QUEENSLAND COURTS

OFFICE OF THE STATE CORONER

FINDINGS OF INVESTIGATION

CITATION:	**Non-inquest findings into the death of Malaki Ron Bower**
TITLE OF COURT:	Coroners Court
JURISDICTION:	Brisbane
DATE:	7 November 2016
FILE NO(s):	2013/2583
FINDINGS OF:	Christine Clements, Brisbane Coroner
CATCHWORDS:	CORONERS: Health care related death, two year old boy, underlying diagnosis of croup, appropriateness of assessment and treatment at hospital including period of observation and decision to discharge

Introduction

1. Malaki Ron Bower was born on 31 January 2011. He lived with his family at Elizabeth Kenny Court at Harristown in Queensland. Malaki's parents are William Bower and Kim Wright. Malaki's older sister is Olivia Bower. Malaki died in the Mater Children's Hospital in Brisbane on 19 July 2013. He was two years of age at the time of his death. There was concern expressed at the time of his death regarding medical care provided, especially at the Toowoomba Base Hospital. His death was therefore reported to the coroner.

2. On Saturday 13 July 2013, Malaki was with his father at their home at Elizabeth Kenny Court, Harristown in Toowoomba. Also present was Malaki's uncle and his daughter. At the time, Malaki's mother, Kim Wright was away in New South Wales helping her mother to move to Toowoomba.

3. Malaki started to have difficulty breathing. The situation was severe enough for the father to call for the ambulance who attended and transported Malaki to the Toowoomba Base Hospital ('the Hospital').

Medical History

4. Malaki's previous medical history included treatment as an infant to strengthen the male genitalia. He underwent minor surgical corrective procedures for an abnormal opening of the urethra. A cluster of seizures in 2012 was assessed by a neurologist and diagnosed as febrile convulsions. His family history included epilepsy, with a number of relatives affected. The other family medical history was of cardiomyopathy, affecting some members at an age under 20 years.

Events of 13 July 2013

5. The episode which precipitated his father calling for assistance from the ambulance was described as follows. Malaki had a sip of milk and appeared to choke and then vomit with episodes of retching. Ambulance officers noted good saturation levels but he had a 'bark-like' cough and was using accessory muscles for breathing. He was given nebulised adrenaline and taken to the Hospital.

6. At the Hospital he was assessed in the emergency department. A two day history of cough and runny nose was noted. Similar symptoms had been observed in his sister. On examination, he was noted to have inspiratory stridor and an expiratory wheeze. Modest airway swelling was noted. The clinical impression was that of a viral upper respiratory tract infection. Management included a single dose of dexamethasone (a steroid) to reduce swelling and paracetamol (simple analgesic). He was discharged home.

Events of 14 July 2013

7. The next day, on 14 July 2013, he was in a vehicle with family when at approximately 08:43 he had a seizure and stopped breathing. His family pulled into a McDonald's restaurant for assistance and a bystander performed CPR until the Queensland Ambulance Service (QAS) arrived.

8. QAS arrived at about 08:48. Ambulance officers observed bystander CPR to be ineffective. Malaki was pale, unresponsive, not breathing and pulseless (cardiorespiratory arrest). Soft white material (thought to be either chewed bread or

milk products) was in his airway, which was difficult to clear. He was also noted to be difficult to ventilate.

9. Malaki arrived at the Hospital's emergency department at 09:14. At this time he was in asystolic cardiac arrest (absence of any heart rhythm). Resuscitation efforts continued, including:

    - Cardiopulmonary resuscitation (CPR);
    - Administration of adrenaline (to stimulate the heart);
    - Intubation and ventilation (intubation was noted to be difficult due to swelling; and
    - Insertion of nasogastric tube.

10. At 09:28 return of sinus rhythm (normal heart rhythm) was recorded. It was estimated that at least 30 to 45 minutes had passed during which he had no cardiac output. This is an extremely prolonged time for vital organs to be without a blood supply.

11. Management included:

    - Hydrocortisone (a steroid);
    - Ceftriaxone (antibiotic);
    - Metaraminol, noradrenaline (to support blood pressure);
    - Morphine/midazolam infusion (for sedation);
    - Rocuronium (for paralysis); and
    - Intravenous fluids.

