ORIGINAL ARTICLE

The Spectrum of Neonatal Disorders Managed at the University Hospital of the West Indies over the Past Two Decades

H Trotman, O Olugbuyi

ABSTRACT

Objective: *To define the spectrum of medical disorders managed on the neonatal unit at the University Hospital of the West Indies (UHWI) over the past two decades.*
Method: *A review of published data pertaining to neonatal medical disorders managed at the UHWI over the past 20 years was conducted. Pertinent findings, implications of these findings and recommendations based on these findings were collated and presented under themes.*
Results: *Common medical disorders managed includes complications of prematurity and very low birthweight infants, neonatal sepsis, hypoxic ischaemic encephalopathy, meconium aspiration syndrome, neonatal jaundice, hypernatraemic dehydration, complications of macrosomia and complications resulting from neonatal transport.*
Conclusion: *It is clear that a diverse spectrum of neonatal disorders is managed on the neonatal unit of the UHWI and that the fledgling neonatal unit providing basic care for neonates of the 1960s has matured into the level II Newborn Special Care Nursery and Level III NICU that it is today. The time is now opportune for Neonatology to gain independent status as a Division of Neonatology within the Department of Child and Adolescent Health at the UHWI.*

Keywords: Neonatal conditions, neonatal disorders

El Espectro de los Trastornos Neonatales Tratados en el Hospital Universitario de West Indies Durante las dos últimas Décadas

H Trotman, O Olugbuyi

RESUMEN

Objetivo: *Definir el espectro de trastornos médicos tratados en la Unidad Neonatal del Hospital Universitario de West Indies (UHWI) en las últimas dos décadas.*
Método: *Se realizó una revisión de los datos publicados sobre los trastornos médicos neonatales tratados en UHWI durante los últimos 20 años. Los hallazgos pertinentes, las implicaciones de estos hallazgos y las recomendaciones basadas en estos hallazgos fueron recopiladas y presentadas en temas.*
Resultados: *Los trastornos médicos comunes tratados incluyen complicaciones de la prematuridad y los neonatos de muy bajo peso al nacer, sepsis neonatal, encefalopatía isquémica, síndrome de aspiración de meconio, ictericia neonatal, deshidratación hipernatrémica, complicaciones de macrosomía y las complicaciones resultantes del transporte neonatal.*

From: Department of Child and Adolescent Health, The University of the West Indies, Mona, St Andrew, Jamaica.

Correspondence: Dr H Trotman, Department of Child and Adolescent Health, The University of the West Indies, Mona, St Andrew, Jamaica. Email: helen.trotmanedwards@uwimona.edu.j

 DOI: 10.7727/wimj.2018.174

Conclusión: *Está claro que un espectro diverso de trastornos neonatales es tratado en la Unidad Neonatal de UHWI, y que la unidad neonatal incipiente que proporcionó atención básica a los neonatos de los años 60 ha madurado, llegando a ser hoy la Sala de Atención Especial a Neonatos de Nivel II y la Unidad de Cuidados Intensivos Neonatales (UCIN) de Nivel III. Es hora ya de que la Neonatología tenga estatus independiente como División de Neonatología dentro del Departamento de Salud de Niños y Adolescentes de UHWI.*

Palabras clave: Afecciones neonatales, trastornos neonatales

West Indian Med J 2018; 67 (5): 405

INTRODUCTION

The Newborn Special Care Nursery (NSCN) of the University Hospital of the West Indies (UHWI) had its embryonic beginning in 1961 in a small room on the Maternity ward providing basic care for neonates. It grew into infancy in 1963 when it was moved to its present location as a 40 bassinet unit on the second floor of an expanded Obstetrics and Gynaecology Unit. During its childhood years it was refurbished in 1985 and it matured and came of age with the major refurbishment done in 2001 which resulted in a neonatal unit consisting of a 30-bed level II Newborn Special Care Nursery and a six-bed Neonatal Intensive Care Unit (NICU).

