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Withdrawing without withholding: A quantitative report of factors indicative of the need for early rehabilitation services after intrauterine drug exposure

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East Tennessee Children's Hospital

Mission: "East Tennessee Children's Hospital will improve the health of children through exceptional, comprehensive family-centered care, wellness, and education."

Vision: "Leading the way to healthy children."

Agency Needs/Project Goals

- Agency Needs: Research regarding early indicators of a need for support services in this population to enhance client care, maintain best practice, and increase caregiver and healthcare professional awareness
- Conduct an analysis of available documents and collaborate with experienced personnel to identify potential research needs and to develop a plan for the research process
- Complete a literature review of existing information regarding care for individuals diagnosed with NAS and/or IUDE, including East Tennessee Children's Hospital's (ETCH) current care plan
- Develop and submit IRB protocol to ETCH and Belmont
- Collect subjects for the research protocol and create a confidential spreadsheet for deidentification purposes
- Collect data from all pertinent systems and clinic spreadsheets and record data in a deidentified spreadsheet
- Collaborate with statistician for the analysis of the findings
- Develop a manuscript containing all components of research process to share with ETCH
- Present findings to the Grow With Me Clinic

Abstract

Maternal opioid use is a proliferative epidemic leading to a widespread increase in cases of Neonatal abstinence syndrome (NAS) and intrauterine drug exposure (IUDE). Much information has yet to be discovered regarding best practice in treatment and the long-term effects of these diagnoses. This retrospective chart review was conducted to increase awareness and achieve a greater understanding of early developmental deficits and intervention in this population. The researchers hypothesized that there are predictive factors of a later need for therapy services. Potentially influential factors and the prevalence of rehabilitation services provided after discharge from the Neonatal Intensive Care Unit (NICU) within the first year of life were examined. Two primary subgroups were initially compared; the differing characteristic between groups was whether the child received a referral to therapy prior to their first birthday. Analysis of the data indicated statistically significant results outlining factors that have predictability power of a referral to therapy. Additional analyses compared the same factors among the subgroup of subjects who had attended the Grow With Me (GWM) follow up clinic at least once. A stay in NICU, equal to or exceeding 21 days, was the statistically significant finding that resulted from this analysis. This study provides insight regarding early indicators of the need for therapeutic intervention in children diagnosed with NAS or IUDE.

Methods

- Research Design/Procedures:** IRB approval from ETCH and Belmont, certificate of confidentiality from ETCH for retrospective chart review
- Data collection materials:** patient medical records (NICU) and patient clinical records (GWM)
- Variables of study:**
 - Mother: smoking and/or tobacco use, diagnosis of depression, diagnosis of anxiety, diagnosis of bipolar disorder, degree of prenatal care, whether mother had previous exposure to Hepatitis C
 - Baby: type and number of drugs exposed to prior to birth, amount of rehab in NICU, medication received during NICU stay, treated for NAS or IUDE, length of NICU stay, caregiver at discharge, attendance in GWM, child's gender, whether child was born via c-section, whether child was breastfed
- Referral variables:** Home health occupational therapy (HHOT), home health physical therapy (HHPT), home health speech therapy (HHST), outpatient occupational therapy (OPOT), outpatient physical therapy (OPPT), outpatient speech therapy (OPST)
- Analyses:** first analysis: all individuals enrolled in GWM; second analysis: only individuals who had attended GWM at least once. Quantitative analyses included chi-squared tests and Mann-Whitney tests. Statistical significance was a p value $< .05$
- Participants:** Diagnosed with NAS and/or IUDE, 3m, 0d-24m, 0d at time of study, required NICU stay at ETCH, enrolled in GWM at ETCH
 - Overall study population (N=134)
 - Subject group (n=67): received a therapy referral prior to first birthday
 - Control group (n=67): no referral prior to first birthday
 - Attended GWM at least once (N=100)
 - Subject group (n=62)
 - Control group (n=38)

Results

Potential influential factor results overall (N=134) * See table 1

Statistically significant positive correlation with therapy referral:

- Mother diagnosed with depression
 - Child treated with phenobarbital, clonidine, and/or morphine
 - NICU stay of 21 days or greater
 - Kinship guardian at discharge
 - Biological guardian at discharge was negatively correlated
 - Higher percentage of GWM visits attended
 - Greater number of speech therapy visits in NICU
- Positive correlation approaching significance
- Diagnosis of NAS

Drug exposure results overall *See table 1

Statistically significant positive correlation with therapy referral:

- Maternal gabapentin use
- Approaching statistically significant positive correlation with therapy referral
- Quantity of substances

Therapy referral results overall (N=134)

- OPOT was the most referred therapy (32.8% of overall study population, 65.7% of referral population)
- HHOT highly referred (20% of overall population, 41.8% of referral population)
- OPPT (14.9% of overall population, 29.9% of referral population)
- OPST least common OP referral (8.2% overall population, 16.4% referral population)

Therapy referral results attended GWM at least once (N=100)

- Therapy referrals were higher compared to overall study population in every referred therapy (HHOT (23%/20%), OPOT 943%/32.8%), OPPT (20%/14.9%), OPST (11%/8.2%)

Potential influential factor results attended GWM at least once (N=100)

Statistically significant positive correlation with therapy referral:

