GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Bae Abertawe
Swansea Bay University Health Board

Guideline for the Prevention, Diagnosis and Management of Hyponatraemia in Labour and the Immediate Postpartum Period

Authors: Eilir Roberts and Susan Williams

Approved by: Intrapartum Forum

Date approved: March 2025

Review Date: March 2028

Summary of document:
Many conditions and situations can lead to hyponatraemia, but the focus of this guideline is on peripartum dilutional hyponatraemia which is hypotonic hyponatraemia. This occurs when a woman/birthing person takes on more fluid of low sodium content than they can excrete leading to dilution of the blood and a fall in sodium concentration. An acute fall in the sodium level can result in cerebral oedema and life-threatening symptoms. Hyponatraemia also having serious implications for the fetus and neonate.

Scope:
The guideline is relevant to all healthcare professionals providing care to women/birthing people in labour on the Central Delivery Suite (CDS) and the immediate post-partum period, as well as to the women/birthing individuals themselves and their carers (where applicable).

Guideline adapted from the 2017 RQIA/GAIN "Guideline for the Prevention, Diagnosis and Management of Hyponatraemia in Labour and the Immediate Postpartum Period":
https://www.rqia.org.uk/RQIA/files/df/dfd57ddd-ceb3-4c0d-9719-8e33e179d0ff.pdf - opens in new tab

Keywords:
Dilutional hyponatraemia, Fluid Balance, Hyponatremia, Hypotonic hyponatraemia, Oxytocin, Sodium Concentration

Glossary of terms:

Glossary of Terms	
ADH	Antidiuretic Hormone
IV	Intravenous
mmolL	Millimole

Key points:
Management and prevention of peripartum hyponatraemia.

Contents

Scope

This guideline applies to all women/birthing individuals who labour and birth on the Central Delivery Suite in Swansea Bay University Health Board and the multi-disciplinary team responsible for providing care.

Aim

The aim of this guidance is prevention, diagnosis, and management of hyponatraemia in labour and the immediate post-partum period, by minimising hyponatremia in the intrapartum period. Many conditions and situations can lead to hyponatraemia, but the focus of this guideline is on peripartum dilutional hyponatraemia which is hypotonic hyponatraemia.

This occurs when a woman/birthing person takes on more fluid of low sodium content than they can excrete leading to dilution of the blood and a fall in sodium concentration. An acute fall in the sodium level can result in cerebral oedema and life-threatening symptoms. Maternal hyponatraemia also has serious implications for the fetus and neonate.

Objectives

The aim of this document will be achieved by the following objectives:

- To reduce the risk of hyponatraemia through the expedients of:
    - Increased awareness
    - Accurate fluid balance monitoring
    - Earlier detection

Background

Women and birthing individuals in labour are at an increased risk of developing hyponatraemia compared to non-pregnant women. This heightened risk is due to a lower baseline plasma sodium level, a diminished ability to excrete water in the third trimester, and the antidiuretic effects of both natural and synthetic oxytocin.

Early reports linked cases of hyponatraemia to the administration of large volumes of hypotonic intravenous fluids, most commonly 5% dextrose, used as a carrier solution for oxytocin. In response, more concentrated oxytocin infusions with sodium-containing solutions as diluents were adopted. However, cases of dilutional hyponatraemia continue to occur, posing serious risks to neonates, including seizures and apnoea, all attributable to dilutional hyponatraemia. Notably, many mothers or parents of neonates affected by hyponatraemia were asymptomatic or displayed only mild, non-specific symptoms, despite the severity of the condition.

An observational study of Swedish women in labour found an 8% incidence of hyponatraemia at birth, with all affected women being asymptomatic. This suggests that relying solely on symptomatic presentation to identify cases of peripartum hyponatraemia may lead to underestimation of its incidence, as the majority of cases are either asymptomatic or present with symptoms so subtle that they go unrecognised.

In late pregnancy, the ability to excrete excess free water is reduced, a condition exacerbated during labour by elevated levels of antidiuretic hormone and the additional antidiuretic effect of oxytocin. As a result, women and birthing individuals in labour are more likely to retain water, increasing the likelihood of hyponatraemia if excess fluid is administered or consumed. Another significant peripartum risk factor is the total volume of fluid intake during labour, both intravenous and oral. This risk applies to both midwifery-led and obstetric-led care. As the volume of fluids received during labour increases, so too does the risk of maternal hyponatraemia.

