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Research Article

Distance Traveled for Intrapartum Care and Perinatal Outcomes in Eastern North Carolina

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Abstract

Background: Current data suggests that women who travel outside of their community for perinatal care are at an increased risk of adverse outcomes.

Objectives: The objective of this study was to compare outcomes between women who live adjacent to a tertiary care center and women who need to travel for this care.

Methods: Data for all deliveries from June 2010 through October 2013 were extracted from the Delivery Database at Vidant Medical Center in Greenville, North Carolina. Subjects included women who were term, admitted for labor and residents of eastern North Carolina. Distances from the patient's residence to the hospital were calculated and evaluated for the impact on perinatal outcomes. Analysis was performed using Chi-square, T-tests, ANOVA and Kruskal-Wallis.

Results: A total of 12,071 deliveries occurred during the study period with a total of 3,955 subjects included in the final analysis. Women who traveled for care had an increased risk of cesarean sections, operative deliveries and postpartum hemorrhage. Overall neonatal outcomes were comparable across distances.

Conclusion: The results from this study support improving access to maternity services for women from rural and remote communities.

Introduction

Adequate access to perinatal care is essential to improving maternal and neonatal outcomes. Access to maternity care is often limited in rural areas and travel time is frequently longer. Current data suggests that women who travel outside of their community for maternity care are more likely to have complications during childbirth and are at an increased risk of adverse perinatal outcomes [1-4]. Research has demonstrated that women who have to travel greater distances for care are more likely to have an unplanned out of hospital delivery or undergo an induction of labor than women who do not have to travel for this care [4-7]. Women who travel for perinatal care are also more likely to experience stress, financial loss, separation from spouse and children and lack continuity of care [5,8]. Infants who deliver to women who have to travel for maternity care have higher rates of prematurity, very low birth weight, fetal heart rate abnormalities and Meconium-Stained amniotic fluid, are more likely to be admitted to the NICU and have higher costs of neonatal care [1,6,9-11].

While the optimal travel distance for maternity care has not been established, data from a recent study by Rayburn and Richardson noted that access to perinatal care is not equal across the United States. Access to a maternity center is within a 30-minute drive for 87.5% of the US population (43.6 million) and within a 60-minute drive for 97.3% of the US population (48.4 million). Hospitals with capabilities to provide care for more complicated cases (level II or III) are less accessible within a 30-minute drive (78.6% of the population; 39.1 million) and a 60-minute drive (93.1% of the population; 46.4 million). Centers providing the most comprehensive maternal and newborn care (level III) are least accessible and located only in metropolitan areas (60.8% or 30.3 million of the population within a 30-minute drive; 80.1% or 39.9 million of the population within a 60-minute drive) [12].

More information regarding perinatal outcomes as they relate to travel distance to the hospital will improve our understanding of how to improve pregnancy outcomes in regions of limited access to adequate perinatal care. The objective of this study was to compare perinatal outcomes between women presenting in labor who live adjacent to a tertiary care center and women presenting in labor who need to travel for this care. The hypothesis was that geographic disparity exists among women delivering at a tertiary care facility and that longer distances traveled have a negative impact on perinatal outcomes.

Methods

Data for all deliveries from June 2010 through October 2013 were extracted from the Delivery Database at Vidant Medical Center in Greenville, North Carolina. Subjects included women who were 37 weeks or greater, admitted with the diagnosis of "labor" or "rule out labor" and were residents of the eastern part of North Carolina as demarcated by the Interstate 95 corridor. Records with invalid or missing zip codes for the patient's residence were excluded from the analysis. Selected demographic variables included in the analysis were patient age, race, parity, marital status, BMI and insurance status. Maternal outcomes of interest included route of delivery, length of labor, labor analgesia, perineal lacerations and augmentation of labor and support persons present. Neonatal variables of interest included nursery admissions, Apgar scores, birth weight and estimated gestational age.

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Driving distance from home residence to the hospital was estimated using the zip code of the woman's residence and the zip code Vidant Medical Center. Direct line distance and driving distance were then calculated using Zipcode Database & Demographic Data and Google Maps. The distance was defined from the central location of each zip code to Vidant Medical Center. Distances were then divided into catchment areas based on proximity to the hospital. NCSS 97 software was used for statistical calculation. The Chi-square, Fisher's exact test was used for analysis of categorical data using. T-tests and analysis of variance routines were used for numeric data and normality of data distribution was always considered. T-tests, or Student Newman Kuels tests, were used on normally distributed data. Mann-Whitney U test was used with T-testing of non-normal data.