12. After being stabilised at the Hospital, Malaki was transferred to the Mater Children's Hospital in Brisbane for tertiary level care.

Mater Children's Hospital

13. The autopsy report summarises events at the Mater Children's Hospital after Malaki was transferred to their care. Results of investigation included the following:

    - Chest x-ray: normal heart silhouette and no signs of pneumonia;
    - Echocardiogram: normal heart structure and function;
    - MRI and CT scans of head: severe hypoxic ischaemic changes; no intracranial haemorrhage, no abscess;
    - Parainfluenza 1 virus and Rhinovirus/Enterovirus detected in nasopharyngeal aspirate (common causes of upper respiratory tract infection in children);
    - No growth from endotracheal aspirate;
    - Negative blood cultures;
    - No growth in urine sample; and
    - No growth and no viruses detected in faeces sample.

14. The clinical diagnosis was a hypoxic-ischaemic encephalopathy (brain damage caused by inadequate blood and oxygen supply) due to an "out of hospital" cardiac arrest secondary to upper airway obstruction caused by croup (laryngotracheitis or laryngotracheobronchitis). It was noted that there was no evidence of epiglottitis (inflammation of the epiglottis).

15. Malaki was cared for in the Intensive Care Unit, where management included:

- Ventilation;
- Body cooling;
- Sedation (morphine, midazolam, propafol);
- Paralysis (cisatracurium);
- Medication to prevent seizures (phenytoin, clonazepam, levetiracetam, thiopentone);
- Medication to support blood pressure (dobutamine, noradrenaline);
- Insulin infusion to control blood sugar;
- Diuretics (frusemide);
- Paracetamol for fever;
- Electrolyte replacement (potassium, calcium, sodium bicarbonate);
- Intravenous fluids; and
- Trophic feeds.

16. He remained unresponsive and showed no signs of recovery. His prognosis was considered dire and that he would likely die. During the morning of 19 July 2013 his condition deteriorated suddenly and life-supporting measures were discontinued, following discussions with his family. Malaki was declared deceased at 11:15 that day.

Family Concerns

17. After Malaki's sudden deterioration requiring his readmission to the Toowoomba Base Hospital, transfer to Brisbane and ultimate death, his family raised their concerns. They wanted to know:

    - Whether discharge from the Hospital on Saturday 13 July in Toowoomba should have occurred in the circumstances and if Malaki could have lived had he remained in hospital in Toowoomba when first presented;
    - Whether Malaki was seen by a paediatrician in the emergency department at the Hospital on 13 July;
    - What diagnosis was made at the Hospital on 13 of July and why croup was not identified and recognised, particularly when ambulance personnel and the emergency nurses were saying that Malaki had croup; and
    - Why Malaki was discharged within three hours of attending the Hospital via ambulance on 13 July. He was still having noisy breathing, difficulty breathing, and his father did not feel that he was well enough to return home.

Autopsy

18. Autopsy examination was conducted by the forensic pathologist, Dr Rebecca Williams.

19. Post-mortem CT imaging showed changes in the brain consistent with hypoxic ischaemic encephalopathy. No bony injury was detected.

20. Dr Williams observed some swelling of the larynx (the cartilaginous component of the upper airway) as well as inflammation of the trachea and bronchi (laryngotracheobronchitis). She said these findings were consistent with the clinical diagnosis of croup. She noted that Malaki had been intubated for a period of around five days before he died. Some swelling would be related to this. It is therefore not possible to determine how much the airway was swollen and obstructed at the time of his collapse during the morning of 14 July 2013.

21. The brain was examined and found to be swollen. Hypoxic ischaemic encephalopathy

was confirmed. There were no other underlying structural abnormalities.

22. Examination of tissue samples under microscopic magnification confirmed laryngotracheobronchitis, which is inflammation of the trachea and bronchi. This was consistent with the clinical diagnosis of croup that had been made. There was also bronchopneumonia. The pathologist stated that as there were no signs of pneumonia at the time Malaki was admitted to hospital, it is likely a secondary infection that developed during hospital admission, rather than an illness prior to admission. Parainfluenza 1 (a virus) was detected in the lung sample. Specific tests for whooping cough (Bordetella pertussis) were negative in the lung sample.

