Health And Child Development Risk Conditions: An Analysis of High-Risk Children in A Specialized Care Outpatient Clinic

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Abstract

Objective: To describe the clinical and epidemiological characteristics of children seen at a high-risk outpatient clinic, report the reasons for referral to the service, the outcomes, and elucidate the importance of specialized care for children at risk provided by public health in Brazil. Method: A descriptive, quantitative, cross-sectional retrospective study that identified the clinical-epidemiological characteristics of children under 12 months of age who started care between January/2017 and December/2018 in a specialized outpatient clinic for high-risk children. Data were collected from electronic medical records and analyzed using Microsoft Excel 2013, while for statistical tests of association, calculation of the odds ratio and confidence interval (95%) the software RStudio (1.4.1103) was used. Results: Of the 246 children seen, 53.66% were male, 76.42% Caucasian, 33.62% premature, 54.73% had low/insufficient weight. At the first consultation 79.67% were less than six months old and 58.54% were eutrophic. The main reasons for referral were prematurity (26.89%), suspected congenital infection (15.53%) and nutritional/gastrointestinal disorders (14.77%). Syphilis stood out among congenital infections with 63.41%. As for the outcome, 62.28% were lost to follow-up, and the use of breast milk was a protective factor for this outcome (OR:0.49; CI:0.26-0.92; p=0.03). Conclusions: The reasons for referral to the high-risk outpatient clinic, evidenced in this study, point to the importance of preventing prematurity, controlling congenital infections, and actions to strengthen the practice of breastfeeding in children under

6 months of age, since it has proven to be a protective factor against loss to follow-up in specialized services.

Keywords: Comprehensive Health Care; Child Development; Risk Factors; Loss to Follow-up; Child Health Services.

1. Introduction

Due to medical advances and the efforts of primary health care, there was a significant reduction in infant mortality rate in children aged zero to five years in Brazil and worldwide. (Araújo et al., 2014). This decrease corroborates the greater survival of high-risk children, who have a greater chance of complications, complications and developmental changes and, therefore, require specialized health care that ensures multidisciplinary care able to manage clinical conditions and maintain their developmental capacity preserved. (França & Lansky, 2016).

The public health services that perform these functions in Brazil are the specialized outpatient clinics, which provide care for high-risk children registered with the Sistema Universal de Saúde (SUS), one of the largest and most complex public health organizations in the world, which provides health care for the individual from before birth to end-of-life care. (Paraná, 2018).

Considering the variety of factors that can bring risks to children's health, it is important that specialized outpatient clinics, also known as secondary care clinics, recognize these conditions and the barriers to adequate childhood development in order to direct the care plan towards prevention, health promotion, and early identification of atypical development. (Feitosa et al., 2018).

This research aims to describe the clinical and epidemiological characteristics of children under 12 months of age referred to a high-risk outpatient clinic in Paraná, report the reasons for referral to the service, the outcomes at the end of follow-up, and elucidate the importance of specialized care for children at risk provided by Public Health in Brazil.

2. Methods

This is a descriptive, quantitative, retrospective cross-sectional study, which conducted a survey of the clinical and epidemiological characteristics of children seen at a reference outpatient clinic for high-risk children in western Paraná, analyzing the medical records of children under 12 months of age who began receiving care between January 1, 2017 to December 31, 2018.

The research project was approved by the ethics committee of the health sciences sector of the Federal University of Paraná, under protocol: 28798920.7.0000.0102.

The children's medical records were selected through filters in the electronic medical record system of the service and epidemiological (race, gender, origin and age at first consultation) and clinical (gestational age, type of delivery, Apgar score (1st and 5th minute), weight, length and head circumference at birth and nutritional status at first consultation) variables were studied, in addition to the reason for referral to the outpatient clinic, outcomes and length of stay in the service (children who continued in follow-up after the cut-off of the studied period were excluded from this calculation).

For the classification of gestational age, the division proposed by Oliveira (2017) was used: post-term (greater than or equal to 42 weeks), full-term (37 to 41 weeks), late preterm (34 to 36 weeks), early preterm (28 to 33 weeks), and extreme preterm (< 28 weeks). The World Health Organization criteria for birth weight were: low weight (< 2500g), underweight (2500g to 2999g), appropriate weight (3000g to 3999g), and overweight (> 4000g). The Apgar score was classified according to the Ministry of Health as severe (1 to 2), moderate degree (3 to 4), mild difficulty (5 to 7), and excellent (8 to 10).

