Author/s:
Tosif, S;Nasi, T;Gray, A;Sadr-Azodi, N;Ogaoga, D;Duke, T

Title:
Assessment of the quality of neonatal care in the Solomon Islands

Date:
2018-02-01

Citation:
Tosif, S., Nasi, T., Gray, A., Sadr-Azodi, N., Ogaoga, D. & Duke, T. (2018). Assessment of the quality of neonatal care in the Solomon Islands. Journal of Paediatrics and Child Health, 54 (2), pp.165-171. https://doi.org/10.1111/jpc.13686.

Persistent Link:
https://hdl.handle.net/11343/293452

Tosif Shidan (Orcid ID: 0000-0003-0022-1009)

An assessment of the quality of neonatal care in the Solomon Islands

Dr S Tosif MBBS FRACP[1], Dr Titus Nasi[2], Dr Amy Gray[1], Mr Nahad Sadr-Azodi[3], Dr Divi Ogaoga[4], Prof T Duke MD FRACP FCICM [1]

Original Article

Affiliations:

(1) Centre for International Child Health, University of Melbourne, Murdoch Children's Research Institute, Royal Children's Hospital Melbourne
(2) Head of Paediatrics Department, National Referral Hospital, Honiara
(3) United Nations Children's Fund, Suva, Fiji
(4) Director, Reproductive and Child Health Division, Ministry of Health and Medical Services, Solomon Islands

Corresponding author:
Dr Shidan Tosif
Centre for International Child Health
University of Melbourne
50 Flemington Rd
Parkville VIC 3052 Australia
Phone -61-3-9345-6160
Fax -61-3-9345-5938
Email shidan.tosif@rch.org.au

Author contact details:

Dr Titus Nasi
Head of Paediatrics Department
National Referral Hospital
P.O. Box 349
Honiara
Solomon Islands
Phone: (677) 23600
Email NTitus@nrh.gov.sb

Dr Amy Gray
Centre for International Child Health

University of Melbourne
50 Flemington Rd
Parkville VIC 3052 Australia
Phone -61-3-9345-6160
Fax -61-3-9345-5938
Email amy.gray@rch.org.au

Dr Divi Ogaoga
Director
Reproductive and Child Health Division
Ministry of Health and Medical Services, Solomon Islands
P.O. Box 349
Honiara
Solomon Islands
Ph.: (677) 28 610
Fax: (677) 20 085
Email: DOgaoga@moh.gov.sb

Mr Nahad Sadr-Azodi
Acting Chief of Child Survival and Development
United Nations Children's Fund
3rd Floor, FDB Building
360 Victoria Parade, Suva, FIJI
Email: nsadrazodi@unicef.org
Telephone: (679) 330 0439
Facsimile: (679) 330 1667

Professor Trevor Duke
Centre for International Child Health
University of Melbourne
50 Flemington Rd
Parkville VIC 3052 Australia
Phone -61-3-9345-6160
Fax -61-3-9345-5938
Email trevor.duke@rch.org.au