23. Dr Williams noted that the parainfluenza viruses (PIV) are important respiratory pathogens in children and adults. A variety of upper and lower respiratory tract illnesses ranging from mild colds to life-threatening pneumonia are caused by the virus. The virus is particularly associated with croup in children.

24. Other testing excluded a metabolic abnormality.

25. Toxicology testing was not significant.

26. Dr Williams reviewed all of the information available and concluded that Malaki died due to hypoxic ischaemic encephalopathy caused by a cardiorespiratory arrest due to an upper airway obstruction caused by parainfluenza 1 laryngotracheobronchitis (croup).

27. Dr Williams remarked that although croup is usually a mild and self-limited illness, it can cause significant upper airway obstruction, respiratory distress and rarely, death can occur. She suggested independent expert review of clinical management of Malaki at the Hospital on 13 July 2013.

Root Cause Analysis

28. Following Malaki's death, the Hospital conducted a review and commissioned a Root Cause Analysis report ('the RCA') under the *Hospital and Health Boards Act 2011*. This is a systemic analysis of what happened and why and is designed to make recommendations to prevent adverse health outcomes from happening again, rather than to apportion blame or determine liability. Nor is it an investigation of an individual clinician's professional competence. It is conducted by a review team who had no involvement in the patient's care.

29. The RCA was finalised on 30 September 2013 (which is before the autopsy report was available) and a copy was provided to the coroner. The RCA made a number of recommendations for improvement and information about implementation of the RCA recommendations was subsequently sought from the Hospital.

Independent Medical Review

30. Following Malaki's death, a senior forensic medical officer, Dr Don Buchanan of the Clinical Forensic Medicine Unit, provided the Coroner with a report. A copy was forwarded to the family.

31. Dr Buchanan included information about croup which he described as a respiratory infection characterised by a barking cough, inspiratory stridor and a hoarse voice with or without respiratory distress. It is usually mild and self-limiting, but can cause airway

obstruction, respiratory distress and death. The infection is viral, the most common being parainfluenza and respiratory syncytial virus. It affects the upper airways, including the larynx (voice box), windpipe and bronchial tubes. The stridor that develops is from the virus causing swelling to the lining of the airway tubes. As there is no specific treatment for the virus itself, therapy is aimed at decreasing the airway swelling.

32. Dr Buchanan noted Queensland Health has produced a document concerning the acute management of acute croup in children. Depending on the severity of symptoms, treatment consists of nebulised adrenaline and steroid medication to decrease the swelling. If nebulised adrenaline is given and the child's symptoms resolve, the child should be observed for four or more hours.

33. The adrenaline dose can be repeated if the response does not resolve the symptoms, but if another dose is required then the paediatric team or paediatric intensive care unit are to be advised to arrange admission. If symptoms do not persist or return after four hours or more hours, in particular if there is no audible stridor at rest, the child can be sent home. Oral dexamethasone, a steroid medication, is also recommended treatment.

34. Dr Buchanan noted that the first time the ambulance attended for Malaki they gave him nebulised adrenaline at 14:51 because of severe respiratory distress. He initially settled substantially. When he was at hospital, clinical examination revealed he still had stridor and an increased respiratory rate. No further dose of nebulised adrenaline was given. He was however given oral dexamethasone (the steroid medication) at an appropriate dose at 16:00. By 18:00, he had significantly settled although he still had a slight stridor. Dr Buchanan noted that if the diagnosis were considered to be croup, then another dose of nebulised adrenaline could have been considered as well as considering notification to the paediatric team in accordance with the Queensland Health procedure.

35. However, Dr Buchanan's reading of the medical record noted that the doctor did not appear to have diagnosed croup, but had diagnosed a viral upper respiratory tract infection. It could therefore be argued that the protocol need not have been followed. In any event, the treatment provided was the same as if a diagnosis of croup had been made to the extent that steroid medication was given. This is not usually prescribed for ordinary viral upper respiratory tract infections. Malaki had settled relatively well although not completely after the dose of nebulised adrenaline had been given by the ambulance officers.