Data were collected using a collection instrument developed for the study in a binder format and organized into tables using the Microsoft Excel 2013 program. The qualitative data were organized into tables, graphs and calculated the means and simple frequencies. While data of quantitative nature were analyzed from measures of central tendency and measures of dispersion and variability.

Statistical tests of association, calculation of the odds ratio and confidence interval (95%) of this parameter were performed in RStudio software, version 1.4.1103. Fisher's test was used to determine the p value in associations involving frequency difference between groups.

3. Results

We identified 246 children under one year of age who initiated care between January 1, 2017 and December 31, 2018 in the high-risk outpatient clinic studied. Of these, 53.66% were male and 46.34% were female. Regarding ethnicity, there was a prevalence of white race (76.42%), followed by brown (17.89%), black (5.28%) and indigenous (0.41%).

Of the 189 children with delivery data, 66.14% had a cesarean delivery, and of the 233 gestational age records, 33.62% were preterm children (Table 1). Among the 18 cities belonging to the coverage territory of the Health Regional Office in which the outpatient clinic studied is a reference, only one city had no record of consultation.

Table 1: Gestational age, birth weight, Apgar score at the 1st and 5th minute, length and head circumference of children referred to a secondary care center between the years 2017 and 2018.

INTERVALS				n	%
Gestational Age (n=233) - Mean +/- SD (37.115 +/- 2.834)					
Post-term	Greater than or equal to	a	42	1	0,43
Term	37	|--	42	156	66,95
Late preterm	34	|--	37	48	20,60
Early preterm	28	|--	34	25	11,73
Extreme premature	Minor	which	28	3	1,29
Birth weight (n=243)- Mean +/- SD (2868.391g +/- 736.4607)					
Overweight	4000	or	more	10	4,12
Appropriate weight	3000	|--	3999	100	41,15
Insufficient weight	2500	|--	2999	66	27,16
Low weight	1500	|--	2500	67	27,57
Apgar 1st minute (n=233)- Mean +/- SD (7.974 +/- 1.779)					

Grave	1	|--	3	7	3,00
Moderate Grade	3	|--	5	11	4,72
Mild difficulty	5	|--	8	28	12,02
Great	8	|--	10	187	80
Apgar 5th minute (n=233)- Mean +/- SD (9.206 +/- 1.146)					
Moderate Grade	3	|--	5	3	1,29
Mild difficulty	5	|--	8	15	6,44
Great	8	|--|	10	215	92
Length (n=150)- Mean +/- SD (46,65 +/- 3,906)					
Cephalic Perimeter (n=127)- Mean +/- SD (33,28 +/- 3,228)					

Source: Authors (2021)

Of the 246 study participants, 229 (93.08%) had only one reason for referral, while 17 had two or more reasons for being referred to the service. The seven main reasons for referral cited are distributed according to Figure 1, while the other eight reasons were: signs of infection (3.03%), some altered neonatal screening test (2.27%), low birth weight not related to prematurity (2.27%), neurological disorders (1.89%), congenital malformation (1.89%), low Apgar at birth (1.52%), perinatal disorders (1.14%) and altered neuropsychomotor development (1.14%).
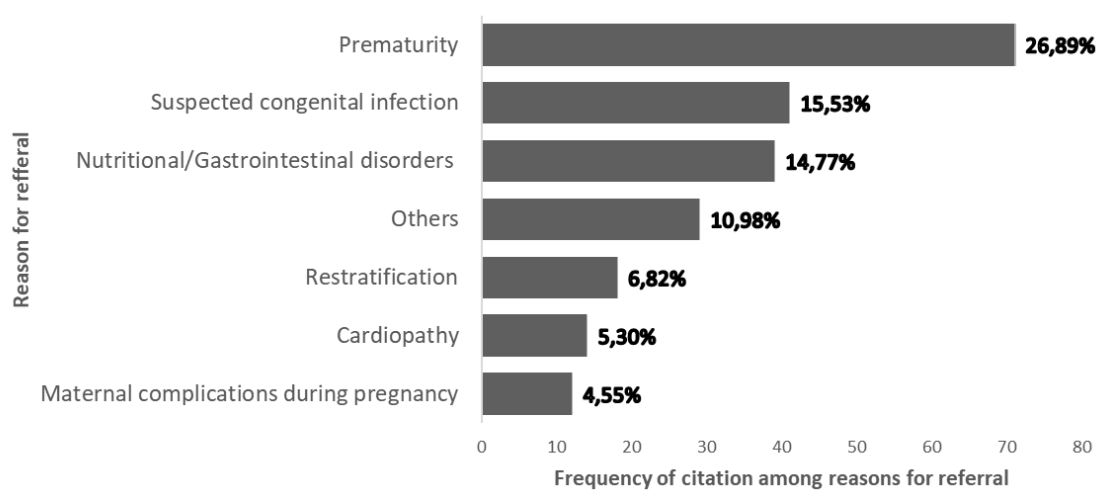
Figure 1: Main complications distributed according to the absolute and relative frequency in which they were mentioned among the reasons for referral to the secondary care center between the years 2017 and 2018. **Source:** Authors (2021).