For ANOVA analysis on non-normal data, the Kruskal-Wallis ANOVA, corrected for ties and Kruskal-Wallis multiple comparison Z value tests were used. Statistical significance was considered when $P<0.05$. Possible confounding factors were analyzed separately for interactions. Ethical considerations for this project were in accordance with the Vidant Medical Center and East Carolina University Institutional Review Board's criteria for research with human subjects. All identifiable information was stripped from the data set prior to final analysis. The authors declare that there is no conflict of interest regarding the publication of this paper

Results

A total of 12,071 deliveries occurred during the study period. A total of 4,028 women met inclusion criteria, however, thirty-three were removed from the dataset due to incomplete data or lack of an address or zip code. A total of 3955 subjects were included in the final analysis. The majority of women in this study were single, multiparous, term gestation at thirty-nine to forty and 6/7 weeks, twenty to thirty-four years of age, overweight or obese, insured by Medicaid and African American or Caucasian. Only three still births and one maternal mortality were identified in the dataset. Results are reported in tables 1-3. Factors that were major contributors to the proportion deviations in the analysis of Chi-Square contribution and deviation from independence are indicated by starred percentages (*).

Travel distance to the hospital was significantly associated with race, BMI and payor status. Race was significantly associated with travel distance to the hospital ($p<0.001$). Asian and African American women were more likely to live in close proximity to the hospital. Hispanic women were most likely to live between 15 and 60 miles from the hospital and Caucasian women were most likely to live >60 miles from the hospital. Maternal obesity was significantly associated with a greater distance to the hospital ($p<0.001$). Nearly 90% of the study population was noted to have a BMI of greater than 30 with a BMI range of 18 to 78. Analysis revealed an even greater significance when maternal obesity was further subdivided among obese (BMI >30), morbid obesity (BMI >50) and super morbid obesity (BMI >60). Increasing maternal obesity was associated with increased distance to the hospital. Payer status was also significantly associated with travel distance to the hospital ($p<0.001$). Women living >60 miles were less likely to have Medicaid and more likely to have private insurance, while the reverse was true for those living <15 miles from the hospital.

Demographics	Total	0-15 Miles	15-60 miles	>60 miles	P-Value
Marital Status	3966				0.116
Married	1806 (45.5%)	925 (44%)	781 (47%)	100 (49%)	
Single	2160 (54.5%)	1175 (56%)	881 (53%)	104 (51%)	
Age	3972				0.976
Young maternal age (<19)	399 (10%)	209 (9.9%)	171 (10.3%)	19 (9.3%)	
Adult (20-34)	3190 (80.3%)	1685 (80.2%)	1339 (80.4%)	166 (81%)	
Advanced maternal age (>35)	383 (9.6%)	207 (9.9%)	156 (9.4%)	20 (9.8%)	
Parity	3966				<0.001
Primiparous	1607 (40.5%)	911 (43.4%)	601 (36.1%)	95 (46.6%)*	
Multiparous	2359 (59.5%)	1187 (56.6%)	1063 (63.9%)	109 (53.4%)*	
BMI	3945				<0.001
Normal (18.5-24.9)	411 (10.4%)	233 (11.1%)	156 (9.4%)	22 (10.8%)	
Overweight (25-29.9)	1359 (34.4%)	747 (35.7%)	547 (33%)	65 (32%)	
Obese (30-39.9)	1750 (44.3%)	898 (42.9%)	766 (46.3%)	86 (42.4%)	
Morbid obesity (40-49.9)	363 (9.2%)	184 (8.8%)	161 (9.7%)	18 (8.9%)	
Super morbid obesity (>50)	67 (1.7%)	29 (1.4%)	26 (1.6%)	12 (5.9%)*	
Race	3995				<0.001
Asian	133 (3%)	102 (5%)	26 (2%)	5 (2%)	
African american	1588 (40%)	944 (45%)	590 (36%)*	54 (25%)*	
Hispanic	475 (12%)	210 (10%)	251 (15%)	14 (6.9%)*	
White	1759 (44%)	825 (40%)	793 (48%)*	131 (64%)*	
Insurance Status	3972				<0.001
Medicaid	2214 (55.7%)	1145 (54.5%)	984 (59.1%)	85 (41.5%)*	
Private	1641 (41.3%)	887 (42.2%)	638 (38.3%)	116 (56.6%)*	
Self/Other	117 (2.9%)	69 (3.3%)	44 (2.6%)	4 (2%)	

Table 1: Demographics and distance traveled for intrapartum care in Eastern North Carolina.