36. With the benefit of information provided at autopsy, Dr Buchanan noted that examination of tissue under microscopic magnification was able to confirm laryngotracheobronchitis. A virus, parainfluenza 1, was detected in the lung sample. Dr Buchanan noted that this virus is associated with croup in children. The result of the autopsy was that the cause of death was established to be hypoxic ischaemic encephalopathy, due to cardiorespiratory arrest, due to upper airway obstruction, due to parainfluenza 1 laryngotracheobronchitis (croup).

37. Dr Buchanan noted the limitation of the Root Cause Analysis (RCA) process which occurred before the autopsy report was available. The RCA process noted that all children are either seen or discussed with a consultant or registrar prior to discharge. The RCA said that a senior doctor did physically review and examine the child. Dr Buchanan could not see any record in the medical documents about this. The hospital subsequently confirmed the doctor who examined Malaki, was the Senior emergency

department Consultant.

38. The Root Cause Analysis referred to the children's early warning tool (CWET) which is a set of observations used to flag if a child is deteriorating and medical care should be reviewed or escalated. It was noted that this set of observations does not include a specific recording of respiratory distress. However, there are other ways of recording this information to provide more detail but these were not in use in the emergency department at the time. This has been recognised as an important additional way to evaluate a child's condition. Dr Buchanan noted that the review acknowledged that children may be required to be monitored for longer periods and that the emergency department was not a suitable place for this to occur. Therefore a recommendation was made for establishing a short stay unit with special paediatric staff.

39. Dr Buchanan noted that there was some comment by the RCA team about poor documentation, particularly the lack of documentation that a senior doctor had reviewed the child. He noted that the RCA team recommended all children must have clear documentation made by a junior medical officer that a discussion and/or review by a senior medical officer has occurred. He noted that one hundred per cent compliance is required.

40. Dr Buchanan also noted that the RCA team found that many medical officers had limited experience with children's medicine. They proposed improving the service by developing a paediatric streaming model within the emergency department. Ways of addressing this were proposed.

41. Dr Buchanan noted the RCA did not specifically refer to acute croup management in children but this is understandable given the autopsy findings were not known at the time of the RCA.

42. Dr Buchanan compared the required procedure with the treatment provided to Malaki. The discharge home on the first presentation assumes that his stridor on discharge was not considered to be significant. However, Dr Buchanan noted he had not been observed for the recommended period which is designed to ensure that symptoms do not recur prior to discharge.

43. In Dr Buchanan's opinion the issue to be addressed was whether Malaki should have been assessed by a paediatric medical officer to consider admission to the hospital. Dr Buchanan noted, having regard to the review by the Root Cause Analysis, that if the emergency department was unsuitable for prolonged monitoring, then in the circumstances he should have been admitted to the Hospital.

44. Dr Buchanan particularly emphasised the importance to be placed on junior doctors recording their discussions with, and any review made by a senior doctor with respect to children. There was no record in the medical record at the Hospital that another doctor was involved. Assuming that another doctor had been involved, it should have been documented.

45. Finally, Dr Buchanan welcomed the recommendation made by the RCA team to include additional tools of assessment and observation and education of doctors in paediatric medicine.

Finalisation of the Initial Investigation

46. On 15 August 2014, draft findings were provided to Malaki's family and they were

advised that an inquest was not going to be held into Malaki's death. This was on the basis that sufficient findings could be made about the death and that there were no prospects of making recommendations that would reduce the likelihood of similar deaths occurring in the future.

47. On 13 November 2014, Malaki's family responded to advise that they disagreed with the finding and wished to make an application pursuant to section 30 of the *Coroners Act 2003* (Act) for an inquest into Malaki's death to be held. The reasons can be summarised as follows:

- It is unclear whether the initial diagnosis of croup from the ambulance (on 13 July 2014) was provided to Hospital staff;
- The misdiagnosis highlights an area of concern surrounding adequate knowledge of medical practitioners to diagnose croup in a timely and effective manner;
- There has been no information given as to the implementation of a dedicated short stay unit at the Hospital (mentioned in the RCA) - a full coronial inquest could reveal whether this has happened or not; and
- The RCA is deficient as it was completed without the autopsy findings.