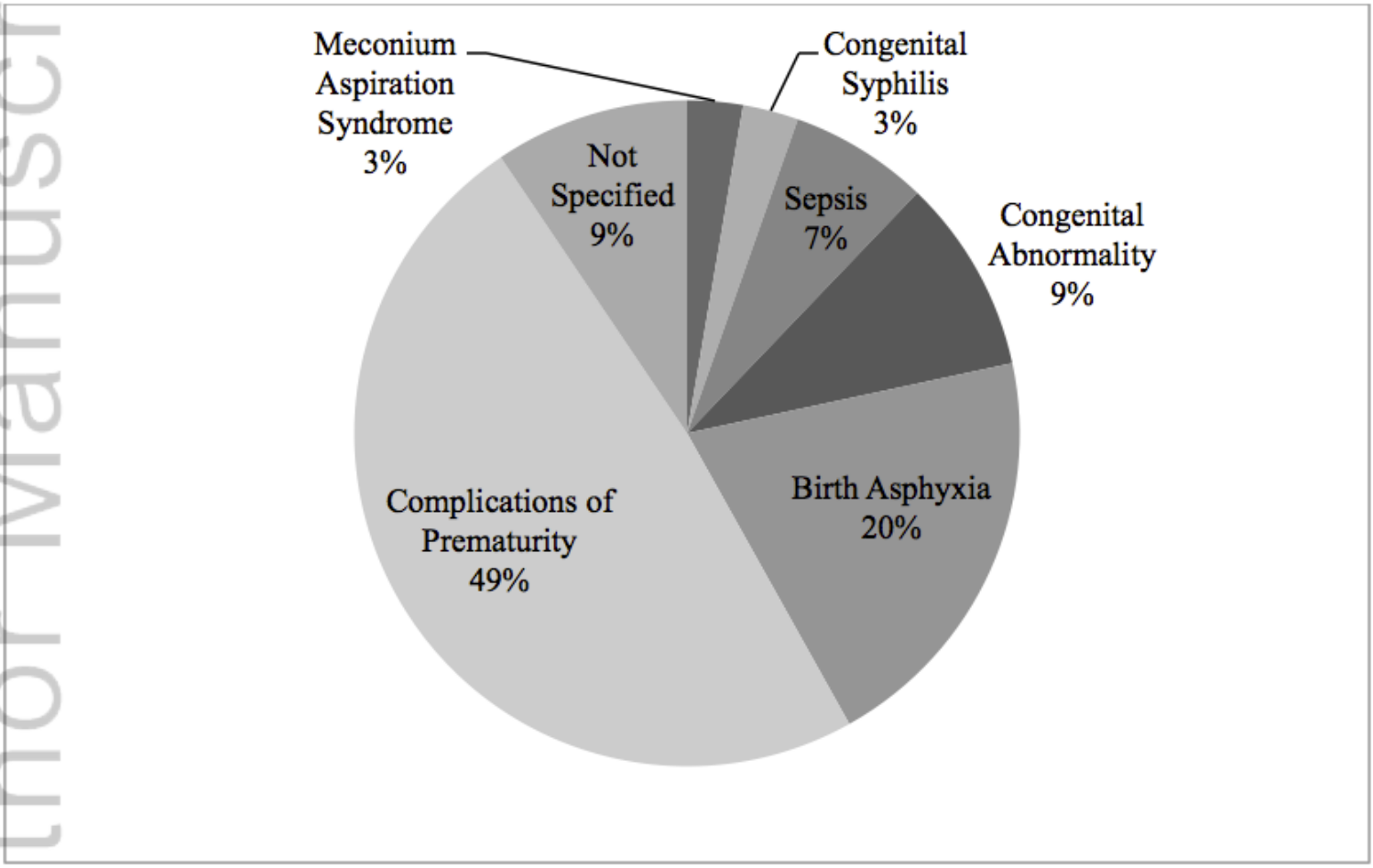

Figure 1.tiff

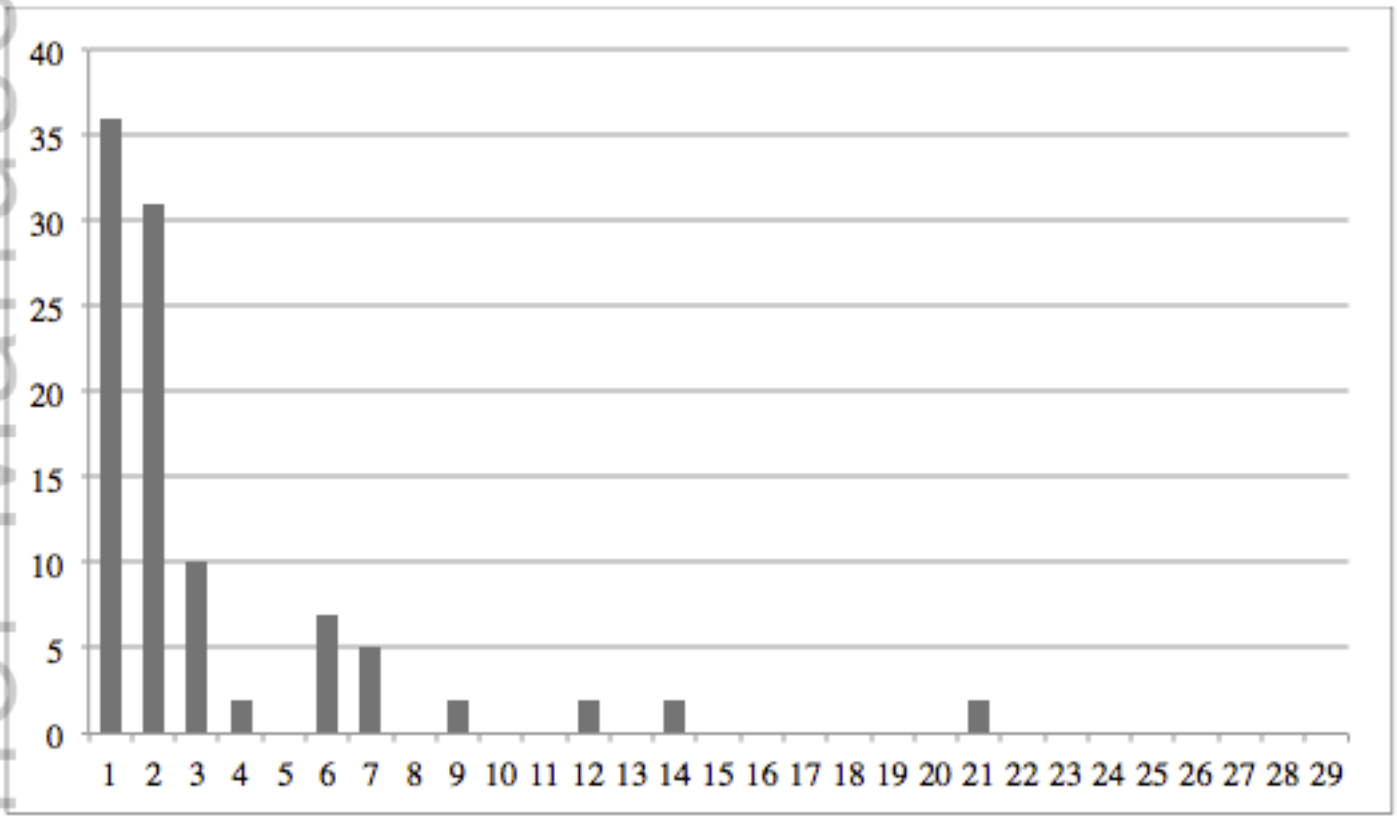

Figure 2.tiff

An assessment of the quality of neonatal care in the Solomon Islands

Keywords: developing countries, neonatal assessment, neonatal mortality, quality of care, small island nation, western pacific

What is already known on the topic:

1. Improving newborn mortality is a priority in The Sustainable Development Goals and the Action Plan for Healthy Newborns in the Western Pacific
2. The Solomon Islands is a low-middle income country in the Western Pacific with a high neonatal mortality rate. Neonatal mortality rates have improved slower than child mortality and now constitute 44% of deaths in children under the age of 5 years.
3. There is a high rate of institutional delivery (95% urban, 84% rural), but the quality of newborn care at these facilities is not known.

What this paper adds:

1. Essential medications and basic equipment were generally available at the facilities.
2. Barriers to newborn care were workforce limitations and expertise, equipment organisation, poor technical maintenance and lack of infection control measures.
3. At the National Referral Hospital in Honiara there is a high rate of stillbirths, and most neonatal deaths occur in the first 3 days of life.

Introduction

Ending preventable newborn deaths is a global and regional priority in Oceania. Mortality in this age group was estimated to account for 44% of under-5 deaths in the Solomon Islands in 2013[1]. Whilst there have been significant improvements in mortality for children under the age of 5 years, newborn mortality has decreased at a much slower rate, and improving outcomes for newborns is a priority for the Sustainable Development Goal agenda. Poor progress is reflective of challenges in access to facilities providing quality care for newborns, an objective inseparable from improving maternal health[2,3]. The majority of newborn deaths occur in the first three days of life despite simple, cost effective interventions existing to prevent them[1].