In 1963, a total of 33 neonates were admitted to the NSCN, the main reason for admission was prematurity/hyaline membrane disease/atelectasis, 24 (72%). In 1973, a total of 364 neonates were admitted to the NSCU. Lowry reported that the NSCU served mainly babies born at the UHWI and operated at 50% occupancy. The medical staff consisted of two house officers, a resident and a Consultant (1). The premature infants with respiratory distress syndrome (RDS) still remained a common cause for admission but jaundiced infants and growth retarded infants were also now being managed on the unit (1).

In the ensuing decades, total annual admissions to the NSCN steadily increased to over 700, (1987–569, 1996–773, 2005–735) but in recent years the trend is downward (2011–667, 2017–456) commensurate with the declining numbers of live births at the institution. Prematurity and its complications however, remains the main reason for admission to the neonatal unit. Lowry suggested that at that time the UHWI was not disseminating its expertise in neonatal care to the wider community and that the way forward for the NSCN was to act as a referral centre for other Maternity units (1). He also suggested that a robust transport system be developed to maintain viability of transported neonates (1). Today the neonatal unit accepts referrals island-wide from public and private institutions, private paediatricians as well as occasionally from other Caribbean Islands, additionally some of these transfers occur *in utero*. Three consultants, two of whom have specialist training in neonatology oversee the medical management of admitted neonates and doctors in the paediatric residency programme rotate through the unit every three months.

SUBJECT AND METHODS

This paper defines the spectrum of medical disorders managed on the neonatal unit at the UHWI over the past two decades. A review of published data pertaining to neonatal disorders managed at the UHWI over the past 20 years was conducted. Pertinent findings, implications of these findings and recommendations based on these findings were collated and presented under themes.

RESULTS

The pre-term very low birthweight infant

Trotman conducted a retrospective review of mortality of 1371 very low birthweight infants (VLBW; < 1500 g) over four decades (2). Survival increased with increasing birthweight. Mortality decreased from 54% to 38% over the time period, decrease in mortality was far greater for infants weighing 1001–1500 g (40%) than those weighing ≤ 1000 g (28%). Despite increased access to mechanical ventilation, no appreciable decrease in mortality occurred for infants weighing ≤ 750 g. Trotman concluded that to attain a further fall in mortality of very low birthweight infants at the UHWI measures aimed at increasing access to parenteral nutrition and to surfactant as well as decreasing mortality of infants weighing ≤ 750 g were required (2).

Trotman and Lord in evaluating the outcome of 118 VLBW infants found that use of prenatal steroids was an independent predictor of survival they concluded that prenatal steroids was a simple but effective clinical intervention that could be implemented in developing countries to decrease mortality (3). Gooden *et al*

found that birthweight was the best predictor of mortality in 109 VLBW at the UHWI. They suggested that in resource poor settings where mortality is high there may be no benefit in the addition of other variables to birthweight in predicting outcome (4).

Trotman and Barton's retrospective review of the outcome of 250 VLBW infants (1999–2003) found respiratory failure secondary to RDS as the main cause of mortality followed by sepsis (5). Similarly, Gooden *et al* noted that RDS (45%) and sepsis (21%) were the commonest causes of mortality in 109 VLBW infants (4).

The late pre-term infant (34–36 completed weeks gestation)

McLean and Trotman conducted a retrospective, descriptive, case controlled study to determine the outcome of 163 late pre-term infants at the UHWI over a two-year period (6). They reported an overall incidence of 3.8% and that late pre-term infants were more likely to require admission to the neonatal unit than term controls (O.R.13.6, CI 7.95, 23.34, $p < 0.001$). Additionally, late pre- term infants had a longer mean duration of hospital stay and a significantly higher incidence of hypothermia, neonatal jaundice and need for respiratory support than term controls ($p < 0.05$). However, there was no increased mortality risk. They postulated that there was a need for more judicious obstetric intervention in the timing of delivery of these infants and also more intensive monitoring of the infants on the postnatal ward and the neonatal unit (6).