Demographics	**Total**	**0-15 Miles**	**15-60 miles**	**>60 miles**	**P-Value**
Intrapartum Variables	Total	0-15 Miles	15-60 miles	>60 miles	P-Value
Reason for Admission	3972				0.867
Labor	2094 (52.7%)	1111 (52.9%)	872 (52.3%)	111 (54.1%)	
"Rule out Labor"	1878 (47.3%)	990 (47.1%)	794 (47.7%)	94 (45.9%)	
Presentation	3958				0.04
Breech	36 (0.9%)	23 (1.1%)	8 (0.5%)*	5 (2.5%)*	
Compound	101 (2.6%)	55 (2.6%)	40 (2.5%)	6 (3%)	
Cephalic	3821 (96.5%)	2018 (96.3%)	1611 (97.1%)*	192 (94.6%)	
Admit Dilation	3968				0.101
0-3 cm	1218 (30.7%)	646 (30.8%)	496 (29.8%)	76 (37.1%)	
4 cm or greater	2750 (69.3%)	1452 (69.2%)	1169 (70.2%)	129 (62.9%)	
Admit Dilation (Secondary Analysis)	3960				0.975
0-5 cm	2890 (73%)	1530 (73%)	1210 (72.8%)	150 (73.5%)	
6 cm or greater	1070 (27%)	565 (27%)	451 (27.2%)	54 (26.5%)	
Labor Duration	3972				0.02
<30 minutes	163 4.1	83 (4%)	65 (3.9%)	15 (7.3%)*	
30 min - 6 hrs	1376 (34.6%)	728 (34.7%)	598 (35.9%)	50 (24.4%)*	
6-12 hours	1443 (36.3%)	767 (36.5%)	596 (35.8%)	80 (39%)	
>12 hours	990 (24.9%)	523 (24.9%)	407 (24.4%)	60 (29.3%)*	
Augmentation	3948				0.362
Pitocin	1541 (39%)	828 (39.7%)	628 (37.8%)	85 (41.7%)	
No augmentation	2407 (61%)	1256 (60.3%)	1032 (62.2%)	119 (58.3%)	
Analgesia	3558				0.218
Epidural	1924 (54.1%)	979 (54.3%)	841 (53.6%)	104 (55.9%)	
IV sedation	402 (11.3%)	220 (12.2%)	163 (10.4%)	19 (10.2%)	
Local	31 (0.9%)	13 (0.7%)	14 (0.9%)	4 (2.2%)	
None	1201 (33.8%)	592 (32.8%)	550 (35.1%)	59 (31.7%)	
Support persons	3968				0.03
Spouse/ Significant other	3017 (76%)	1604 (76.5%)	1274(76.5%)	139 (67.8%)*	
Parent/Guardian	442 (11.1%)	241 (11.5%)	171 (10.3%)	30 (67.8%)*	
None/Staff only	509 (12.8%)	252 (12%)	221 (13.3%)	36 (17.6%)*	

Table 2: Intrapartum variables and distance traveled for intrapartum care in Eastern North Carolina.

Maternal Outcomes	**Total**	**0-15 Miles**	**15-60 miles**	**>60 miles**	**P-Value**
Lacerations	3505				0.263
None	1674 (47.8%)	879 (47.2%)	723(48.9%)	72 (43.9%)	
First or Second	1751 (50%)	946 (50.8%)	720 (48.7%)	85 (51.8%)	
Third or Fourth	80 (2.3%)	38 (2%)	35 (2.4%)	7 (4.3%)	
Delivery Mode	3965				<0.001
Spontaneous	3308 (83.4%)	1744 (83.2%)	1415 (85%)	149 (72.7%)*	
Operative	173 (4.4%)	101 (4.8%)	59 (3.5%)	13 (6.3%)	
Cesarean section	484 (12.2%)	251 (12%)	190 (11.4%)	43 (21%)*	
VBAC	249				0.201
Successful	194 (77.9%)	70 (72.2%)	107 (81.1%)	17 (85%)	
Failed	55 (22.1%)	27 (27.8%)	25 (18.9%)	3 (15%)	
Estimate Blood Loss	3958				0.05
<500cc	3411 (86.2%)	1806 (86.2%)	1443 (87%)	162 (79.8%)	
500-1000cc	478 (12.1%)	257 (12.3%)	187 (11.3%)	34 (16.7%)	
>1000cc	69 (1.7%)	33 (1.6%)	29 (1.7%)	7 (3.4%)	

Table 3: Maternal Outcomes and distance traveled for intrapartum care in Eastern North Carolina.