The Solomon Islands is a lower-middle-income country and small island nation, facing unique challenges in the provision of health care across a large geographical area serviced by a small workforce. It is recognised as a fragile state[4], and over the past 15 years, efforts to improve health care have been challenged by economic vulnerability, social unrest and a series of complex emergencies. The Solomon Islands remains at high risk of susceptibility to extreme natural events[5].

Unlike in many countries facing such challenges, in Solomon Islands there is a high rate of institutional delivery of newborns (95% urban, 84% rural)[6]. There are improving rates of routine immunisation and proportion of exclusively breastfed infants under 6 months of age[7]. The Solomon Islands Ministry of Health and Medical Services (MHMS) is in the process of establishing Universal Health Coverage and together with development partners (World Health Organisation, United Nations International Children's Fund) aims to identify and improve the types of health facilities available and improve core services, infrastructure and equipment for newborns.

As the Solomon Islands embarks on efforts to improve and scale up newborn care, an understanding of the baseline quality of care is required. Previous studies assessing the quality of care for children in the Solomon Islands[8] and neonates in other countries[9] have illustrated the links between assessments, health policy and quality improvement activities. Information regarding gaps in standards of care, referral guidelines, infrastructure (basic equipment and medications for neonatal care) and health systems for neonatal services are essential to understand, shape and prioritise interventions. The purpose of this study was to assess newborn services and describe the obstacles to improving newborn quality of care.

Methods

Study Sites

A purposeful sample of health facilities was chosen following consultation with the Solomon Islands MHMS, and paediatricians from the National Referral Hospital (NRH). The provinces in which hospitals were selected account for 80% of the population of the country. They were chosen as being representative due to size and location, and as the sites with the highest number of births. Four provincial hospitals (Gizo, Western Province, Kilu'ufi, Malaita Province, Kirakira, Makira-Ulawa Province and Good Samaritan Hospital, Guadalcanal Province) and the NRH (Honiara, Capital Territory) were systematically assessed over 1-2 days per site.