The infant requiring ventilatory support

Trotman *et al* in a 15-year retrospective review (1997–2001) of 153 neonates ventilated in the main ICU of the UHWI and Trotman in reviewing the NICU first few years' experience from 2001–2004 found that RDS seen in VLBW infants was the predominant reason for ventilator support (7, 8).

Hamilton and Trotman in a 10-year retrospective descriptive study at the UHWI found that only 13% of neonates with RDS received surfactant therapy. The median time of surfactant administration was 16.5 hours (IQR 6–37 hours). Challenges encountered in optimizing SRT included affordability and accessibility of surfactant, supportive equipment and therapies, as well as a high incidence of complications related to prematurity (9).

The infant born to women with pre-eclampsia

McKenzie and Trotman conducted a retrospective case control study comparing the outcome of 114 babies born to women with pre-eclampsia with 104 born to normotensive women at the UHWI over a twenty-month period (10). Neonates of women with pre-eclampsia were more likely to be low birthweight (O.R. 2.8; CI 2.2, 3.5), small for gestational age (O.R. 2.3; CI 1.9, 2.9) or premature (O.R. 2.5; CI 2.0, 3.0). They were also more likely to be admitted to the neonatal unit and to die. The authors suggested that optimizing obstetric and neonatal care at the UHWI would be essential to decrease morbidity and mortality in these neonates (10).

The infant born to women of advanced maternal age

Johnson-Harrison and Trotman conducted a matched retrospective cohort study of the outcome of 198 babies born to women ≥ 40 years and 208 control babies born to women aged 20–30 years at the UHWI over a two-year period (11). Women ≥ 40 years were more likely to be delivered *via* Caesarean section than their younger counterparts (O.R. 3.1; CI 2.1, 4.8). The study found no difference in the proportion of pre-term or low birthweight infants, neonates with a low five minute Apgar score < 7, neonates admitted or neonates who died between women ≥ 40 years and their younger counterparts ($p > 0.05$). The authors concluded that although women 40 years and over were at increased risk of having an operative delivery no adverse neonatal outcome was noted (11).

The infant with sepsis

Bell *et al* documented an incidence of sepsis of 6.7/1000 live births and a case fatality rate of 6.7% in a five-year retrospective review of 135 neonates with culture proven sepsis admitted to the UHWI. *Klebsiella sp* (28%) was the commonest isolate, 46% of which showed resistance to gentamicin and 18% showed a multiple antibiotic resistant pattern. They recommended that empiric antibiotic regimes for gram-negative sepsis at the UHWI must take into consideration the high prevalence rates of gentamicin resistance (12).

In exploring predictors of outcome in neonates with bacterial sepsis, these authors found that prematurity, very low birthweight and female gender were predictors of poor outcome (13). They therefore, suggested that strategies aimed at decreasing morbidity and mortality in neonates with sepsis must include measures that will decrease the incidence of prematurity and low birthweight (13). Following analysis of a subgroup of 51 neonates with urinary tract infection (UTI), Bell *et al* found that UTI was an important cause of serious bacterial infection affecting one in three infants with proven

bacterial infection and that it may be the first indicator of underlying structural renal abnormalities (14). They recommended that the absence of specific clinical features made it necessary to include urine cultures in the sepsis evaluation of neonates presenting with symptoms suggestive of sepsis (14).

Trotman and Bell in a five-year retrospective review of sepsis in VLBW infants found that nosocomial infections (64%) was a major cause of sepsis and *Klebsiella sp* (37%) was the predominant isolate. They concluded that strategies aimed at prevention, such as limiting the excessive use of broad-spectrum empiric antibiotics and the periodic review and continuous reinforcement of infection control policies will help decrease the mortality and morbidity associated with nosocomial infection in the VLBW infant (15).

