Jack is at the children's hospital for a myringotomy and insertion of grommets day case surgery: A case study --Manuscript Final Draft-

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Abstract

This evidence based case study will follow a two-year-old child through the nursing assessment on the day of their elective surgery at the children's hospital; for myringotomy and insertion of grommets under general anaesthesia; through to his arrival accompanied by a parent at the operating room doors. Potential pre-operative problems will be identified and two problems with nursing interventions will be discussed in detail. This case study is based on a real case with any identifiers removed as well as a fictitious name being introduced to preserve anonymity.

Background

Jack, a two-year-old boy was seen by his family General Practitioner (GP) due to recurrent middle ear infections known as otitis media with effusion (OME). The GP carried out a general assessment, including otoscopy, tympanometry and developmental status. Jack was subsequently referred for a hearing test and monitored for a period of three months. Following this, due to continued OME, notable hearing loss and developmental delays it was decided that Jack would benefit from a referral to an ENT consultant with a view to the elective procedure of myringotomy and insertion of grommets (National Institute for Health and Care Excellence (NICE), 2020).

Myringotomy and grommet insertion is one of the most common referrals for elective surgery in paediatrics (Steele *et al.*, 2017). The procedure is relatively short and performed safely under general anaesthetic as a day case. It involves making an incision in the tympanic membrane, allowing access to the middle ear and drainage of fluid (myringotomy) (Robinson and Engelhardt, 2017). The tiny drainage tube, known as a grommet, is then placed in the tympanic membrane to allow for the fluid to continue to drain and air to circulate following surgery (Robinson and Engelhardt, 2017; Health Information and Quality Authority (HIQA), 2013). The grommet usually remains in place for at least six months to a year. Sometimes fluid can build up again within the ear, causing hearing and secondary speech problems. If these problems occur the procedure may need to be repeated.

According to NICE (2020) guidelines, grommets are recommended for children who experience repeated episodes of bilateral OME, in addition to reduced hearing and speech problems. OME is known as 'glue ear' as the child's middle ear becomes obstructed with fluid which resembles glue (NICE, 2020). There are usually no signs of infection present. Recurrent acute otitis media (when an infection is present in the middle ear) is also an indication for grommets, however the benefits for this indication are less transparent (Van Brink and Gisselsson-Solen, 2019; Venekamp *et al.*, 2018). OME can lead to hearing loss, which in turn can lead to developmental delays (NICE, 2020; Ball *et al.*, 2019). OME is extremely common in young children, particularly before school age (Murray *et al.*, 2019). It's also commonly seen in children who have Downs Syndrome and children with a cleft palate (Rosenfeld *et al.*, 2016).

Nursing Assessment:

Jack was admitted through the surgical day ward on the morning of his bilateral grommet procedure. The nurse introduced themself to Jack and his mother and orientates them to the ward. Following admission, the nurse records any relevant medical history, allergies and fasting status (Our Lady's Children's Hospital, Crumlin (OLCHC), 2018a). The responsible nurse carries out the assessment as per the Nursing and Midwifery Board of Ireland (NMBI) (2014), code of professional conduct and ethics, to ensure dignity and professionalism is upheld at all times. Jack receives two patient identification bracelets and his height and weight are recorded and double checked by two nurses in accordance with hospital policy and best practice (OLCHC, 2018a; RCN, 2017a). The nurse also confirms with the mother that Jack has been fasting for the appropriate amount of time. This ensures that Jack is not at risk of aspiration due to non-compliance with the fasting guidelines and also that he is not fasting for a long period (Ball *et al.*, 2019; Dennhardt *et al.*, 2016).

The nurse ensures consent has been obtained from the parent and assures Jack of his assent before carrying out baseline observations utilising the A-E (Airway, Breathing, Circulation, Disability and Environment) framework (Resuscitation Council UK, 2020). Results are recorded in the Paediatric Early Warning Score (PEWS) chart for 1-4 years (Health Service Executive (HSE), 2017).

Airway: Jack is speaking to his mother and therefore shows no signs of airway occlusion. The nurse listens and observes carefully for any abnormal respiratory signs of stridor, wheeze or grunting (RCN, 2017b). These signs are absent meaning there are no concerns about Jack's airway.