Among the suspected congenital infections, syphilis was the most common (63.41%), followed by toxoplasmosis (21.95%) and Human Immunodeficiency Virus (12.19%). As for nutritional/gastrointestinal disorders, low weight (9) and difficulty in weight gain (7) stood out.

In the two years observed, 983 consultations were performed, with a minimum number of one and a maximum of 13 consultations per child. The youngest child attended was six days old and the oldest 12 months old (Table 2), due to the inclusion criteria defined by this study.

Table 2: Age and nutritional status at the first consultation of children referred to a secondary care center between the years 2017 and 2018.

	n	%
Age at first consultation (n=246)		
From six days to 30 days	42	17,07
More than one month to 3 months	82	33,33
More than 3 months to 6 months	72	29,27
Over 6 months to 12 months	50	20,33
Nutritional status by BMI ᵃ(n=246)		
Eutrophy	144	58,54
Thinness	36	14,63
Risk of overweight	30	12,20
Not informed	18	7,32
Overweight	9	3,66
Severe thinness	6	2,44
Obesity	3	1,22

[a] As described in the medical record

Source: Authors (2021)

As for the length of stay in the service, 41.91% had follow-up between one day and three months, 18.26% from more than three months to six months, 30.29% from six months to one year, and 9.54% remained in care for more than one year. In addition, all children had multidisciplinary follow-up, with 63.82% of children being followed-up with all professionals of multidisciplinary care of this service (pediatrician, nurse, social worker, nutritionist, and psychologist).

Of the sample, 18 children were restratified in the first visit due to an error in the referral criteria and therefore were not considered regarding the outcome, 62.28% had as final outcome the loss of follow-up, 33.33% were discharged, five children were referred to another service and five were still in follow-up when data were collected.

Table 3 contains the analysis regarding the protective or risk character for loss to follow-up among the clinical variables evaluated in this study in the comparison between the group that abandoned follow-up and the children who were discharged from the service.

Table 3: Evaluation of factors involved in loss to follow-up of children referred to a secondary care center between the years 2017 to 2018.

	Loss		High		Grand total		OR	95% CI	p-value
Reason for referral (n=218)	n	%	n	%	n	%			
Nutritional Disorder	21	67,7%	10	32,3%	31	14,2%	2,94	0,75 – 11,60	0,17
Maternal complications	5	41,7%	7	58,3%	12	5,5%		Reference	
Other	43	70,5%	18	29,5%	61	28,0%	3,34	0,94 – 11,94	0,09