Additional analysis showed that Caucasian women were more likely to have private insurance while African American and Hispanic women were more likely to have Medicaid coverage (p<0.001). Analysis of the results revealed that patient age and marital status were not significantly associated with travel distance to the hospital (Table 1).

Maternal outcomes for comparison included route of delivery, length of labor, labor analgesia, perineal lacerations and augmentation of labor and presence of support persons. For all subjects, the mode of delivery (cesarean, operative or vaginal) was significantly associated with distance from the hospital (p<0.001). Women who lived greater than 60 miles were more likely to have been delivered by cesarean section or operative delivery. The most common indications for cesarean delivery included, in order of frequency, arrest of descent or arrest of dilation, abnormal fetal heart tracing, malpresentation, active HSV infection or HIV. Indications for cesarean section were not significantly associated with travel distance to the hospital. Further analysis revealed that for women with a history of a cesarean section, the travel distance to the hospital was not significantly associated with success or failure of a trial of labor after a cesarean section (p=0.210) (Table 2).

Length of labor and dilation at admission was significantly associated with the distance women traveled to the hospital (p<0.001). Women who were dilated 4 cm or greater at the time of admission were less likely to have labor lasting greater than 12 hours. Secondary analysis was performed using 6cm dilation which revealed similar results. Length of labor from time of admission to delivery increased as travel distance increased and the longer a woman was in labor, the more likely she was to deliver by cesarean section (Figure 1). The duration of labor was significantly associated with travel distance to the hospital (p=0.02) and women who delivered via cesarean section or operative delivery were more likely to be in labor for greater 12 hours. Women who lived >60 miles were more likely to labor <30 minutes, were less likely to have labor lasting 30 min to 6 hours and were more likely to have longer labors >12 hours (Table 2).

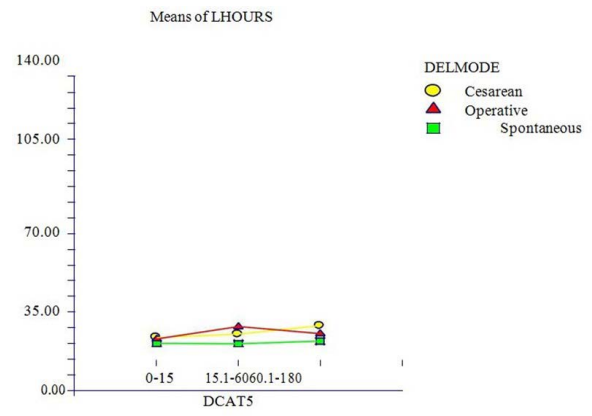

Figure 1: Length of labor, mode of delivery and distance traveled for intrapartum care in Eastern North Carolina.

There was an association noted between Estimated Blood Loss (EBL) and travel distance to the hospital (p=0.05). Women who traveled greater distances to the hospital were noted to have an increased risk of a postpartum hemorrhage. Women who experienced a postpartum hemorrhage with an EBL >1000cc were more likely to live >60 miles from the hospital. Lacerations were not significantly associated with distance although women who lived >60 miles, but women who traveled for care did have twice as many third- and fourth-degree perineal lacerations as those who lived in close proximity to the hospital (Table 3). A median of 39% of subjects required pitocin augmentation across all distances. There were no significant differences regarding augmentation of labor regardless of the distance traveled for Intrapartum care. There was a variety of use of pain medications and combinations of pain medications. Use of pain medication revealed no significant differences in relationship to travel distance to the hospital (p=0.218). Twice as many women who lived greater than 60 miles were more likely to lack support during labor (p=0.03) (Table 2).

Neonatal outcomes for comparison included Apgar scores, nursery admission, birth weight and estimated gestational age. Apgar scores are universally used as an indicator of the neonate's condition in the first few minutes after delivery. An apgar score of less than seven is frequently associated with the need for resuscitative measures. Therefore, analysis was performed using an apgar score of seven. A one minute apgar score of less than seven was noted to be significantly associated with increased travel distance to the hospital (p<0.001). Women coming from >60 miles were more likely to have 5 minute apgar scores of less than seven versus those who lived <15 miles, although this was not statistically significant (p=0.064). Nursery admissions were not significantly associated with travel distance to the hospital (p=0.07). However, women who lived >60 miles did have a higher percentage of infants admitted to the intermediate unit and neonatal intensive care unit. Infants were subdivided into three categories based on birth weight: low birth weight (<2500 grams), normal birth weight (2500-3900 grams) or high birth weight (>4000 grams). Infants were also divided into four categories based on gestational age: early term (37-38.6 weeks), term (39-40.6 weeks), late term (41-41.6 weeks) and post-term (>42 weeks). Neither gestational age nor birth weight was significantly associated with travel distance to the hospital. Further analysis did show that super morbidly obese patients were more likely to have infants >4000 grams (p<0.001) (Table 4).