- Women and birthing individuals receiving less than 1 litre of fluid during labour are less likely to develop hyponatraemia compared to those who receive more than 2.5 litres (1% vs 26%). While the association between hyponatraemia and the use of large volumes of hypotonic intravenous fluids and oxytocin for induction and augmentation of labour is well documented, recent cases have shown that hyponatraemia can also result from excessive oral fluid intake, even in settings where little or no oxytocin or intravenous fluids were administered.

Fluid and Electrolyte Balance in Pregnancy

During pregnancy, blood sodium concentration and osmolality are lower, with 130-140 mmol/L considered the normal range, compared to 135-145 mmol/L in non-

pregnant adults. In this guideline, hyponatraemia in pregnancy is defined as a blood sodium concentration below 130 mmol/L.

Lower baseline plasma sodium

Physiological changes affecting fluid and electrolyte balance begin as early as six weeks into pregnancy. These changes include increased renal blood flow, plasma volume expansion, and sodium retention. Consequently, normal pregnancy is characterised by a positive sodium and water balance, with an additional 7-10 litres of total body water accumulated by term. The regulatory mechanisms underlying these changes are complex, involving adaptations in the renin-angiotensin-aldosterone system and a resetting of the osmotic threshold for antidiuretic hormone (ADH) release. Blood osmolality is tightly regulated, typically maintained around 285 Osm/L in non-pregnant adults. In cases of dehydration, blood osmolality increases, prompting the secretion of ADH from the posterior pituitary gland, which then binds to receptors in the kidneys, causing water reabsorption and a subsequent decrease in blood osmolality as volume is restored. Conversely, with excessive water intake, blood osmolality decreases, reducing ADH secretion, leading to increased urine excretion and a subsequent rise in blood osmolality. During pregnancy, blood osmolality is lower, around 280 Osm/L, with physiological mechanisms—including lower thirst and ADH secretion thresholds—working to maintain this balance.

Oxytocin

Antidiuretic effect of oxytocin is the hormone responsible for uterine contractions. Secreted from the posterior pituitary gland it has a structure similar to ADH giving it an antidiuretic action at high concentrations. In labour higher quantities of endogenous oxytocin are present and synthetic oxytocin is commonly administered intravenously to induce or augment labour. Oxytocin can contribute to dilutional hyponatraemia when large volumes of sodium free fluids are consumed or given intravenously simultaneously. This is compounded in late pregnancy by a reduced ability to excrete excess water. Impaired ability to excrete water in the third trimester. During the first and second trimesters women/birthing people are able to excrete excess fluid in the urine as effectively as nonpregnant adults. In the third trimester this ability to excrete excess water is reduced, predisposing to fluid retention.

Impaired Ability to Excrete Water in the Third Trimester

During the first and second trimesters, women and birthing individuals can excrete excess fluid in the urine as effectively as non-pregnant adults. However, this ability is reduced in the third trimester, leading to a predisposition for fluid retention.

Signs and Symptoms of Hyponatraemia

If hyponatraemia is suspected, a Point of Care Test is indicated. The signs and symptoms of hyponatraemia are primarily related to central nervous system dysfunction and may include:

- Anorexia (loss of appetite)
- Nausea
- Lethargy
- Apathy
- Headache

These early symptoms are non-specific and may be misattributed to pregnancy, labour, or common conditions such as pre-eclampsia.

More advanced symptoms may include:

- Disorientation
- Agitation
- Seizures
- Depressed reflexes
- Focal neurological deficits
- Cheyne-Stokes respiration
- Coma

The severity of symptoms typically correlates with the degree of hyponatraemia and the speed of change in sodium concentration. Rapid changes can cause fluid shifts between extracellular and intracellular compartments, without sufficient time for physiological compensation, leading to acute symptoms.

Prevention and Diagnosis of Hyponatraemia in Labour

Maternal dilutional hyponatraemia during labour can be prevented by maintaining a neutral fluid balance. This condition can be identified through careful fluid balance monitoring, clear documentation, and blood sodium testing when necessary. Healthy women and birthing individuals in labour who maintain a neutral fluid balance are at low risk of developing hyponatraemia. However, as fluid intake during labour increases, so does the risk of hyponatraemia.