Trotman and Bell in a ten-year retrospective review of 29 inborn neonates at the neonatal unit of the UHWI with Group B streptococcal infection found an incidence of 0.91/1000 live births and a case fatality rate of 3.6%. They postulated that further reduction in incidence could be achieved by implementation of measures to prevent perinatal transmission (16).

Duncan documented that 28 neonates, 11 term and 17 pre-term infants were treated for necrotizing enterocolitis (NEC) over a six-year period at the UHWI. There were three deaths among 13 cases of bowel perforation (17). Treatment was in accordance with a management protocol which emphasised aggressive screening of potential cases, early laparotomy for bowel perforation and primary anastomosis after small bowel resection. He concluded that centres in developing countries can achieve rates of survival comparable to those in the developed world in babies with NEC weighing over 1000 g by adopting the UHWI management protocol (17).

The macrosomic infant

Richardson and Trotman in a retrospective, descriptive, case controlled study of 316 macrosomic infants (birthweight ≥ = 4000 grams) at the UHWI over a three-year period (18) documented an incidence of 4.3%. Risk of an operative delivery was significantly increased as was shoulder dystocia and maternal post-partum haemorrhage in macrosomic neonates. These babies were more likely to have respiratory distress at birth and require admission to the neonatal unit $p < 0.05$. The authors concluded that macrosomia contributes significantly to maternal and neonatal morbidity and there needed to be targeted, coordinated perinatal and neonatal measures if these morbidities are to be reduced (18).

These researchers also determined the risk factors for the delivery of macrosomic infants at the UHWI. Maternal obesity, height > 164 cm, abnormalities of glucose control, weight gain > 15 kg, gestational age > 40 weeks and male gender of the infant were found to increase the risk of delivering a macrosomic infant by over two-fold ($p < 0.05$). Having a previous macrosomic infant increased the risk of delivering a macrosomic infant by as much as six-fold (AOR: 6.0, 95% CI: 1.9, 18.7). They recommended that identification of modifiable risk factors for the delivery of macrosomic infants: - (nutritional status at the start of pregnancy, weight gain and glucose control during pregnancy) should inform management protocols and guidelines to help decrease the incidence of macrosomia at UHWI (19).

The infant with hypoxic ischaemic encephalopathy

Garbutt and Trotman's retrospective review of 95 cases of hypoxic ischaemic encephalopathy admitted to the neonatal unit of the UHWI during a six-year period showed an incidence of 6/1000 live births. There was a 13% mortality rate; all non-survivors had Stage 3 encephalopathy. Babies with Stage 3 encephalopathy had increased neurological deficits and more severe end organ damage compared with babies with Stage 2 or Stage 1encephalopathy ($p < 0.05$). The authors concluded that decreasing morbidity and mortality from hypoxic ischaemic encephalopathy would require increased prenatal identification and improved peripartum management of at risk pregnancies (20).

These researchers also found that the stage of encephalopathy, presence of seizures on admission, need for more than one anti-epileptic for seizure control and an abnormal neurological examination at hospital discharge were associated with poor outcome. They recommended that neonates who had an abnormal neurological examination at discharge should be followed up in specialist neurology clinics (21).

The infant with meconium aspiration syndrome

Panton and Trotman's five-year retrospective, descriptive study of 108 inborn neonates with meconium aspiration syndrome admitted to the neonatal unit of the UHWI revealed an incidence of 10 per 1000 live births and a 1% mortality rate. The incidence of MAS seen at the UHWI was similar to that in other resource limited settings; however, the disease spectrum seen was milder with lower morbidity and mortality. Grunting, retrieval of thick meconium from below the cords and low arterial oxygen levels on admission were found to

be independent predictors of disease severity. They postulated that in the future this may assist in stratifying patients by risk early in the management process in an effort to decrease morbidity (22).