Breathing: As children less than seven years are primarily abdominal breathers, Jack's rate of breathing is assessed by counting his abdominal movements for one full minute (RCN, 2017b). Jack's respiratory rate is noted to be 39 breaths per minute which is within the normal range for his age (20 to 40 breaths per minute) (HSE, 2017). Respiratory movements are symmetrical and there is no evidence of any intercostal or subcostal recessions (Macqueen, Bruce & Gibson, 2012). A pulse oximeter is applied to measure Jack's oxygen saturation, a reading of 98 percent is obtained indicating a normal (above 94 percent) oxygen saturation level which indicates a score of zero on the PEWS chart (HSE, 2017).

Circulation: Since Jack is over two years of age, his pulse and Heart Rate (HR) can be measured at the radial site on his wrist rather than at the heart apex (RCN, 2017b). The artery is palpated by placing the nurse's first two finger tips gently upon his radial pulse. The rate, rhythm and depth of his pulse are noted by counting for one full minute for accuracy (Macqueen, Bruce and Gibson, 2012). Jack has a strong steady pulse and a HR of 120 beats per minute, which again is within the normal range of 130 to 180 beats per minute for his age (HSE, 2017). Jack's central capillary refill time (CRT) is checked by pressing on his forehead for five seconds and counting the refill time (RCN, 2017). Jack's refill rate is under two seconds which is within the normal range (HSE, 2017). His skin colour is pink and he appears well perfused, meaning that Jack is well hydrated prior to his surgery.

Jack's blood pressure (BP) is measured using an electronic device through the selection of the correct sized cuff for his arm (RCN, 2017b). His reading was slightly elevated at 112/80 millimetres of mercury. Jack became upset while his BP was being recorded which may have had an effect on the reading (Ball *et al.*, 2019). Following a period of ten minutes relaxation his BP was retaken and it was 105/75, which was more within the normal range for his age (HSE, 2017).

Disability: This section assesses level of consciousness by using the Alert, Voice, Pain and Unresponsive (AVPU) scale. Jack is awake and speaking to his mother; it is noted in the chart that he is alert (HSE, 2017).

Environment: Jack's temperature is taken using a child sized tympanic thermometer (RCN, 2017), it is 36.9 degrees Celsius (within the normal range) (HSE, 2017). Any elevation in temperature is important to note as contraindications to paediatric ambulatory surgery include an active infection (Robinson and Engelhardt, 2017). Pyrexia prior to surgery may also lead to post-operative complications (Macqueen, Bruce and Gibson, 2012).

The nurse notes that Jack's mother does not have any concerns regarding his health at the moment; which is a unique feature of the Irish PEWS since it allows for any parental concern to be recorded (HSE, 2017). Following Jack's full assessment, an overall PEWS score is calculated by adding the score from each parameter: concern from the parents or clinician, respiratory rate, respiratory effort, oxygen therapy, oxygen saturation, HR, CRT, BP and level of consciousness (HSE, 2017). Temperature and skin colour are non-scoring parameters but the

results may trigger the sepsis pathway if required (HSE, 2017). The score determines how frequently observations should be taken and whether there is a need to escalate to the nurse in charge, or if medical review is required (HSE, 2017). Clinical judgement should be taken into account at all times, regardless of the PEWS score (HSE, 2017). Jack's score was zero without any signs of active infection indicating his observations are optimal for surgery to proceed as planned (Robinson and Engelhardt, 2017).

A secondary assessment is typically carried out prior to admission for grommet insertion (Easto *et al.*, 2016). The secondary assessment is to confirm the diagnosis of OME, it involves clinical review by a GP or in a specialist clinic where otoscopy and tympanometry can be carried out (Rosenfeld *et al.*, 2016). In recurrent OME with hearing loss, children are often referred to an Otolaryngologist for an audiological assessment (Easto *et al.*, 2016). Generally two audiograms are required three months apart and within three months of surgery (Easto *et al.*, 2016; HIQA, 2013).