Prematurity and/or Low Weight	49	67,1%	24	32,9%	73	33,5%	2,86	0,82 – 9,95	0,11
Suspected Congenital Infection	24	58,5%	17	41,5%	41	18,8%	1,98	0,54 – 7,29	0,34
Race (n=218)									
White	114	67,5%	55	32,5%	169	77,5%	1,55	0,81 – 2,98	0,23
No White	28	57,1%	21	42,9%	49	22,5%		Reference	
Gender (n=218)									
Female	64	61,5%	40	38,5%	104	47,7%		Reference	
Male	78	68,4%	36	31,6%	114	52,3%	1,35	0,77 - 2,37	0,32
Origin (n=218)									
City of the outpatient clinic	67	63,2%	39	36,8%	106	48,6%		Reference	
Other Municipalities	75	67,0%	37	33,0%	112	51,4%	1,18	0,68 – 2,06	0,57
Gestational Age (n=206)									
Preterm Early	17	63,0%	10	37,0%	27	13,1%	1,00	0,42 – 2,35	1
Preterm Late	35	72,9%	13	27,1%	48	23,3%	1,58	0,76 – 3,27	0,29
Term	82	63,1%	48	36,9%	130	63,1%		Reference	
Post-term	0	0%	1	100%	1	0,5%	0,20*	0,01 – 4,91 [a]	0,14
Birth weight (n=215)									
Low or insufficient birth weight	44	68,8%	20	31,3%	64	29,8%	1,29	0,68 – 2,41	0,53
Suitable	89	63,1%	52	36,9%	141	65,6%		Reference	
Excess birth weight	6	60,0%	4	40,0%	10	4,7%	0,88	0,24 – 3,25	1
Apgar 1st minute (n=218)									
Not great [b]	36	65,5%	19	34,5%	55	25,2%	1,02	0,54 – 1,94	1
Great	106	65,0%	57	35,0%	163	74,8%		Reference	
Apgar score 5th minute (n=207)									
Not great [b]	14	77,8%	4	22,2%	18	8,7%	1,92	0,61 – 6,07	0,31
Great	122	64,6%	67	35,4%	189	91,3%		Reference	
Length of Stay (n=218)									
Less than one month	23	62,2%	14	37,8%	37	17,0%	0,71	0,28 – 1,80	0,49
Between one and three months	46	61,3%	29	38,7%	75	34,4%	0,69	0,31 – 1,53	0,43
Between three and six months	43	68,3%	20	31,7%	63	28,9%	0,93	0,40 – 2,16	1
Longer than six months	30	69,8%	13	30,2%	43	19,7%		Reference	
Nutritional status at the first consultation (n=202)									
Eutrofic	87	69,0%	39	31,0%	126	62,4%		Reference	

Non Eutrofic	45	59,2%	31	40,8%	76	37,6%	0,65	0,36 – 1,18	0,17
Use of breast milk (n=218)									
No	55	75,3%	18	24,7%	73	33,5%		Reference	
Yes	87	60,0%	58	40,0%	145	66,5%	0,49	0,26 – 0,92	0,03
Type of delivery (n=168)									
Normal	38	67,9%	18	32,1%	56	33,3%		Reference	
Cesarean section	68	60,7%	44	39,3%	112	66,7%	0,73	0,37 – 1,44	0,40

[a]Haldane-Anscombe correction

[b]Not optimal: severe grade, moderate grade and mild difficulty

Source: Authors (2021)

Of the variables analyzed in Table 3 by the association test, only the use of breast milk, exclusively or not, was statistically significant (p=0.03), indicating it as a protective factor for the outcome loss to follow-up.

4. Discussion

Of the 246 children in the sample, most were male (53.66%) and white (76.42%) in accordance with the characteristics found in live births in Paraná from 2016 to 2018. (Brasil, 2020). The surgical route was the type of delivery with the highest number of records (66.14%), well above the maximum percentage of 15% recommended by the World Health Organization. (WHO, 2015). This number reflects the high rate of cesarean sections in the country, which accumulated 56.30% in 2019 (Brasil, 2020), also considered alarming at the global level and may be related to the significant percentage of preterm births (32.62%) found in this study. (Boerma et al., 2018).

Vidal et al. (2020) in a study that investigated the barriers to the implementation of recommendations for normal birth in Brazil defined that the three main difficulties were linked to the training and professional experience of doctors, the social culture and issues associated with management and policy. This highlights the importance of disseminating information regarding the birth route, its indications, risks, and benefits (Mascarello et al., 2017), not only among health professionals, but also to the population and the political sector, in order to implement public health strategies.

The significant percentage of preterm births (32.62%) and low birth weight (27.57%) is justified because, in addition to prematurity being the cause of 70% of neonatal mortality, it is associated with long-term complications, being responsible for 50% of late neurological disorders in newborns. (Sandeva & Uchikova, 2016). Premature or low birth weight children also present a higher risk of delayed or impaired motor and cognitive development in childhood and adolescence. (Feitosa et al., 2018).