[INSERT Table 1: Demographics of hospitals assessed, 2014]

Data Collection

An audit of 12 months of birth and neonatal admissions for 2014 at NRH was conducted, by extraction of data from ward logbooks. Data collected included number of births, stillbirths, and neonatal deaths from the labour ward. Birth weight, duration of admission, diagnosis, treatment, survival, and length of stay were retrieved from the NRH newborn nursery logbooks. The outcomes of interest were diagnoses, causes of mortality, rates of stillbirth, low birth weight and age at death. Data were entered into Excel (Microsoft 2011) for analysis. Descriptive statistics were calculated for clinical characteristics and neonatal outcomes. A facility based neonatal mortality rate was calculated by combining data from neonatal and labour ward logbooks, removing duplicates, and out-born neonates.

Site inspections were conducted together with the provincial hospital administrator and senior nursing staff in May 2015 and June 2016. The assessment team comprised a paediatrician from NRH (TN) and two NRH paediatric registrars (JS, SL) accompanied by a visiting paediatrician (ST). An assessment tool adapted for the local context from the WHO assessment tool for hospital quality of care was used[10]. The assessment covered all facility areas where newborn care was delivered (labour ward, postnatal ward, neonatal, children's wards, and emergency and outpatients departments). Data were collected through observation of facilities and equipment and review of ward admission records for the preceding 12 months. Interviews with available health care workers were used to fill in gaps in data, and to provide an opportunity to raise issues not covered elsewhere in the assessment. At the end of the assessment, health care workers were asked to discuss their priorities to improve newborn care. Data were entered into a standardised form and compared between sites to identify common themes, specifically regarding indicators important for newborn care.

This study was approved by the Solomon Islands Health Research and Ethics Review Board (project number HRE033/16) and the University of Melbourne Human Research Ethics Committee (HREC number 1646267.1).

Results

The main findings of the hospital assessments are summarised in tables 2 and 3. Basic equipment and supplies for the resuscitation and care of sick newborns, including bag and mask, oxygen source and pulse oximeters were generally available. However no site had these items ready and organised for routine and emergency newborn care in a resuscitation area. Facilities to support expressing and storing breast-milk, and items required for neonates with feeding difficulties (refrigerator for storage of expressed breast milk, cup/spoon) were limited. Apart from NRH, which was regularly overcrowded, physical space in the nurseries was adequate, with direct access for mothers. Most hospitals had access to running water. Electricity supplies were by mains power, which was erratic, with surges and blackouts occurring commonly. Backup generators were present at all sites but frequently failed at the two largest hospitals. With regards to infection control, hand sanitizer dispensers were present in each ward, but invariably empty.

[INSERT Table 2: Hospital assessment for newborn indicators]

[INSERT Table 3: Availability of essential medications for newborn care]

Almost all paediatricians, and nurses with training in paediatrics were based at NRH, with only one other provincial hospital employing a paediatrician. Access to an on-call doctor after hours was affected predominantly by transport availability, with significant delay for paediatrician attendance at NRH. Almost all medications relevant for neonates were available at each nursery.

12 months of data from the NRH labour ward and nursery were analysed. At the labour ward, there were 5412 live births, 65 (1.2%) fresh stillbirths, 96 (1.8%) macerated stillbirths and 38 neonatal deaths. 688 (12.7%) of births were low birth weight (<2500g).

Over the same 12 months there were 779 nursery admissions with 68 (8.7%) deaths. The final diagnosis for neonatal deaths was available for 61 neonates and is shown in figure 1. 77% of deaths occurred in the first 3 days of life (see figure 2). Neonatal mortality increased with decreasing birth weight, with 6% mortality rate in neonates > 2500g, 13% mortality in 1500-2499g, 35% mortality in 1000-1499g and 80% mortality rate in neonates less than 1000g. The most common reasons for admission were infection/suspected sepsis (46.5%), prematurity/low birth weight (22.2%), infection (10.0%), birth asphyxia (7.7%), hypoglycaemia (5.3%), and meconium aspiration (3.8%). Total neonatal mortality at NRH was 16 per 1000 live births (89 / 5412).

[INSERT Figure 1 Final diagnosis in neonatal deaths, NRH Nursery (n = 61) 2014]

[INSERT Figure 2 Age at death for newborns, by percentage, NRH Nursery (n = 61) in 2014]

Staff interviews and group discussions raised a number of concerns regarding structure and process aspects of delivering neonatal care. The priority themes and challenges are described in textbox 1.

Discussion

This study describes an assessment of four provincial hospitals and the National Referral Hospital of the Solomon Islands, a small but widely dispersed island nation in the Western Pacific, based on standards of newborn care set out in WHO guidelines. Amongst these facilities, barriers to newborn care were equipment organisation, poor technical maintenance, and lack of infection control measures. Health workforce limitations were marked by few paediatric-trained nurses and lack of paediatricians outside of the capital. An assessment of NRH birth and nursery admissions showed high rates of stillbirth and early neonatal deaths. The neonatal mortality rate at NRH of 16 per 1000 live births is within reach of the SDG target of 12 per 1000 live births[11]. However, there are at least as many stillbirths as neonatal deaths, which need to be accounted for in reaching targets to improve perinatal care.