- Women and birthing individuals who have a fluid intake of up to 1 litre during labour have a 1% incidence of hyponatraemia at birth.
- Intake of between 1 to 2.5 litres increases the incidence to 5%.
- Intake above 2.5 litres results in a 26% incidence of hyponatraemia.

In cases of hyponatraemia, a thorough review of the clinical history, medications, and fluid input and output is necessary to establish the cause. Alternative causes of hyponatraemia should always be considered, particularly in cases of severe hyponatraemia, where concurrent illness exists or symptoms and laboratory results pre-date labour. Blood osmolality, urine sodium, and urine osmolality tests are valuable tools in determining the underlying cause of hyponatraemia.

Guidance for the care of women/birthing people during intrapartum/peripartum period on the Central Delivery Suite:

1. The importance of accurate fluid balance monitoring during labour should be explained to all women/birthing people.
2. All fluid balance observations should be recorded on the fluid balance chart.

3. Women/birthing people should have oral intake documented at least four hourly.
4. Women/birthing people should have intravenous (IV) fluid intake documented hourly.
5. IV fluids must have a prescribed reason documented in the maternity notes.
6. IV fluids must be prescribed in millilitres (ml) per hour.
7. IV fluids must be administered via volumetric pumps (in exceptional circumstances such as fluid resuscitation during haemorrhage this can be waived).
8. IV fluids should not routinely be prescribed for the treatment of ketosis in non-diabetic women/birthing people.
9. Women/birthing people should be encouraged to void 2-4 hourly and to have urine output volume measured and recorded.
10. Women/birthing people should have other fluid losses measured and recorded including vomit, and measured blood loss.
11. Women/birthing people require sodium monitoring (Peripartum Sodium Monitoring Pathway) if they are:
    - On an oxytocin infusion (includes induction and augmentation of labour, treatment of postpartum haemorrhage)
    - In labour and require IV insulin and dextrose.
    - Noted to have a blood sodium below 130 mmolL for any reason. ➢ Greater than 1500 mls positive on their fluid balance chart.

Sodium Monitoring Peripartum

When an oxytocin infusion is commenced a blood sodium level should be checked using a serum blood test (yellow top – urea and electrolyte). It is not necessary to await the result prior to starting the infusion. **Where an oxytocin infusion is commenced as prophylaxis against uterine atony in the setting of Planned Caesarean Birth sodium monitoring is not routinely required**.

It is essential that blood samples are not taken from a limb attached to an intravenous infusion as this may lead to inaccurate results. Results should be referenced against the Peripartum Sodium Monitoring Pathway to guide frequency of repeat testing and further management (Appendix 1). All women requiring intravenous insulin and dextrose infusions during labour should have a blood sodium level checked at least four hourly.

Where blood sodium is equal to or greater than 130 mmolL further testing is necessary 8 hourly unless either of the following occurs:

- the change in sodium concentration has been greater than 1 mmolL per hour (eg. 10mmolL over 8 hours), this rapid fall in sodium increases the risk of developing symptoms and so 4 hourly testing is necessary.
- a positive fluid balance of more than 1500mls is reached: this necessitates an immediate repeat sodium check.

The neonatal team should be made aware of babies born to hyponatraemic mothers/parents – with a consideration of paired cord blood sampling.

In cases where the maternal sodium is below 125 mmolL oxytocin should be stopped while senior clinical advice is sought. The decision regarding further oxytocin administration should be made following assessment of the woman/birthing persons clinical condition and circumstances after discussion with a consultant obstetrician. Following birth if a woman/birthing person remains on an oxytocin infusion, for example as treatment for postpartum haemorrhage, they should remain on the Peripartum Sodium Monitoring Pathway.

Postpartum

Once a woman/birthing person has a blood sodium level equal to or greater than 130 mmolL no further sodium checks are necessary unless clinically indicated. If a woman has a sodium level below 130 mmolL they should be reviewed by the obstetric team and consideration given to alternative causes, the clinical condition and the severity of the hyponatraemia, and a decision made as to whether they are suitable for discharge.

Management of Symptomatic Hyponatraemia

In a woman/birthing person with significant clinical symptoms believed to be due to hyponatraemia (for instance, seizures or loss of consciousness), 200 mls of 2.7% sodium chloride should be given immediately as an IV bolus over 30 minutes. Consider co-administration of 20 mg IV furosemide if there is any evidence of fluid overload. This will raise serum sodium by approximately 2 – 4 mmolL and will reduce cerebral oedema.

