	REGULATION 28 REPORT TO PREVENT FUTURE DEATHS **THIS REPORT IS BEING SENT TO:** **1) Chief Executive of the Royal Stoke University Hospital** **2) Chief Executive of Birmingham Children's Hospital.**
1	**CORONER** I am Sarah Murphy HM Assistant Coroner for **Stoke-on-Trent & North Staffordshire Coroner's Court**
2	**CORONER'S LEGAL POWERS** I make this report under paragraph 7, Schedule 5, of the Coroners and Justice Act 2009 and regulations 28 and 29 of the Coroners (Investigations) Regulations 2013. http://www.legislation.gov.uk/ukpga/2009/25/schedule/5/paragraph/7 http://www.legislation.gov.uk/uksi/2013/1629/part/7/made
3	**INVESTIGATION and INQUEST** On 02/11/2018 I commenced an investigation into the death of Alex Louise Shaw, aged 12. The investigation concluded at the end of the inquest on 29th April 2021. The conclusion of the inquest was that death was due to complications of therapy for methylmalonic aciduria.
4	**CIRCUMSTANCES OF THE DEATH** Alex Shaw had a medical history of Methylmalonic Acidemia and chronic kidney insufficiency. She was under the care of the Birmingham Children's Hospital. On the 19th October 2018, she presented to the Children's Assessment Unit of the Royal Stoke University Hospital, Stoke-on-Trent with a three day history of vomiting. She was found to be dehydrated and suffering from mild metabolic acidosis. She was provisionally diagnosed with gastritis or gastroenteritis and treated for the metabolic acidosis with intravenous fluids. A loading dose of carnitine was not administered. She was admitted to the children's paediatric ward. The metabolic consultant from the Birmingham Children's Hospital was consulted and in agreement with the management plan and they were contacted throughout her admission. Alex was on regular medications for the management of her condition but they were not immediately written on the drugs charts on the Children's Assessment Unit which resulted in 3 missed doses of oral carnitine and a dose of Allopurinol. This did not contribute to her death. On Sunday 21st October, her lactate level increased and advice was sought from the metabolic consultant. Her heart rate was stable but she continued to vomit. She commenced intravenous bicarbonate at 4.00pm and Intravenous carnitine at 5.30pm the same day. At 6.00pm her heart rate began to rise. She was placed on a heart rate monitor but the time of this was not noted and the metabolic consultant had not been informed. Blood gases at 10.15pm showed that her acid level had not responded. There was a discrepancy as to the timing, but the metabolic consultant had been informed of the blood gas results between 10.30pm and 11.11pm and told that there was a stable heart rate when it was raised. Advice was given to administer a half correction of bicarbonate infusion, to increase the dose of the intravenous sodium bicarbonate injection from 8mmol to 15mmol four times a day, to repeat blood gas after the bicarbonate correction had finished and to give a fluid bolus if haemodynamically unstable.

	After a medical review, Alex was found to be haemodynamically unstable and still vomiting. At 11.00pm, a nasogastric tube was inserted which drained 160ml of greenish coloured aspirate .A fluid bolus was administered at 11.30pm before a CT scan. Before the fluid bolus was given, Alex's chest was examined and found to be clear, and there was no evidence of stress to her heart. Intravenous carnitine was administered at midnight and around the same time; the management plan was discussed with the Intensive Care Consultant who was informed that Alex had been transferred to the High Dependency Unit. Consideration was given for transfer to intensive care unit but it was not considered necessary. A CT scan was completed at 1.00am on Monday 22nd October 2018 which did not find any bowel obstruction. The cause of the bilious vomiting was not identified during the hospital admission. Whilst Alex was breathing faster, there was no evidence that she was suffering from a lack of oxygen at the time of the CT scan. After the CT scan, she was started on a half correction of sodium bicarbonate plus 120% of normal fluid correction. After 2.30am on Monday 22nd October, her oxygen levels had worsened and following review by the Intensive Care Registrar, supplemental oxygen was delivered by a mask. Elective ventilation was not considered necessary prior to 2.30am on Monday 22nd October. A chest x ray was completed and she was diagnosed with pulmonary oedema. The evidence was not able to determine the cause of the pulmonary oedema. Intravenous fluids were stopped apart from the intravenous bicarbonate and she was treated with intravenous furosemide. A decision was made to intubate when she could not manage with oxygen masks alone. The intensive care consultant and anaesthetist were preparing to intubate but her heart rate dropped. Cardiac pulmonary resuscitation was started at 4.08am and a pulse was regained. She was intubated but her heart immediately stopped. Despite chest compression and emergency medication, it was not possible to re-start her heart. The metabolic consultant was contacted when Alex went into cardiac arrest for the second time. Cardiopulmonary resuscitation was stopped at 4.58 hours on the 22nd October 2018 when Alex passed away. A post mortem examination found that death was not due to metabolic acidosis and that there was fluid overload around the lungs, heart and abdominal cavity. The build-up of fluid in and around the lungs resulted in a failure to breathe and led to death. The cause of the bilious vomiting was not identified at post mortem. The free carnitine on the post mortem dried blood spot was 450 umol/L which was within the normal range. The cause of death was: 1a) Fluid overload due to complications of therapy for methylmalonic aciduria and dehydration. 1b) - 1c) - 2) Chronic Kidney Failure
5	**<u>CORONER'S CONCERNS</u>** During the course of the inquest the evidence revealed matters giving rise to concern. In my opinion there is a risk that future deaths will occur unless action is taken. In the circumstances it is my statutory duty to report to you. The **MATTERS OF CONCERN** are as follows. – [BRIEF SUMMARY OF MATTERS OF CONCERN] (1) There was poor communication of the patient's clinical condition/observations between the Registrar at the Royal Stoke University Hospital and the Consultant at the Birmingham Children's Hospital when advice was sought by telephone. There was also poor documentation of the contents of the information that had been provided during that conversation and the timing of when the call was made. The evidence of the Consultant at the Birmingham Children's Hospital was that her advice would have been different if she had been made aware of the patient's rising heart rate. (2) The evidence also revealed that it was a "judgment call" when the clinician felt that a dialogue between clinician's at a different hospital needed to be documented. (3) Consideration should be given as to how a patient's observations are communicated to clinician's between the University Hospital and the Birmingham Children's Hospital, the time, content, advice and documentation of the conversations.

6	**ACTION SHOULD BE TAKEN** In my opinion action should be taken to prevent future deaths and I believe you have the power to take such action.
7	**YOUR RESPONSE** You are under a duty to respond to this report within 56 days of the date of this report, namely by 5th July 2021. I, the coroner, may extend the period. Your response must contain details of action taken or proposed to be taken, setting out the timetable for action. Otherwise you must explain why no action is proposed.
8	**COPIES and PUBLICATION** I have sent a copy of my report to the Chief Coroner and to the following Interested Persons: • [redacted] **(Parents of the deceased).** • **Dickson's Solicitors (Solicitor for the family).** I am also under a duty to send the Chief Coroner a copy of your response and all interested persons who in my opinion should receive it. I may also send a copy of your response to any other person who I believe may find it useful or of interest. The Chief Coroner may publish either or both in a complete or redacted or summary form. He may send a copy of this report to any person who he believes may find it useful or of interest. You may make representations to me, the coroner, at the time of your response, about the release or the publication of your response.
9	07/05/2021 Signature_____ _____ Sarah Murphy HM Assistant Coroner **Stoke-on-Trent & North Staffordshire Coroner's Court**