Potential problems and nursing interventions:

Although elective surgery is planned there are still risks associated with the procedure and undergoing general anaesthesia (Ball *et al.*, 2019). The nurse identifies potential problems, utilising NANDA International as guidance (NANDA-I, 2019; Johnson *et al.* 2006). Two sample problems will be explored in detail, focusing on the nursing interventions required:

1. Potential problem: Risk of anxiety.

Goal: Jack and his parents will be well prepared and exhibit behaviours which indicate low levels of anxiety prior to his elective surgery (Ball *et al.*, 2019).

2. Potential problem: *Risk of fluid volume imbalance and risk of unstable blood glucose* (Johnson *et al.*, 2006).

Goal: Jack will maintain adequate hydration and will not fast for longer than required; fluid volume and blood glucose levels will remain within the normal range (Ball *et al.*, 2019).

3. Potential problem: Risk of pain.

Goal: Jack will be provided with pain relief when required to provide comfort pre and postsurgery. His pain levels will be managed effectively through regular pain assessment and active management through pharmacological and non-pharmacological means (Ball *et al.*, 2019).

4. Potential problem: *Risk of infection*.

Goal: Any risk of infection will be minimised to avoid Jack developing any infection postsurgery and optimal wound healing will be promoted (Ball *et al.*, 2019).

Problem 1: Risk of anxiety

Preoperative anxiety is commonly experienced in children undergoing elective surgery (Dai and Livesley, 2018). The nursing goal is to ensure Jack and his parents do not experience anxiety. Research has shown that if anxiety is not controlled it may have negative consequences post-surgery; such as behavioural problems, delay in the healing process and increased pain levels (Pomicino, Maccacari and Buchini, 2018; Al-Yateem *et al.*, 2016; He *et al.*, 2015a).

The nurse will ensure the goal is met by carrying out an array of nursing interventions. As grommet insertion is an elective surgery, it is important that the family are made aware of the preparation material available (Trigg and Mohammed, 2010). For example, there are videos available on the Children's Health Ireland (CHI), at Temple Street website, titled 'Ben and Tara's visits to the hospital' (CHI, Temple Street, 2020). This allows the child to prepare for surgery by following Tara and Ben's journey through the elective surgery process; from what assessments the nurse will do preoperatively to what to expect when they return from surgery.

On the day of admission, the nurse introduces themself to Jack and his mother. The family are encouraged to voice any concerns they may have and questions answered in an effort to build a strong rapport from the beginning (Ball *et al.*, 2019). The principles of Child and Family Centred Care (CFCC) which are evident within the hospital mean that the nurse takes into account how the procedure is going to impact them as a family (Park *et al.*, 2018). This can be a stressful time for the parents and often, if not managed appropriately, the stress can be transferred to the child (Pomicino, Maccacari and Buchini, 2018; Short and Gordon, 2015).

Research has shown the importance of getting to know the family to ensure the strategies being implemented are suitable to their needs and cultural values (Dai and Livesley, 2018; Bray, Callery and Kirk, 2012). The level of information to be provided and the extent to which the child should be involved is discussed, as providing too much information may cause additional

anxiety in some children (Bray, Callery and Kirk, 2012). The nurse speaks to Jack in age appropriate language to determine his interests, such as favourite toys and games. In addition to building a relationship with Jack, this information can be used later to help explain the procedure to him (Ball *et al.*, 2019). After spending some time with the family the nurse determines that Jack likes to look at picture books and has a teddy which he uses as a comforter.

Once a relationship has been established the nurse explains to Jack what the surgery will involve using a doll and equipment. She allows Jack to play with the doll himself and explains what will happen when he goes to surgery and what to expect afterwards (Ball *et al.*, 2019). The nurse also shows Jack a book which illustrates a boy going for surgery. Research suggests that therapeutic play which involves multiple components can reduce preoperative anxiety (Dai and Livesley, 2018). Nonetheless, in a study carried out by He *et al.* (2015b), it was found that although therapeutic play was beneficial for the child it did not reduce the parents' anxiety. Therefore the nurse is cognisant of the mother displaying behaviour which may suggest anxiety. She provides her with additional information on the surgery and encourages her to ask questions (Pomicino, Maccacari and Buchini, 2018).