The assistance of an experienced clinician should be sought to guide further treatment. Senior members of obstetric and anaesthetic teams should be involved. Following administration of hypertonic saline it is necessary to monitor sodium levels 2 - 4 hourly. Rapid increases in blood sodium concentration can cause serious harm including central pontine myelinolysis. Therefore, the level should rise by no more than 12 mmolL in a 24-hour period.

References

1. Moen V, Brudin L, Rundgren M, Irestedt L. Hyponatrameia complicating labour-rare or unrecognised? A prospective observational study. BJOG. 2099 116:552-56

2. GAIN Guideline for the Prevention, Diagnosis and Management of Hyponatraemia in Labour and the Immediate Postpartum Period. March 2017. www.rqia.uk/GAIN ISBN:978-1-906805-36-4

3. NHS Resolutions. Case story: Understanding the risk of maternal and neonatal hyponatraemia.

4. R Barr, C Curry, G Fitzpatrick and M Molloy. Intravenous Fluids in Labour: An Improvement in Practice. International Journal of Obstetric Anesthesia. May 2014. Supplement 1 P35:S30.

5. Bilek W, Dorr P. Water intoxication and grand mal seizure due to oxytocin. C.M.A Journal. 1970. 103:379-382

6. Mckenna P, Shaw RW. Hyponatremic fits in oxytocin augmented labors. Int J Gynaecol Obst. 1979. 17:250-252

7. Singhi SC, Chookang E. Maternal fluid overload during labour; transplacental hyponatraemia and risk of transient neonatal tachypnoea in term infants. Archives of Disease in Childhood. 1984. 59:1155-1158.

8. Bergum D. Lonnée H, Hakli TF. Oxytocin infusion: acute hyponatraemia, seizures and coma.
Acta Anaesthesiol Scand. 53:826-827. 2009.

9. Halaweh SAA, Aloweidi AS, Quadaisat IY, Al-Kazaleh FA. Iatrogenic water intoxication in healthy parturient causing convulsions and fractured mandible. Saudi Med jnl. 2014. 35(2):192194.

10. Johansson S, Lindow S, Kapadia Hand Norman M. Perinatal water intoxication due to excessive oral intake during labour. Acta Pñ diatr 91: 811± 814. 2002.

11. Robert KM, Funk D, Margarites C. Acute postpartum altered mental status. Air Medical Journal Associates. 2007. 27:3

12. Green A, Popham P. Hyponatraemia complicating vaginal delivery. International Journal of Obstetric Anesthesia. 2008. 17:93-94.

13. Graham K, Palmer J. Severe hyponatraemia as a result of primary polydipsia in labour.
Australian and New Zealand Journal of Obstetrics and Gynaecology. 2004. 44:586-587.

14. Aldana-Valenzuela C, Prieto-Pantoja JA, Hernandez-Acevedo A. Oxitocina y síndrome de secreción inapropiada de hormona antidiurética neonatal. Reporte de un caso de hiponatremia severa temprana y revisión de la bibliografía. Ginecol Obstet Mex. 2010;78(12):692-696

15. West CR, Harding JE. Maternal water intoxication as a cause of neonatal seizures. J. Paediatric Child health. 2004. 40:709-710. 24

16. Chapman TH, Hamilton M. Water intoxication presenting as maternal and neonatal seizures: a case report. Journal of medical Case Reports. 2008. 2:366.

17. Kamdar T, Burton DJ. Acute hyponatraemia in labour secondary to water intoxication: a case report. BJOG: E-posters, labour and Obstetric Complications. 2015. Pg 184.

18. Walter KN, Montgomery J, Amess P, Rabe H. Hyponatraemia and brain oedema in newborns following oral water intoxication during prolonged labour. Klinische Paädiatrie. 2012. 224(4):266267

19. Paech MJ. Convulsions in a healthy parturient due to intrapartum water intoxication. IJOA. 1998. 7:59-61.

20. Jellema J, Balt J, Broeze K, Scheele F, Weijmer M. Hyponatraemia during pregnancy. The Internet Journal of Gynecology and Obstetrics. 12(1): 1-6.