- NICU stay of 21 days or greater

Drug exposure attended GWM at least once

No statistically significant findings

Table 1
Potential Influential Factors Results - Overall

Characteristic	Overall (N=134)	Control (N=67)	OT/PT/ST (N=67)	P value
Maternal				
	N Yes (% Yes)			
Mother smoked while pregnant	84 (62.7)	38 (56.7)	46 (68.7)	.152
Mother diagnosed depression	13 (9.7)	3 (4.5)	10 (14.9)	.036
Mother diagnosed anxiety	9 (6.7)	3 (4.5)	6 (9.0)	.296
Mother diagnosed bipolar	5 (3.7)	2 (3.0)	3 (4.5)	.647
Child diagnosed with NAS	117 (87.3)	55 (82.1)	62 (92.5)	.066
Child diagnosed with IUDE	134 (100)	67 (100)	67 (100)	^a
Child treated with phenobarbital	13 (9.7)	2(3.0)	11 (16.4)	.006
Child treated with clonidine	28 (20.9)	6 (9.0)	22 (32.8)	.000
Child treated with morphine	110 (82.1)	50 (74.6)	60 (89.6)	.022
Child in NICU greater than or equal to 21 days	31 (23.1)	9 (13.4)	22 (32.8)	.007
Child received greater than or equal to 5 rehab visits in NICU	71 (53.0)	33 (49.3)	38 (56.7)	.387
Child born male gender	78 (58.2)	36 (53.7)	42 (62.7)	.293
Child born via C-section	35 (26.1)	17 (25.4)	18 (26.9)	.844
Child breast feed	25 (18.7)	15 (22.4)	10 (14.9)	.266
Child exposed: Gabapentin	10 (7.5)	2 (3.0)	8 (11.9)	.042
Mother exposed to Hep C	(N=133)	(N=67)	(N=66)	.526
	79 (59.4)	38 (56.7)	41 (62.1)	
Mother degree of prenatal care				
None	(N=132)	(N=66)	(N=66)	.648
Limited	8 (6.1)	3 (4.5)	5 (7.6)	
Complete	52 (39.4)	28 (42.4)	24 (36.4)	
	72 (54.5)	35 (53.0)	37 (56.1)	
Child discharged home with				
Foster	(N=134)	(N=67)	(N=67)	.003
Biological	27 (20.1)	9 (13.4)	18 (26.9)	
Kinship	81 (60.4)	50 (74.6)	31 (46.3)	
	26 (19.4)	8 (11.9)	18 (26.9)	
Median [IQR]				
Child % GWM visits attended	50.0 [0, 75]	25.0 [0, 50]	50.0 [33, 75]	< .001
Child # PT/OT NICU visits	3 [1,5]	3 [1,4]	3 [1,6]	.211
Child # ST NICU visits	3 [1,4]	2 [1,4]	3 [2,5]	.009

a. No statistics are computed as it was a constant

Discussion

Potential influential factor results overall (N=134)

- More pharmacological intervention and extended NICU stays indicate higher likelihood of referral
 - Connect individuals requiring pharmacologic treatment with nonpharmacologic solutions
 - Medical environment could lead to difficulties in sensory regulation and developmental progression
 - Given preventative protocols in place at ETCH, it is unlikely that additional time was the main causative factor
 - Increased medical complexity and exposure history
 - Extended NICU stay= increase in quantity of ST visits
- Better GWM attendance = greater chance of referral
 - Greater quantity of developmental screenings
- A diagnosis of NAS is positively correlated with referrals
 - Promote increased early screening
- Several factor results with no statistically significant differences between groups
 - Further research: these factors have been noted in previous literature and anecdotally linked to later therapy services

Potential influential factor results attended GWM at least once (N=100)

Decrease in statistically significant findings:

- Smaller sample size = less results of significance
 - Many individuals in the no referral group never attended the GWM clinic
- Statistically significant positive correlation with therapy referral
- Extended NICU stay

Drug exposure results overall and attended GWM at least once

- Maternal gabapentin use may increase likelihood of developmental delays and potential sensory deficits
- Polysubstance use was common which poses a challenge to pinpointing the degree of harm caused by various drugs

Therapy referral results overall (N=134)

- Difference in rate of referral among varying disciplines outlines the most common deficits
- HHOT and OPOT = sensory deficits and play/developmental delays in gross and fine motor skills
 - No HHPT or HHST
 - Deficits leading to these referrals are less apparent or absent in early stages.
- OPPT referrals indicate delayed motor milestones
- OPST referrals indicate delayed communicative milestones, both expressive and receptive.

Therapy referral results attended GWM at least once (N=100)

- Increased rate of referral among all referred therapies
 - Highlights the importance of GWM attendance for early screening and subsequent treatment

Limitations

- Small sample size
- One specific healthcare facility in one geographic region
- COVID impacted the regularly scheduled weekly in-person clinics (nine clinics were only offered through telemedicine)
 - Many appointment delays

Implications/Conclusion

- Contributes to existing body of knowledge
- Certain factors were determined to indicate a future need and subsequent referral for therapy services after intrauterine drug exposure. This includes the following: maternal diagnosis of depression, pharmacological treatment with phenobarbital, clonidine, and morphine, kinship guardian at discharge, an extended stay in the NICU, a greater quantity of speech therapy visits in the NICU, a higher attendance in GWM, and intrauterine exposure to gabapentin.
- There is a need for early rehabilitation services, especially: HHOT, OPOT, OPPT, and OPST.
- Goal remains: Alter malleable factors and connect children with supportive services early on in order to positively impact trajectory of development in individuals with a history of intrauterine drug exposure.

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References available upon request