The general availability of essential medications, oxygen, and electricity was positive, and constitutes an improvement since an assessment in 2003 following 5 years of civil unrest[8]. However, maintenance and organisation of equipment was a problem. Empty hand sanitiser dispensers or hand hygiene not within working reach of patient care areas point to the lack of a system for replenishment, procurement and distribution, and lack of practical awareness of the importance of the basics of infection control. Whilst a bag and mask was present in each health facility, no hospital had an assembled, accessible bag and mask ready to use where neonates were born. This would lead to delays in initiation of resuscitation or recognition of resuscitation opportunities, which may contribute to high rates of stillbirth and early neonatal death found in our audit, as described in other settings[12]. Routine newborn care is reliant on few, but important pieces of equipment to be available in a timely manner. Resuscitation devices for newborns are listed as one of thirteen lifesaving commodities in the improvement of maternal, child and newborn health outcomes[13].

The Solomon Islands is emerging from a period of social unrest, environmental and economic challenges, which have had an impact on health service delivery. As a small island nation, the Solomon Islands encounters challenges specific to this setting, such as high commodity and transport costs. Low staffing numbers, and the flow-on effects of strikes and low pay of nurses in particular, presents a challenge to workforce culture, quality and consistency of services. Training and maintenance of skills for such a dispersed population of health care workers, and births across a large number of facilities is logistically difficult and expensive. Sick neonates, whose conditions are fragile and where management is time sensitive, can face days of travel by road or sea, depending on prevailing weather conditions and transport availability such as hospital ambulances or boats.

Similar to our findings, missing or underutilised essential equipment, logistical difficulties and poor supply have been described in low-middle income countries as barriers to delivering newborn care[14-16]. Inadequate hygiene measures, documentation, staff knowledge and skills, and insufficient essential equipment are common themes[16-19]. In other assessments where essential equipment is available, other systemic factors such as hand hygiene, inadequately

trained staff, poor routine care, documentation and prescribing practices impact on quality of newborn care,[20,21] highlighting the need to focus beyond structural improvements.

The findings of the audit of admissions and neonatal mortality at NRH are consistent with those observed in low and middle income countries, where neonatal infections, birth asphyxia, complications of preterm death and congenital abnormalities account for the greatest disease burden in neonates[22] and highlights that more specialised training is needed in this area. This specialised training needs to take into account the health workforce in the country. In countries like the Solomon Islands, this needs to include training of paediatric nurses with neonatal skills, as well as more training for non-specialist medical officers who will practice in remote areas. A high rate of stillbirths could represent missed opportunities for resuscitation of a newborn[12], or the need for greater intra-partum monitoring[23,24].

We identified health workforce problems such as skilled staffing shortages and high turnover in this assessment, an issue identified in other countries[25,26]. From our observation, knowledge and skills in recognition and management of the sick newborn was limited. Equipping health care workers with skills for resuscitation, and capacity to care for sick newborns in the first week and beyond are essential[12,24,27]. These training issues need to be considered when equipment is made available. Resuscitation training is proposed to reduce term intra-partum related deaths by up to 30%[28]. Education programs focussing on this content were not consistently delivered in ways that will be effective, instead relying on one-off trainings provided by external agencies. Past assessments of health care worker knowledge and skills in newborn care in low-middle income countries have also identified that many staff perform below competency levels[29,30]. Barriers in establishing supportive practices following birth such as with KMC require significant training time and resources[9,31], and resuscitation skills can be affected by decrement in knowledge and skills with time, requiring a long term approach to quality improvement[32,33].

Priorities to accelerate improvement in neonatal care need to focus on interventions around the time of birth, identification and treatment of infections, and intra-partum and birth complications[34]. Greater emphasis should be placed on evidence based practices, which are known to improve outcomes in care of sick newborns, premature and low birth weight babies. These include nursing even very sick babies with their mothers for skin-to-skin contact to reduce hypothermia and to facilitate feeding, breast feeding or the use of expressed breast milk, prevention of hospital-acquired infections, basic respiratory support such as safe use of oxygen and CPAP, improving infection control and limiting invasive procedures that carry risks [35,36]. In addition to high quality routine birth care, specific attention is required towards sick and small newborns, and increased community-based postnatal care [34]. Simple interventions such as protocol-based management, enforcing hand hygiene and aseptic procedures, Early Essential Newborn Care, and abandoning unnecessary interventions can lead to a significant decline on mortality in hospitals with limited resources[37].