21. Tarnow-Mordi WO, Shaw JCL, Liu D, Gardner DA, Flynn FV. Iatrogenic hyponatraemia of the newborn due to maternal fluid overload: a prospective study. BMJ. 1981 283:639-643

22. Spencer SA, Mann NP, Smith ML, Woolfson AMJ, Benson S. The effect of intravenous therapyduring labour on maternal and cord serum sodium levels. BR J Obstet Gynaecol. 1981 88:480-483.

23. Singhi S, Singh M. Asymptomatic transplacental hyponatraemia following oxytocin infusion during labour. Indian J Med Res 1979;70:55-7.

24. Dahlenburg GW, Burnell RH, Braybrook R. The relationship between cord serum sodium levels in newborn infants and maternal intravenous fluid therapy. Br J Obstet Gynaecol 1980;87:51922.

25. Nelson-Piercy, C. Handbook of Obstetric Medicine 5th Edition. London: CRC press. 2015.

26. Shakmatova EI, Osipova NA, Natochin YV. Changes in osmolality and blood serum ion concentrations in pregnancy. Hum Physiology. 2000 26:92

27. Abassi-Ghanavanti M, Greer LG, Cunningham FG; Pregnancy and laboratory studies. Obstetrics & Gynecology. 2009 14(6): 1326-1331.

28. Larsson A, Palm M, Hansson LO, Axelsson O. Reference values for clinical chemistry tests during normal pregnancy. BJOG 2008; 115:874-81.

29. Moen, V, Brudin, L, Rundgren M, Irestedt, L. Hyponatraemia complicating labour - rare or unrecognized? A prospective observational study. BJOG. 2009 116:552- 561. 25

30. Lind T. Fluid balance during labour a review. Journal of the Royal Society of Medicine. 1983. 76:870-875.

31. Hytten FE, Klopper AI. Response to a water load in pregnancy. J Obstet Gynaecol Br Commonw. 70:811-6, 1963 Oct.

32. Smith JG, Merrill DC. Oxytocin for induction of labour. Clinical Obstetrics and Gynecology. 49(3):594-608.

33. Siba P, Basude S, Smith-Collins A. Maternal over hydration in labour can cause dilutional hyponatremia in neonates. Indian Journal of Pediatrics. 2014. 81(7):637- 638

34. Singata M, Tranmer J, Gyte GML. Restricting oral fluid and food intake in labour (Review). Cochrane Database of Systematic Reviews. 2013 Iss 8.

35. Advice for Guideline Development in Northern Ireland (2016) 34.Hytten FE; Thomson AM; Taggart N.Total body water in normal pregnancy. Journal of Obstetrics & Gynaecology of the British Commonwealth. 73(4):553-61, 1966.