Reopening of the investigation

48. On 8 July 2015, the State Coroner directed that the investigation be re-opened pursuant to section 50B of the Act. His Honour advised the family of this decision and that he had not determined that the holding of an inquest was necessary.

Further information and advice is sought

49. Further information was subsequently sought from the Hospital and other interested parties to clarify the circumstances surrounding Malaki's death. A number of witness statements were received including from nursing staff and the treating doctors.

50. The information received was then provided to Dr Buchanan and his further advice was requested.

51. In summary, Dr Buchanan advised that:

- The verbal handover by the paramedics to the nurses was adequate;
- The medical notes indicate that the only diagnosis made at the time was of a viral Upper Respiratory Tract Infection (URTI). However in his statement, the treating doctor now says that he made the diagnosis of croup as well as a viral URTI. This may be supported by the prescription of Dexamethasone which is used in the treatment of croup symptoms and generally not for regular viral URTIs;
- Whilst is not apparent form the medical record, the treating doctor says that he did consult a more senior colleague and medical supervisor;
- There were differences in recollection between these two doctors as to the diagnosis and therefore their communication may not have been optimal;
- Neither doctor read the QAS report;
- There was enough evidence provided by QAS and in turn from the nurses to also include croup as part of the differential diagnosis;
- In any event, having diagnosed croup means that Malaki should have been observed for a four hour period as stated in the guideline at the time. This did

not occur as Malaki was only observed for a period of three hours. He should have been observed for longer than he was;
- As from 20 March 2014, the Hospital has implemented the CWET accessories which in his opinion is adequate and appropriate;
- There is an opportunity for the Hospital to re-examine the issue in relation to poor documentation, in particular, emergency department record-keeping and communication in the broader context, from pre-hospital care through to admission or discharge; and
- It was unclear whether a solution has been identified to address the unsuitability of the emergency department to monitor paediatric patients for long periods.

52. Upon receipt of the additional report from Dr Buchanan, further correspondence was sent to the Hospital asking them to address the issues that he had raised.

53. The Hospital responded and advised that:

- The Hospital reiterated that it has now implemented the RCA recommendation to introduce the use of the CWET accessory tools. This is now included as part of the Hospital's audit process and the Nurse Unit Manager for the emergency department will now monitor the completion of the discharge planning section on the back of the CWET forms;
- Steps have been taken to improve communication in the emergency department and the QAS is now required to provide their report in a timely manner to the cubical in which the patient was admitted and provides the treating doctor with essential and complete information to assist in the decision making for the ongoing treatment of the patient;
- A project is currently underway to help identify how information for expected patients is received by the emergency department from QAS, GPs and other hospitals. This aims to ensure the incoming information is disseminated in a timely and appropriate way;
- The Hospital does not have the resources to implement a paediatric streaming model however children are triaged and treated accordingly regardless of the availability of a specific paediatric cubicle;
- While no specific short-stay or close observation unit for paediatrics within the emergency department there is now provision for children to be observed in the emergency department short stay unit for up to four hours;
- Progress is underway to facilitate a short stay option in the paediatric unit with capacity for four bed specifically for close observation of children. Children who have been administered nebulised adrenaline for croup would meet the criteria for observation in this unit;
- Steps have been taken to increase the volume of education provided to medical officers in paediatric medicine. The Director of Clinical Training/Medical Education Unit at the Hospital has proposed a mandatory module for the management of paediatrics in the emergency department for all Registrars and a recommended module for emergency department Registered Medical Officers and Interns;
- The Hospital has introduced a new work instruction titled 'Croup – Emergency Management In Children'. This work instruction is based on the Children's Health Queensland Guideline and outlines in particular:
    - The clinical symptoms that characterise croup (barking cough, inspiratory stridor and hoarseness of voice with or without respiratory distress);
    - The need to consider the differential diagnosis of an acute episode of stridor;

- Guidelines for the initial assessment of a child presenting with croup (mild, moderate, severe and life threatening);
- Important steps for the management of croup (including the appropriate use of systemic (or nebulised) corticosteroids and nebulised adrenaline;
- The process for admission into the paediatric unit for observation and options for rural hospital in the district;
- That prior to discharge, clinicians should ensure that the child has adequately responded to treatment, can access further doses of any prescribed medication and has parents who have been appropriately educated about the condition, have access to emergency transport or emergency services and feel comfortable with the diagnosis and what to do if symptoms recur. It is noted that the presence of ongoing stridor at rest after treatment necessitates admission; and

- Patient information sheets on many childhood conditions including croup are available for care givers in the Hospital's emergency department.