This study has several limitations. The selection of sites was not random, and whilst the largest provinces with highest birth rates were chosen, smaller provinces may face different challenges. In a small country however, five health facilities form a significant proportion of the Solomon Island's health service. Interviews with staff relied on the individuals present on the days of assessment, and may be affected by bias or recollection in reporting. Whilst ward admission logbooks were the most reliable source of information, some fields were unfilled and neonatal admissions or deaths may be underestimated as a result. This study focused on newborn quality of care, however more information regarding intra-partum monitoring and obstetric care is needed to describe factors during labour associated with stillbirth or poor neonatal outcomes.

Conclusion

This assessment highlights some of the challenges to newborn quality of care in the Solomon Islands. Neonatal outcomes are characterised by high rates of stillbirth, immediate and early neonatal death, with a high contribution from premature and birth asphyxiated infants. Following substantial improvements in child survival, specific attention is now required to improve newborn outcomes through improvement in routine newborn care practices, resuscitation and specialised newborn skills, technical maintenance and a focus on infection control in the Solomon Islands.

Acknowledgments

We would like to thank MHMS and the NRH Department of Paediatrics for their contribution and support, and UNICEF Fiji for funding this assessment.

References

1. WHO. *Action plan for healthy newborn infants in the Western Pacific region (2014-2020).* Geneva: Available online: https://www.unicef.org/eapro/regional_action_plan_new_born_infants.pdf [last accessed May 2017]; 2014.

2. Austin A, Langer A, Salam RA, Lassi ZS, Das JK, Bhutta ZA. Approaches to improve the quality of maternal and newborn health care: an overview of the evidence. *Reprod Health.* 2014;11 Suppl 2:S1.

3. Knippenberg R, Lawn JE, Darmstadt GL, et al. Systematic scaling up of neonatal care in countries. *Lancet.* 2005;365(9464):1087-1098.

4. The World Bank, List of Fragile and Conflict Affected Situations FY16. 2016. Available online: http://data.worldbank.org/region/fragile-and-conflict-affected-situations [last accessed 20th November 2016].

5. United Nations University: Insitute for Environment and Human Security. *World Risk Report.* Available online: https://i.unu.edu/media/ehs.unu.edu/news/4070/11895.pdf [last accessed May 2017]; 2014.

6. UNICEF. *The State of the World's Children 2016, Geneva. Available online* http://www.unicef.org/publications/files/UNICEF_SOWC_2016.pdf *[last accessed November 2016].* 2016.

7. UNICEF and World Health Organisation. *Countdown to 2015: A Decade of Tracking Progress for Maternal, Newborn and Child Survival The 2015 Report.* Available online: http://countdown2030.org/reports-and-articles/2015-final-report [last accessed May 2017]2015.

8. Auto J, Nasi T, Ogaoga D, Kelly J, Duke T. Hospital services for children in the Solomon Islands: rebuilding after the civil conflict. *J Paediatr Child Health.* 2006;42(11):680-687.

9. Aluvaala J, Nyamai R, Were F, et al. Assessment of neonatal care in clinical training facilities in Kenya. *Arch Dis Child.* 2015;100(1):42-47.

10. WHO Regional Office for Europe. *Making Pregnancy Safer Assessment tool for the quality of hospital care for mothers and newborn babies.* Available online: http://www.euro.who.int/__data/assets/pdf_file/0008/98792/E93128.pdf [last accessed May 2017].

11. United Nations. *Sustainable Development Goals: Goal 3.* New York 2015 https://sustainabledevelopment.un.org/ [last accessed May 2017].

12. Ersdal HL, Mduma E, Svensen E, Perlman JM. Early initiation of basic resuscitation interventions including face mask ventilation may reduce birth

asphyxia related mortality in low-income countries: a prospective descriptive observational study. *Resuscitation.* 2012;83(7):869-873.

13. United Nations Commission on Life-Saving Commodities for Women and Children. *Commissioners' Report.* Available online: https://www.unfpa.org/sites/default/files/pub-pdf/Final UN Commission Report_14sept2012.pdf [last accessed May 2017]2012.

14. Pavitra M, Baya K, Sharad S, Rajiv B, Anju P, Rajesh K. Assessment of implementation of integrated management of neonatal and childhood illness in India. *Journal of Health, Population and Nutrition.* 2011;29(6):629-638.

15. Pradhan NA, Rizvi N, Sami N, Gul X. Insight into implementation of facility-based integrated management of childhood illness strategy in a rural district of Sindh, Pakistan. *Glob Health Action.* 2013;6:20086.

16. Trevisanuto D, Cavallin F, Arnolda G, et al. Equipment for neonatal resuscitation in a middle-income country: a national survey in Vietnam. *BMC Pediatr.* 2016;16:1-8.

17. Owens L, Semrau K, Mbewe R, et al. The state of routine and emergency obstetric and neonatal care in Southern Province, Zambia. *Int J Gynaecol Obstet.* 2015;128(1):53-57.