The Jaundiced infant

The incidence of clinically significant neonatal jaundice at the UHWI was found to be 4.6% by Henny-Harry and Trotman in a retrospective descriptive study of 170 neonates at the UHWI (22). The aetiology of jaundice was attributed to ABO incompatibility in 35% of infants, infection in 18%, prematurity in 11%, G6PD deficiency in 5%, Rhesus incompatibility 3.5% and no cause was identified in 9% of infants. There was a low incidence 26% of screening for G6PD deficiency although it was the most common aetiology for infants presenting from home (23). In a related study they found G6PD deficiency to be an independent predictor of severe hyperbilurubinaemia (24). From these studies, the authors recommended that to reduce morbidity associated with neonatal jaundice at the UHWI, there should be increased screening for G6PD deficiency and current systems in place for follow-up and monitoring of infants discharged from hospital prior to 72 hours should be expanded and strengthened.

The hypernatraemic dehydrated infant

In a 12-year retrospective review of 24 cases of hypernatraemic dehydration in breast-fed neonates admitted to the UHWI, Trotman *et al* demonstrated complications in 19 (79%) neonates: renal failure 19 (79%), seizures 3(13%) intraventricular haemorrhage 1(4%) and death one [4%] (24). They concluded that in addition to educating healthcare workers and mothers of the advantages of breast-feeding, knowledge of the risk factors and symptoms of this unwanted complication must also be stressed. They also stated that it was important that a system for early review of at-risk-mothers be initiated, ideally three days post discharge, to detect and/or prevent the morbidity and mortality associated with hypernatraemic dehydration (25).

The transported infant

Henry and Trotman conducted a prospective descriptive study of neonates transported to the UHWI over a 15-month period to determine challenges associated with neonatal transport. The most common reason for transfer was for respiratory support, 60%. The most common mode of transport was by road ambulance, 84%. Thirty-four per cent of neonates experienced at least one adverse event during transport. On arrival, 54% of neonates required warming, 84% – fluid resuscitation and 28% 84% – CPR, 36% of the neonates died. The need for CPR on arrival predicted mortality. A lack of appropriate equipment and adequately trained personnel was noted. The authors concluded that ensuring pre-transport stabilization of neonates, the availability of adequately trained staff and the provision of appropriate equipment must be urgently addressed to improve the outcome of neonates transported to the UHWI (26).

CONCLUSION

It is clear that a diverse spectrum of medical disorders is managed in the neonatal unit of the UHWI and that the fledgling neonatal unit providing basic care for neonates of the 1960s has matured into the level II Newborn Special Care Nursery and Level III NICU that it is today. The time is now opportune, for Neonatology to gain independent status as a Division of Neonatology within the Department of Child and Adolescent Health at the UHWI.

Authors contribution

H Trotman conceived the paper, oversaw the data collection, wrote the manuscript and approved the final version. AO Olugbuyi participated in analysis and critical review of the manuscript and approved the final version.

REFERENCES

1. Lowry MF. University Hospital newborn services present and future. West Indian Med J 1974; **23:** 142–44.
2. Trotman H. Review of mortality of very low birthweight infants at the University Hospital of the West Indies over the past four decades. West Indian Med J 2012; **61:** 356–60.
3. Trotman H, Lord C. Predictors of outcome in very low birth weight infants at the University Hospital of the West Indies, Jamaica. Trop Doct 2008; **38:** 183–5.
4. Gooden M, Younger N, Trotman H. What is the best predictor of mortality in a very low birth weight infant population with a high mortality rate in a medical setting with limited resources? Am J Perinatol 2014; **31:** 441–6.
5. Trotman H, Barton M. The impact of the establishment of a neonatal intensive care unit on the outcome of very low birth weight infants at the University Hospital of the West Indies. West Indian Med J 2005; **54:** 297–301.
6. McLean N, Trotman H. Outcome of late preterm infants at the University Hospital of the West Indies. Am J Perinatol 2016; **33:**1365–370.
7. Trotman H, Barton M, Mitchell V. Outcome of neonates ventilated in the main intensive care unit at The University Hospital of the West Indies: a 15-year experience. Trop Doct 2007; **37:** 249–50.
8. Trotman H. The Neonatal Intensive Care Unit at the University Hospital of the West Indies: the first few years experience. West Indian Med J 2006; **55:** 75–79.
9. Hamilton N, Trotman H. challenges faced in translating the benefits of surfactant replacement therapy to a resource-limited setting. Am J Perinatol 2017; **34:** 742–48.
10. McKenzie KA, Trotman H. A retrospective study of neonatal outcome in Pre-eclampsia at the University Hospital of the West Indies: a resource