Discussion

North Carolina ranks 36th in overall health as measured by determinants such as personal health behaviors, community environment, health policies and access to care and health outcomes in the United States and if Eastern North Carolina were considered its own state, it has been suggested that it would rank 51st in access to care and health outcomes [13]. The state of North Carolina, particularly Eastern North Carolina, has poor access to acute obstetrical care and has repeatedly had some of the highest rates of preterm birth, low birth weight and infant mortality in the county. In response to the poor perinatal outcomes in North Carolina, the Pregnancy Medical Home program was initiated in 2011 in order to decrease rates of preterm delivery, low birth weight and primary cesarean sections [14,15]. The results from this study may help direct future research efforts and health policies to focus on geographic disparities in perinatal care in order to improve maternal and neonatal outcomes.

Neonatal Outcomes	Total	0-15 Miles	15-60 miles	>60 miles	P-Value
Nursery Care	3971				0.078
Newborn	3658 (92.1%)	1941 (92.4%)	1538 (92.3%)	179 (87.3%)	
Intermediate	218 (5.5%)	106 (5%)	94 (5.6%)	18 (8.8%)	
NICU	95 (3.9%)	53 (2.5%)	34 (2%)	8 (3.9%)	
One Minute APGAR Score	3966				<0.001
<7	450 (11.3%)	255 (12.2%)*	158 (9.5%)	37 (18%)*	
>7	3516 (88.7%)	1842 (87.8%)*	1506 (90.5%)	168 (82%)*	
Five Minute APGAR Score	3971				0.064
<7	75 (1.9%)	41 (2%)	26 (1.6%)	8 (3.9%)	
>7	3896 (98.1%)	2060 (98%)	1639 (98.4%)	197 (96.1%)	
Birth Weight	3959				0.537
<2500 grams	100 (2.5%)	51 (2.4%)	41 (2.5%)	8 (3.9%)	
2500-4000 grams	3585 (90.6%)	1908 (91.1%)	1497 (90.2%)	180 (88.2%)	
>4000 grams	274 (6.4%)	136 (6.5%)	122 (7.3%)	16 (7.8%)	
Estimated Gestational Age	3972				0.285
Early term (37-38.6)	1176 (29.6%)	602 (28.7%)	507 (30.4%)	67 (32.7%)	
Term (39-40.7)	2592 (65.3%)	1397 (66.5%)	1068 (64.1%)	127 (62%)	
Late term (41-41.6)	198 (5%)	101 (4.8%)	86 (5.2%)	5 (0.3%)	
Post term (>42 weeks)	6 (0.2%)	1 (0%)	5 (0.3%)	0 (0%)	

Table 4: Neonatal outcomes and distance traveled for intrapartum care in Eastern North Carolina.

The results from this study show that women who travel greater distances for Intrapartum care have an increased risk of adverse perinatal outcomes. For example, women traveling greater than 60 miles were at a higher risk for a cesarean section or operative delivery and postpartum hemorrhage. As mentioned above, the most common indications for cesarean delivery in this study included arrest of descent of arrest of dilation, abnormal fetal heart tracing, malpresentation or active HSV infection or HIV. These results are consistent with a 2011 population-based study which noted that the most common indications for primary cesarean delivery included labor dystocia, abnormal fetal heart rate tracing, fetal malpresentation, multiple gestation and suspected fetal macrosomia [16].

The presence of a support person during labor has been associated with improved perinatal outcomes. A Cochrane review including 23 trials involving more than 15,000 women concluded that women who receive continuous labor support are more likely to have a spontaneous vaginal delivery, less likely to use pain medications and have slightly shorter labors and to have infants who were also less likely to have low five minute apgar scores [17]. The decreased support during labor which was noted among women traveling greater distances for Intrapartum care may have been a contributing factor to the increased risk of cesarean section among this population. Maternal obesity has also been associated with adverse perinatal outcomes such as increased risk of cesarean and operative deliveries [18]. In this study, increasing maternal obesity was associated with greater distances from the hospital and may have contributed to the increased risk of cesarean and operative deliveries among this population. In addition to the increased risk of operative delivery, maternal obesity has been associated with an increased risk of postpartum hemorrhage [19]. In this study, women who traveled greater than 60 miles for Intrapartum care had an increased risk of a postpartum hemorrhage. In addition to maternal obesity, the increased risk of cesarean sections and operative deliveries, the increased risk of rapid or prolonged labor and the increased percentage of third and fourth degree perineal lacerations among this population may have also contributed to the increased in postpartum hemorrhages.