18. English M, Ntoburi S, Wagai J, et al. An intervention to improve paediatric and newborn care in Kenyan district hospitals: understanding the context. *Implement Sci.* 2009;4:42.

19. Vesel L, Manu A, Lohela TJ, et al. Quality of newborn care: a health facility assessment in rural Ghana using survey, vignette and surveillance data. *BMJ Open.* 2013;3:e002326(5).

20. Mirkuzie AH, Sisay MM, Reta AT, Bedane MM. Current evidence on basic emergency obstetric and newborn care services in Addis Ababa, Ethiopia; a cross sectional study. *BMC Pregnancy And Childbirth.* 2014;14:354-354.

21. Kim YM, Ansari N, Kols A, et al. Assessing the capacity for newborn resuscitation and factors associated with providers' knowledge and skills: a cross-sectional study in Afghanistan. *BMC Pediatr.* 2013;13:140.

22. Lawn JE, Kerber K, Enweronu-Laryea C, Massee Bateman O. Newborn survival in low resource settings--are we delivering? *Bjog.* 2009;116 Suppl 1:49-59.

23. Kidanto H, Msemo G, Mmbando D, Rusibamayila N, Ersdal H, Perlman J. Clinical article: Predisposing factors associated with stillbirth in Tanzania. *International Journal of Gynecology and Obstetrics.* 2015;130:70-73.

24. Ersdal HL, Singhal N. Resuscitation in resource-limited settings. *Seminars in Fetal and Neonatal Medicine.* 2013;18(6):373-378.

25. Faqir M, Zainullah P, Tappis H, Mungia J, Currie S, Kim YM. Availability and distribution of human resources for provision of comprehensive emergency obstetric and newborn care in Afghanistan: a cross-sectional study. *Confl Health.* 2015;9:9.

26. Enweronu-Laryea C, Dickson KE, Moxon SG, et al. Basic newborn care and neonatal resuscitation: a multi-country analysis of health system bottlenecks and potential solutions. *BMC Pregnancy and Childbirth.* 2015;15(Suppl. 2):S4.

27. Wall SN, Lee ACC, Carlo W, et al. Reducing intrapartum-related neonatal deaths in low- and middle-income countries - what works? *Semin Perinatol.* 2010;34(6):395-407.

28. Lee AC, Cousens S, Wall SN, et al. Neonatal resuscitation and immediate newborn assessment and stimulation for the prevention of neonatal deaths: a systematic review, meta-analysis and Delphi estimation of mortality effect. *BMC Public Health.* 2011;11 Suppl 3:S12.

29. Ariff S, Soofi SB, Sadiq K, et al. Evaluation of health workforce competence in maternal and neonatal issues in public health sector of Pakistan: an Assessment of their training needs. *BMC health services research.* 2010;10:319.

30. Malhotra S, Zodpey SP, Vidyasagaran AL, et al. Assessment of essential newborn care services in secondary-level facilities from two districts of India. *Journal of Health, Population and Nutrition.* 2014;32:130.

31. Bergh AM, Kerber K, Abwao S, et al. Implementing facility-based kangaroo mother care services: lessons from a multi-country study in Africa. *BMC Health Serv Res.* 2014;14:293.

32. Reisman J, Arlington L, Jensen L, Louis H, Suarez-Rebling D, Nelson BD. Newborn Resuscitation Training in Resource-Limited Settings: A Systematic Literature Review. *Pediatrics.* 2016;138((2) e20154490).

33. Mduma E, Ersdal H, Svensen E, Kidanto H, Auestad B, Perlman J. Frequent brief on-site simulation training and reduction in 24-h neonatal mortality--an educational intervention study. *Resuscitation.* 2015;93:1-7.

34. Lawn JE, Blencowe H, Oza S, et al. Every Newborn: progress, priorities, and potential beyond survival. *Lancet.* 2014;384(9938):189-205.

35. Boo NY, Puah CH, Lye MS. The role of expressed breastmilk and continuous positive airway pressure as predictors of survival in extremely low birthweight infants. *J Trop Pediatr.* 2000;46(1):15-20.

36. Ho JJ, Chang AS. Changes in the process of care and outcome over a 10-year period in a neonatal nursery in a developing country. *J Trop Pediatr.* 2007;53(4):232-237.

37. Agarwal R, Agarwal K, Acharya U, Christina P, Sreenivas V, Seetaraman S. Impact of simple interventions on neonatal mortality in a low-resource teaching hospital in India. *J Perinatol.* 2007;27(1):44-49.