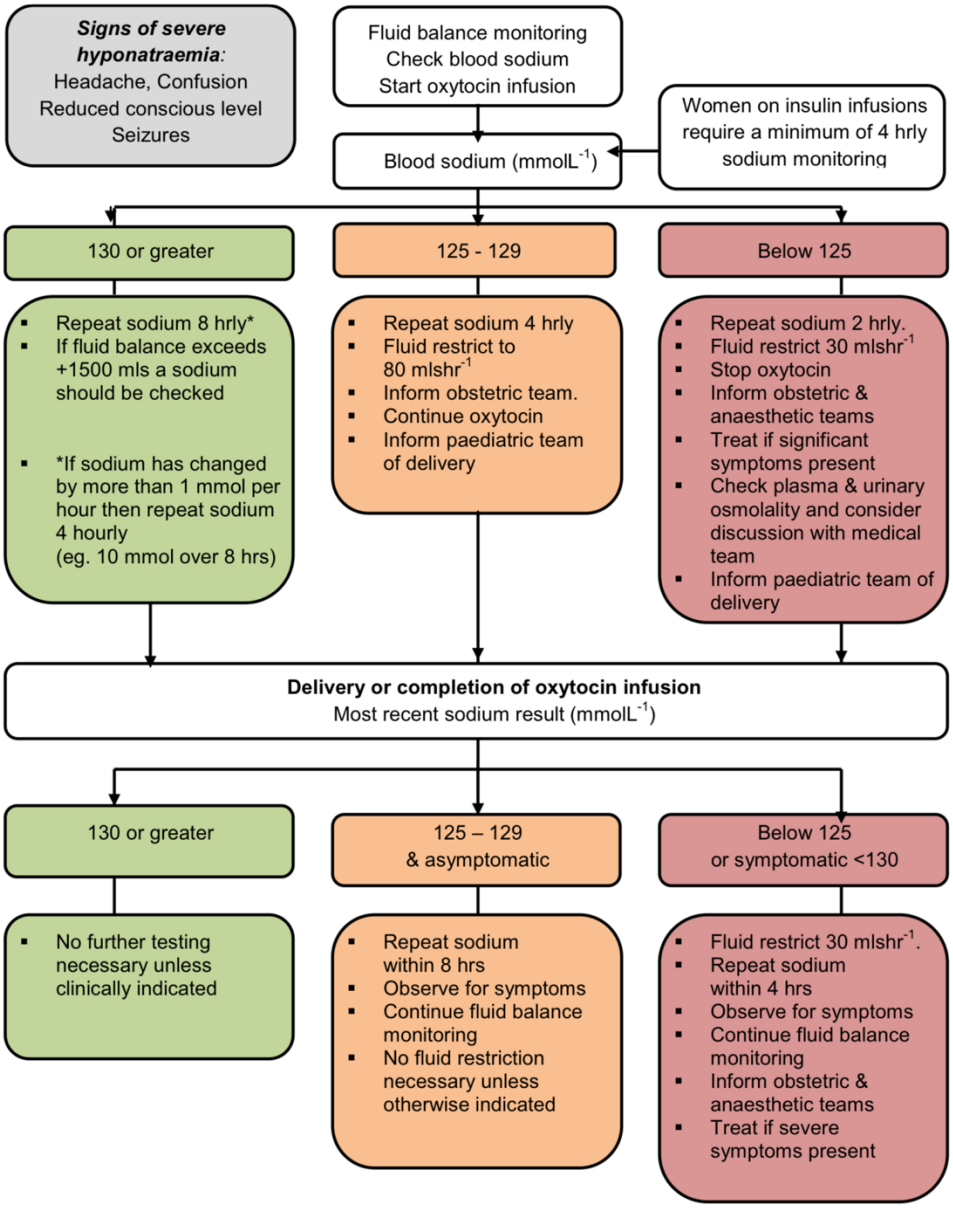
36. Lindheimer MD. Osmoregulation of thirst and vasopressin release in pregnancy. Am J Physiol 1989;257:F159-69. 36.Lindheimer MD, Davison JM. Osmoregulation, the secretion of arginine vasopressin and its metabolism during pregnancy. Eur J Endocrinol 1995;132:133-43

Appendix 1 – Peripartum Sodium Monitoring Pathway

Peripartum sodium monitoring pathway

Women require sodium monitoring if they are:

a. On an oxytocin infusion (includes induction and augmentation of labour, treatment of postpartum haemorrhage)
b. In labour and require IV insulin and dextrose.
c. Noted to have a blood sodium below 130 mmolL^{-1} for any reason.
d. Greater than 1500 mls positive on their fluid balance.



In a woman/birthing person with significant clinical symptoms believed to be due to hyponatraemia (for instance, seizures or loss of consciousness), 200 mls of 2.7% sodium chloride should be given immediately as an IV bolus over 30 minutes.

For routine bloods (e.g., commencing Oxytocin infusion) please send Urea and Electrolytes – Serum laboratory test For urgent bloods (e.g., signs of severe hyponatraemia) please take a Point of Care Testing (POCT) sample.

Maternity Services Checklist for Clinical Guidelines being Submitted for Approval by Maternity Quality & Safety Group

Title of Guideline:	Guideline for the Prevention, Diagnosis and Management of Hyponatraemia in Labour and the Immediate Postpartum Period
Name(s) of Author:	Eilir Roberts & Susan Williams
Chair of Group or Committee approving submission:	Intrapartum Forum
Brief outline giving reasons for document being submitted for ratification	
Details of persons included in consultation process:	
Name of Pharmacist (mandatory if drugs involved):	
Issue / Version No:	1
Please list any policies/guidelines this document will supercede:	
Date approved by Group:	March 2025
Next Review / Guideline Expiry:	March 2028
Please indicate key words you wish to be linked to document	Obstetrics, Hyponatraemia
File Name: Used to locate where file is stores on hard drive	