Race was noted to be associated with travel distance to the hospital in this study and the racial disparities were similar to what has previously been reported. Prior studies have noted that Native-American women had the lowest percentage of living within a 30-minute drive (68.2%) or a 60-minute drive (83.2%) of the nearest perinatal center, while Hispanic and African American women lived the closest to targeted hospitals [12]. Similarly, in this study Caucasian women were more likely to live >60 miles from the hospital while Asian, African American and Hispanic women tended to live <60 miles from the hospital.

The strengths of this study include the use of a large database to investigate the association between travel distance to the hospital and perinatal outcomes. Another strength is that this study included subjects from a variety of providers including academic obstetricians and family medicine physicians, private obstetricians and nurse-midwives, therefore taking into account various practice patterns. Because the exact location of the onset of labor was unknown, the zip-code of the location of residence on the delivery record was used for calculating distance to the hospital. The type of transportation used (i.e., car versus ambulance) and individual situations are unknown and could not be taken into account. Therefore, actual travel times may be variable. The associations found in a study such as this are not necessarily causal. It is possible that the effects of some important confounding factors such as maternal or fetal comorbidities were missed, although this is less likely in women presenting in labor at term. Finally, this study population from Eastern North Carolina may not be representative of the population as a whole.

Conclusion

Many rural women experience poor geographic access to adequate maternity care. A shortage and maldistribution of health care providers and the closing of many maternity care facilities across the country in rural communities are creating increasing disparities for rural women. The results from this study indicate that there may be an increased risk of either very short or prolonged duration of labor, an increased risk of cesarean and operative deliveries and an increased risk of postpartum hemorrhage. The results also indicated that overall neonatal outcomes were similar across all distances. Identification of travel distance for perinatal care as a potential health care disparity is one of the first steps toward directing interventions in order to improve access to maternity services for women from rural and remote communities and improve maternal and neonatal outcomes.

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Journal of Cytology & Tissue Biology

Journal of Dentistry: Oral Health & Cosmesis

Journal of Diabetes & Metabolic Disorders

Journal of Dairy Research & Technology

Journal of Emergency Medicine Trauma & Surgical Care

Journal of Environmental Science: Current Research

Journal of Food Science & Nutrition

Journal of Forensic, Legal & Investigative Sciences

Journal of Gastroenterology & Hepatology Research

Journal of Gerontology & Geriatric Medicine

Journal of Genetics & Genomic Sciences

Journal of Hematology, Blood Transfusion & Disorders

Journal of Human Endocrinology

Journal of Hospice & Palliative Medical Care

Journal of Internal Medicine & Primary Healthcare

Journal of Infectious & Non Infectious Diseases

Journal of Light & Laser: Current Trends

Journal of Modern Chemical Sciences

Journal of Medicine: Study & Research

Journal of Nanotechnology: Nanomedicine & Nanobiotechnology

Journal of Neonatology & Clinical Pediatrics

Journal of Nephrology & Renal Therapy

Journal of Non Invasive Vascular Investigation

Journal of Nuclear Medicine, Radiology & Radiation Therapy

Journal of Obesity & Weight Loss

Journal of Orthopedic Research & Physiotherapy

Journal of Otolaryngology, Head & Neck Surgery

Journal of Protein Research & Bioinformatics

Journal of Pathology Clinical & Medical Research

Journal of Pharmacology, Pharmaceutics & Pharmacovigilance

Journal of Physical Medicine, Rehabilitation & Disabilities

Journal of Plant Science: Current Research

Journal of Psychiatry, Depression & Anxiety

Journal of Pulmonary Medicine & Respiratory Research

Journal of Practical & Professional Nursing

Journal of Reproductive Medicine, Gynaecology & Obstetrics

Journal of Stem Cells Research, Development & Therapy

Journal of Surgery: Current Trends & Innovations

Journal of Toxicology: Current Research

Journal of Translational Science and Research

Trends in Anatomy & Physiology

Journal of Vaccines Research & Vaccination

Journal of Virology & Antivirals