Heidemann and collaborators (2019), when studying premature children with birth weight less than 1500g, evidenced a prevalence of 15.1% of metabolic syndrome at two years of age (age corrected). Still in that study, arterial hypertension was found in 57.7% of the 214 children studied, while HDL less than or equal to 40 mg/dl (29.2%), hypertriglycemia (22.6%), high abdominal circumference (18.8%), and hyperglycemia (3.7%) were reported in smaller numbers. (Heidemann et al., 2019). Low birth weight and

prematurity also influence economically, as they can increase social, educational, medical service and productivity costs when adults. (Tongo et al., 2009). Thus, the high rate of premature children found in this study draws attention to the need not only for immediate support, but also for health, educational and socioeconomic strategies.

As for the Apgar score, 19.74% of the evaluated children had a non-optimal index in the first minute, and 3% of these were classified as severe. At the fifth minute only 7.73% of children had a non-optimal index and no Apgar score was classified as severe. The fifth minute is the best predictor of long-term neonatal survival, and the low index in this minute has a strong association with the risk of neonatal and infant death. (Iliodromiti et al., 2014). According to a research, of a sample of 154 newborns with Apgar score less than or equal to three in the first minute, submitted to initial resuscitation maneuvers, 64.3% achieved improvement of the Apgar score in the fifth minute. (Bouzada et al., 2018) The significant improvement in the scale between the first and fifth minutes reinforces the importance of delivery room care to the newborn by a pediatrician as a measure to prevent neonatal mortality and long-term sequelae.

In the two years observed, 983 consultations were performed, encompassing 17 of the 18 cities covered by the Health Regional Office in which the outpatient clinic studied is a reference, (Brasil, 1997) thus complying with the principle of regionalization and expansion of secondary care services to citizens.

Among the children who were followed-up at the outpatient clinic, the main reason for referral was associated with prematurity and low weight, possibly due to the need to assess neuropsychomotor development, sequelae and intercurrences related to premature birth. In addition to early consequences, premature birth has late impacts involving specific physical complications such as visual and hearing impairment, chronic lung disease of prematurity, cardiovascular problems, neurological and behavioral impairments, which explains the need for long outpatient follow-up for these children. (Sociedade Brasileira de Pediatria, 2012). For example, the low pulmonary function of premature infants at birth persists with considerable reduction even when the child reaches six years of age, showing that normalization of pulmonary aspects is difficult and requires long follow-up. (Friedrich, 2018).

Due to technological development, there has been a decrease in early complications related to prematurity in recent years, as well as an increase in survival for increasingly premature children.18 The decrease in early mortality has accentuated the need for outpatient clinics trained for the continuous follow-up of the child due to the risk of later complications, management of sequelae and stimulation of development (Passini et al., 2010), especially when considering that gestational age below 37 weeks is one of the greatest recorded causes of disability in developing countries. (Mascarello et al., 2017).

Low birth weight and premature newborns are also more susceptible to hyaline membrane disease, bronchopulmonary dysplasia, pneumonias and pulmonary malformations, besides other respiratory complications. (Kliegman et al., 2017). In addition, a higher prevalence of neurological and hematological disorders (anemia), metabolic alterations, an important immunological susceptibility, and ophthalmological and hearing anomalies are expected in these children. (Oliveira, 2017). Neuropsychomotor development is also a frequently altered target in this population, therefore, a more emphatic follow-up can ensure early detection and action on neuromotor variations that will directly impact the development of these patients. (Rosa Neto et al., 2006). Thus, preterm birth should draw attention to an organization in the Health Care Networks in search of expanding and consolidating multiprofessional outpatient clinics in secondary care,

such as the one described in this study, in order to meet the continuous complex health demands required by preterm-born children.

Congenital infections were the second highest among the reasons for consultation to the outpatient clinic, especially suspected fetal exposure to maternal syphilis. The cases of congenital syphilis have shown expressive increase in Brazil, especially in recent years, the rates increased from 2.0 cases/1,000 live births in 2006, to 8.2 cases/1,000 live births in 2019 (Brasil, 2020), which may explain the high number of children with this suspicion in the evaluated outpatient clinic. Besides the high prevalence, the follow-up of children exposed to syphilis is complex and requires an adequate follow-up service to ensure the effectiveness of care (Rojas, 2018), this is because, to monitor the onset of symptoms, the child exposed to syphilis, even if treated, should have monthly consultations until the 6th month of life, bimonthly from the 6th to the 12th and biannually until the 24th month. (Brasil, 2020).

