has increased health care costs.³⁹ It has also increased the disparity between access to care for privately insured children and children on Medicaid.⁴⁰ Alternate approaches to care are needed.

Using the low-cost NP cell phone and texting intervention, intervention group mothers' perceived social support was significantly higher in months 4, 5, and 6 compared to control group mothers, and they had increased perceived social support at each time point compared to control group mothers. Leahy-Warren⁴¹ examined social support with 135 first-time low-income mothers and found that social support provided to mothers by nurse practitioners during follow-up provided more than half (52%) of their perceived social support, findings consistent with those of Hannan.⁴² Social support in the first year postpartum has been identified as an important factor affecting parenting stress levels and the long-term mental health functioning of mothers.^{43,44} However, there was no significant difference in perceived maternal stress between groups in the present study.

Intervention group infants received their first newborn follow-up visit significantly earlier (6 vs 9 days); significantly more infants were immunized at recommended times (2, 4, and 6 months of age); and there were fewer infant morbidities (emergency room visits, no hospitalizations) compared to controls. Overall, the majority of infants in this study did not receive their health care follow-up visits within the AAP recommended time of 48 to 72 hours post-hospital discharge.²² Most newborns received their first well newborn follow-up late. Timely well newborn visits continue to be problematic despite the AAP recommended guidelines. Other researchers report similar findings. Shakib et al⁴⁵ using data from a large health care system reported that 85% of newborns received their well newborn visit late followed by an increased rehospitalization rate. O'Donnell et al⁴⁶ reported in a retrospective cohort analysis with 3282 newborns born at a large urban university hospital that 44% of the newborns received late follow-up visits. The Agency of Healthcare Research and Quality National Healthcare Disparities Report⁸ indicated that many low-income minority infants lack newborn follow-up care. In the present study, many mothers had delayed Medicaid for their infants. Kulash⁴⁷ reported similar delays because changes in the health care system make it difficult for many pregnant women and newborns to confirm their Medicaid eligibility status, leaving some without coverage for weeks, or even months. In the present study, the NPs were able to provide mothers with information on local health care facilities that would accept newborns with delayed Medicaid, thus allowing them to be seen at appropriate follow-up times.

Intervention group health care utilization and costs were considerably lower compared to the control group costs. These findings are consistent with Brooten et al⁴⁸ reporting significant health care cost saving with postpartum mothers using an Advanced Practice Nurse Transitional Model of Care. The results of this study suggest that significant health care cost savings could be achieved by implementing this type of intervention more broadly. The health care cost savings achieved were substantially higher than the intervention cost, suggesting a positive return on investment.

Previous interventions to improve maternal and newborn outcomes in postpartum mothers have included nurse home visits,^{48,49} hospital or community follow-up programs, e-mail messages,⁵⁰ follow-up telephone calls,⁴² or a combination of these.⁵¹ While these interventions have demonstrated improved maternal and infant outcomes, they have been costly and difficult to sustain.^{48,52,53}

Studies using mobile technology are mainly 1-way message reminders and/or health information delivered

by text messages or automated cell phone messages. They have been used to gather information about health predictors⁵⁴; text messaging general health information⁵⁵ including information on asthma, obesity, human immunodeficiency virus, diet,^{56,57} sexual behaviors⁵⁸; and text messages with 1-way cell phone calls with home visits by a nonnursing coach.⁵⁹ Those targeted to women include text or cell phone messaging addressing contraceptive use, appointment reminders, smoking cessation, prenatal support, midwifery continuing education, gestational diabetes monitoring, immunization reminders, and breastfeeding support.⁶⁰⁻⁶⁴ Studies examining 2-way mobile technology on maternal and newborn outcomes postdelivery in first-time low-income mothers, especially those non-English speaking, are very limited. Yet mobile technology using cell phone and text messaging has emerged as an effective way to reach a wide range of populations.⁶⁵

Limitations include potential lack of generalizability to other groups of mothers and infants. Our study sample was largely minority (99%), low income, and/or awaiting Medicaid coverage. It is not clear if the study findings would hold in nonminority, or upper income mothers, or those with private health insurance.

Conclusion

Low-income mothers have difficulty accessing the health care, have delays in health care coverage, and mothers of full-term infants with early discharge (24-48 hours) have little or no follow-up care postpartum. The 2-way NP mobile intervention used in this study with low-income first-time, mainly minority, mothers was low-cost, easy-to-use, safe, and demonstrated improved maternal and infant outcomes. This intervention of 2-way mobile technology with cell phone and text messaging is an effective way of providing continuity of care for vulnerable populations at a time of major budget cuts and health care changes that affect health care services.

Future studies could include interventions with mobile technology using cell phones and texting on other populations. Studies using such interventions have reported improved communication between providers and patients by facilitating quick and direct access regardless of physical location and increased patient compliance.

Author Contributions

JH substantially contributed to conception or design; contributed to acquisition, analysis, or interpretation of data; drafted the manuscript; critically revised the manuscript for important intellectual content; gave final approval; and agrees to be accountable

for all aspects of the work in ensuring that questions relating to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

DB substantially contributed to conception or design; contributed to acquisition, analysis, or interpretation of data; drafted the manuscript; critically revised the manuscript for important intellectual content; gave final approval.

TP substantially contributed to conception or design; contributed to acquisition, analysis, or interpretation of data; drafted the manuscript; and gave final approval.

AG substantially contributed to conception or design and gave final approval.

MT contributed to acquisition, analysis, or interpretation of data and gave final approval.

Declaration of Conflicting Interests

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