Conclusion

54. Malaki Ron Bower died as a result of lack of oxygen causing damage to his brain following on from cardiorespiratory arrest due to upper airway obstruction. The underlying cause was parainfluenza 1 laryngotracheobronchitis, otherwise known as croup.

55. At the time, there was an existing Queensland Health procedure to guide identification and treatment of acute croup management in children. When the ambulance was called to attend Malaki on the first occasion on 13 July they administered nebulised adrenaline which is part of the recommended protocol. Examination at the Hospital emergency department noted inspiratory stridor but Malaki was not in any respiratory distress. Modest airway swelling was noted and a diagnosis was considered to be that of viral upper respiratory tract infection. The medical notes do not reflect that a diagnosis of croup was specifically made. However the treating doctor subsequently advised that he did make a diagnosis of croup. This may be supported by the fact that a single oral dose of dexamethasone 2mg (the recommended steroid medication for treatment of croup) was provided.

56. Malaki was discharged by 6:00pm at which time it was considered he was moving about with a slight stridor but was otherwise considered well enough to be discharged home. In hindsight, and in strict compliance with the procedure, Malaki could have been admitted to the hospital for further observation and should have been observed for a period of four hours. The Hospital has now implemented a new work instruction titled 'Croup – Emergency Management In Children'. This work instruction is based on the Children's Health Queensland guideline.

57. The underlying cause of Malaki's death was croup. On the first occasion he was taken by ambulance to the Hospital. He was examined and diagnosed with viral URTI. Although a specific diagnosis of croup was not documented, the appropriate treatment of croup was administered. This was Dexamethasone 2mg, the recommended steroid.

58. He was examined by a senior emergency department Consultant, who was aware of the subsequent discharge planning when Malaki's condition improved after the administration of medication. In hindsight, a further period of observation might have ensured that Malaki's symptoms had indeed resolved. As indicated by the reviewing opinion of Dr Buchanan, this may have involved consideration of admission of Malaki to the Hospital rather than retaining him in the emergency department, which appeared to be an unsuitable environment for such a purpose.

59. The Hospital has reviewed its care via the RCA process. It has also responded to the Coroner's enquiries on behalf of the family. In Dr Buchanan's opinion, the Hospital's responses have been positive and will likely lead to an improved standard of care of children who are brought to the hospital.

Request for Inquest

60. The focus of the coronial jurisdiction is to make the findings required by section 45 of the *Coroners Act 2003* (Act) where possible. There is sufficient evidence available to determine the cause of Malaki's death as required by that section.

61. The question of whether any institution or individual failed to meet the relevant duty of care towards Malaki is a matter which cannot be determined by a coroner as a result of the constraint imposed by s 45(5)(b) of the Act.

62. No similar incidents have occurred at the Hospital since Malaki's death.

63. The Hospital has now introduced a new procedure specifically in relation to the assessment, management and discharge of children with croup.

64. The Hospital has taken steps to address issues of poor documentation and communication.

65. The Hospital has taken steps to facilitate a short stay option in the paediatric unit for the close supervision of children.

66. The Hospital has increased training and education around the diagnosis, treatment and management of croup.

67. Based on the expert advice and the changes made by the Hospital, an inquest is therefore not likely to result in further recommendations for change.

68. In all these circumstances it is not considered in the public interest that an inquest should be convened.

69. The findings are also published on the Queensland Coronial website. The dissemination of information in this way is the most appropriate and likely means to raise awareness of such an unexpected death and thus help to prevent a similar death occurring in the future

70. My sincere condolences are extended to Malaki's family.

Chris Clements
Brisbane Coroner
7 November 2016