The high percentage of multiprofessional consultations found is important because an adequate follow-up not only influences the child's evolution but also positively impacts the family structure, since parents of children with atypical development need more emotional, financial, and social support. (Lakshmanan et al., 2017).

As for the outcome, 142 children left the service due to loss of follow-up, showing a weakness in the follow-up of these patients. According to Feliz and collaborators (2016), follow-up outpatient clinics, such as the one studied, have difficulty in maintaining adequate follow-up even if the indications are well established. Most children (58.09%) had a length of stay longer than three months, which is consistent with the need for prolonged follow-up in most diseases or complications that pose risk to the child. (Brasil, 2020).

This perception of the need for supervision of child development, especially when there is associated risk, is current and, despite its clear importance, is associated with historical difficulties that still interfere socially and culturally for the loss of follow-up. This culture of care is weakened because only between 1937 and 1945, the first state program for the protection of childhood, maternity and adolescence (Brasil, 2011) appeared and the perception that children should be monitored during the phases of their development and growth was only triggered for public action around 1980, when the Ministry of Health created the Program of Integral Assistance to Women and Children's Health (PAISMC). (Araújo et al., 2014). However, only four years later children's health was less linked to that of the mother and received specific attention. (Brasil, 2011). Thus, the perception of the child in the social environment during history was closely linked to the health provided to this population, i.e., no aid was promoted to the child that differed from the biomedical model based on curative medicine, and that such essential vision of prevention, health promotion and intense assistance to development was established only when the Federal Constitution (1988) instituted basic rights as full health privilege and preventive and care measures. (Brasil, 1988).

Other factors may also contribute to the high number of dropouts found in this study, which is consistent with the dropout rate found in other studies. (Frônio et al., 2010). In this study, through the analyses shown in Table 3, the use of breast milk, exclusively or not, was presented as a protective factor (OR:0.49; CI:0.26-0.92; p=0.03) to avoid the outcome loss to follow-up. This protective association can be explained by the affective bond that is created between mother and child during breastfeeding that may reflect in greater concern and care in keeping the appointments at the specialty outpatient clinic, because

previous research has shown that the non-recognition of the importance of follow-up by parents is a cause of dropout. (Frônio et al., 2010). In addition, it is a reality that mothers with very demanding and rigid labor bonds, and without a consolidated family support network, have difficulty maintaining breastfeeding, which can also culminate in the difficulty in maintaining the long-term follow-up of outpatient consultations. (Frônio et al., 2010; Diniz et al., 2019).

There are also other factors not addressed by this research that may be related to low adherence to outpatient consultations, such as social conditions, the organization of the service, the socioeconomic reality, difficulties in public transportation, and the distance to the health service. (Diniz et al., 2019). Recognizing the factors that negatively influence the continuity of the child's follow-up, but also those that strengthen the bond with the service, are guiding strategies in the search for minimizing this problem in order to ensure adequate follow-up.

5. Conclusion

We conclude from this study that among the 246 children under one year of age attended at the high-risk outpatient clinic studied, there is an expressive number of preterm newborns (33.62%) and low or insufficient birth weight (54.73%), which highlights the relationship between these factors and the risk of clinical complications, resulting in losses in the development of these children. This study also highlighted the importance of secondary services for attention to risk conditions, as it showed that 92.68% of the children referred actually needed this follow-up, and the main reasons for entering the service were prematurity (26.89%), suspected congenital infection (15.53%) and nutritional and gastrointestinal disorders (14.77%). The service also provided longevity in the follow-up of more than three months for 58.09% of the sample and multi-professional care to all children who were followed up. This research also found an expressive number of loss to follow-up that was related to not using breast milk at the first visit to the service; however, further studies are needed to assess family and socioeconomic issues in order to encompass all the factors that can lead to discontinuation of follow-up. Therefore, it is noteworthy that the reasons for referral to the high-risk outpatient clinic evidenced in this study point to the importance of preventing prematurity, the need for more efforts to control congenital infections and actions to strengthen the practice of breastfeeding in children under 6 months of age, since it resulted as a protective factor against loss of follow-up in the specialized service.

6. Acknowledgement

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