Hospital	NRH	Kilu'ufi	Gizo	Kirakira	Good Samaritan
Province	Honiara town council	Malaita	Western	Makira-Ulawa	Guadalcanal
Province population	64,609	137,596	76,649	40,419	93,613
Provincial births (2013)	5561	3123	2283	1234	1443
Provincial hospital births (2013)	5554	953	587	405	626
Travel time to NRH	-	8hrs (boat)	48hrs (boat)	24hrs (boat)	1hr (drive)
Mean births per month (range)	451 (388-514)	88 (71-102)	53 (35-77)	34 (23-44)	56 (43-67)
Special care nursery	Yes	Yes	Yes	Yes	No
Capacity (neonatal beds)	22	6	10	2	N/A
Mean nursery admissions per month (range)	65 (44-84)	11 (6-16)	6 (2-9)	3 (2-3)	N/A

Table 1: Hospital demographics (2014)

Facility	NRH	Kilu'ufi	Gizo	Kirakira	Good Samaritan
Equipment/Supplies					
Oxygen Source	Cylinder + concentrator	Cylinder	Concentrator	Cylinder + concentrator (not in use)	Cylinder + concentrator
Oximeter with neonatal probes	1	1	1	1	1
Overhead warmers	3	1	2	0	2
Phototherapy system	3	1	2	1	0
Self-inflating resuscitation bags	4	3	2	2	2
Thermometers	Yes	Yes	Yes	Yes	Yes
Stethoscopes	Yes	Yes	No	Yes	Yes
Glucometers + strips	Yes	Yes	Yes	Yes	Yes
Nasogastric tubes sizes 6, 8, 10, 12F	Yes	Yes	Yes	Yes	Yes

Facilities for Mothers					
24-hr access to newborn	Yes	Yes	Yes	Yes	Yes
Cups/spoons for feeding babies	No	Yes	No	No	No
Dedicated EBM milk fridge	No	No	No	No	No
Ward Organisation					
Bag and bask assembled and within reach of resuscitation area	No	No	No	No	No
Overcrowding	Yes	No	No	Yes	N/A
Direct Access (labour ward, operating theatre, post-natal)	Yes	Yes	Yes	Yes	N/A
Direct line of sight to high dependency neonates	Yes	Yes	Yes (if nurse allocated)	No	No
Designated resuscitation area	Yes	Yes	Yes	No	Yes
State of building repair and maintenance	Satisfactory	Satisfactory	Excellent	Poor	Satisfactory

Continuous electricity supply	No	No	Yes	Yes	No
Continuous running water	Yes	Yes	Yes	Yes	Yes
Infection Control					
Wash basin, soap, water	No	No	No	No	Yes
Alcohol hand gel dispenser and supply	No	Yes	Yes	No	No
Staffing					
Paediatricians	3	1	0	0	0
Paediatric Nurse	> 10	0	1 (not on clinical duties)	0	0
Staff availability after hours	Paediatricians available on call, 3 nurses available at night	1 on-call doctor, 1-2 nurses per night	1 on-call doctor during night, 2 midwives per overnight shift.	1 midwife per shift, 1 paediatric nurse, on-call doctor overnight	1 midwife, 1 nurse
First responder to resuscitation after hours	Nurse	Midwife	Midwife	Midwife	Nurse/Midwife
How is senior staff called for	Mobile phone	Mobile phone	Mobile phone	Mobile phone	N/A

in emergency					
Time for senior doctor to arrive after hours?	60-90 minutes depending on availability of hospital transport	5-15mins	<30 minutes	5-10minutes	No doctor available

Table 2: Hospital assessment for newborn indicators

	NRH	Kilu'ufi	Gizo	Kirakira	Good Samaritan
Adrenaline	Yes	Yes	Yes	Yes	Yes
Aminophylline	Yes	Yes	Yes	Yes	Yes
Ampicillin	Yes	Yes	Yes	Yes	Yes
Benzylpenicillin	Yes	Yes	Yes	Yes	Yes
Cefotaxime or Ceftriaxone	Yes	Yes	No	No	No
Chloramphenicol	Yes	Yes	Yes	Yes	Yes
Gentamicin	Yes	Yes	Yes	Yes	Yes
Phenobarbitone	No	Yes	No	No	No
Tetracycline eye drops or ointment	Yes	Yes	Yes	Yes	Yes

Table 3: Availability of essential medications for newborn care

Structural: poor condition of buildings, equipment shortages (e.g. insufficient oximeters, oxygen supply interrupted, thermometers), lack of technical support and prolonged time for repairs and spare parts (e.g. for replacement of phototherapy light bulbs)

Organisational: high workloads, insufficient numbers of nurses for care of neonates, more specially trained paediatric nurses needed

Training needs: more practical training modes preferred, staff most in need of a specific skillset were often not invited to appropriate training sessions, more opportunities for clinical attachments wanted

Resuscitation: Concerns raised that a sense of urgency was not present in practice of immediate newborn care

Resources: More copies of references needed, guidelines most frequently cited need updating (e.g. Solomon Islands Standard Treatment Manual)

Textbox 1: Healthcare worker challenges and priorities in improving newborn care