limited setting. J Trop Pediatr 2018 Mar 24, doi: 10.1093/tropej/fmy014. [Epub ahead of print]
11. Johnson-Harrison T, Trotman H. Neonatal Outcome of Babies Born to Women 40 Years and over at the University Hospital of the West Indies 2012–2013. J Trop Pediatr 2017 Jul 18. doi: 10.1093/tropej/fmx053. [Epub ahead of print]
12. Bell Y, Barton M, Thame MM, Nicholson A, Trotman H. Neonatal sepsis in Jamaican neonates. Ann Trop Paediatr 2005; **25:** 293–96.
13. Bell Y, Barton M, Thame MM, Nicholson A, Trotman H. Predictors of poor outcome in neonates with bacterial sepsis admitted to the University Hospital of the West Indies. West Indian Med J 2006; **55:** 80–84.
14. Barton M, Bell Y, Thame M, Nicholson A, Trotman H. Urinary tract infection in neonates with serious bacterial infections admitted to the University Hospital of the West Indies. West Indian Med J 2008; **57:** 101–5.
15. Trotman H, Bell Y. Bacterial sepsis in very low birth weight infants at the University Hospital of the West Indies. West Indian Med J 2006; **55:** 165–69.
16. Trotman H, Bell Y. Neonatal group B streptococcal infection at the University Hospital of the West Indies, Jamaica: a 10-year experience. Ann Trop Paediatr 2006; **26:** 53–57.
17. Duncan ND. Necrotising enterocolitis: a management protocol for developing countries. West Indian Med J 1999; **48:** 26–8.
18. Richardson C, Trotman H. Outcome of macrosomic infants at the University Hospital of the West Indies. West Indian Med J 2017; **66:** 269–74.
19. Richardson C, Trotman H. Risk Factors for the delivery of macrosomic infants at the University Hospital of the West Indies. Am J Perinatol 2014; **31:** 927–32.
20. Garbutt A, Trotman H. Outcome of neonates with hypoxic ischaemic encephalopathy admitted to the neonatalunit of the University Hospital of the West Indies. Ann Trop Paediatr 2009; **29:** 263–69.
21. Trotman H, Garbutt A. Predictors of outcome of neonates with hypoxic ischaemic encephalopathy admitted to the neonatal unit of the University Hospital of the West Indies. J Trop Pediatr 2011; **57:** 40–4.
22. Panton L, Trotman H. Outcome of neonates with meconium aspiration syndrome at the University Hospital of the West Indies, Jamaica: A Resource-Limited Setting. Am J Perinatol 2017; **34:** 1250–254.
23. Henny-Harry C, Trotman H. Epidemiology of neonatal jaundice at the University Hospital of the West Indies. West Indian Med J 2012; **61:** 37–42.
24. Trotman H, Henny-Harry C. Factors associated with extreme hyperbilirubinaemia in neonates at the University Hospital of the West Indies. Paediatr Int Child Health 2012; **32:** 97–101.
25. Trotman H, Lord C, Barton M, Antoine M. Hypernatremic Dehydration in Jamaican Breast-fed Neonates: an eleven year review in a baby friendly hospital. Ann Trop Paediatr 2004; **24:** 295–300.
26. Henry S, Trotman H. Challenges in neonatal transport in Jamaica: a resource-limited setting. J Trop Pediatr 2017; **63:** 307–13.