Despite the nurses' efforts, Jack is still anxious and unsettled. At this stage, recognising their limitations, a play specialist is involved (OLCHC, 2018b; Macqueen, Bruce and Gibson, 2012). The play specialist utilises distraction techniques and blows bubbles with Jack to help him take deep breaths; as a result he displays an overall sense of calmness (White, 2017; Hockenberry, Wilson and Rodgers, 2017).

The nurse speaks to Jack's mother regarding her wishes to attend theatre with Jack, while he receives anaesthesia. It's important to discuss this topic as although it may help ease anxiety for the child, some parents can find the process of their child being anaesthetised distressing (Pomicino, Maccacari and Buchini, 2018). In addition, this anxiety can then be transferred to the child (Short and Gordon, 2015). Jack's mother wishes to accompany him therefore the nurse ensures she is well prepared and knows what to expect. The nurse accompanies Jack and his mother as far as the operating theatre check-in desk. Despite still showing slight signs of anxiety the family appear prepared and at ease overall, illustrating that the goals associated with this problem have been met.

Problem 2: Risks associated with pre-operative fasting:

Fasting is necessary prior to undergoing general anaesthesia in order to reduce the risk of pulmonary aspiration of stomach contents (Dennhardt *et al.*, 2016). The reflex which normally protects the airway is lost while under sedation (Toms and Rai, 2019). The Children's Health Ireland (CHI) at Crumlin guidelines for fasting are as follows; clear fluids one hour, breast milk four hours and solid food (including milk) six hours prior to surgery (OLCHC, 2018c). Despite the recommendations studies have shown that children often exceed the fasting guidelines (Tagg, 2018). The importance of scheduling practical operation times and communication of associated fasting times to children and their parents, in language they can understand, are extremely important in order to achieve compliance (National Adult Literacy Agency (NALA), 2019).

Children are particularly vulnerable to the effects of fasting as they are at increased risk of hypovolemia, dehydration, hypoglycaemia, irritability and catabolic metabolism (Ball *et al.*, 2019; Dennhardt *et al.*, 2016). Hypovolemia is of a particular concern as infants have a reduced ability to conserve fluids (Ball *at al.*, 2019). This is coupled with the fact that fluid loss from bleeding during surgery can further deplete fluid volume (Ball *at al.*, 2019). Due to these adverse effects extensive research has been carried out in a bid to reduce fasting time within safe and reasonable limits (Tagg, 2018; Dennhardt *et al.*, 2016). The nurse is conscious of the risks of prolonged fasting and ensures interventions are implemented so that Jack will not fast longer than is necessary.

Jack is admitted to the day unit on the morning of his surgery as his procedure is due to take place at 11:00 hrs. While speaking to Jack and his mother, the nurse learns that Jack has been fasting since 21:00hrs the previous night. The mother explains that she was worried and wanted to ensure that Jack was within the fasting times. Jack is irritable and lethargic. As per the CHI at Crumlin guidelines (OLCHC, 2018c), the nurse explains that Jack can sip on some apple juice up to one hour prior to his surgery as "*approximately 3mls/kg/hour is acceptable up to a maximum of 200mls/hour*" (OLCHC, 2018c, pp.2). Jack's weight on admission was 12.5 Kg. therefore he is allowed up to 37.5 millilitres per hour (up to one hour prior to surgery). The juice helps to increase overall fluid volume, thus reducing the risk of hypovolemia and dehydration. It also helps to increase insulin levels, minimises glycogen store depletion and negates the risk of hypoglycaemia (Tagg, 2018).

Communication is fundamental when mitigating the risks associated with preoperative fasting. Elective surgery can be delayed for a number of reasons; causing the fasting time to be prolonged longer than is necessary (Andersson, Hellstrom and Frykholm, 2018). The nurse maintains communication with the theatre staff to ensure the family are informed of any delays. The nurse notes that Jack was not called for surgery at 11:00 hrs as expected. The operating theatre is contacted and the nurse is informed that Jack's surgery would be delayed by a further hour and a half. Taking this information into account the nurse informs the family and allows Jack to have some more apple juice (up to 37.5 mls.). This approach helps ease anxiety for the family and results in Jack's fasting time not being prolonged and prevents further complications of hypoglycaemia, hypovolemia or dehydration (Macqueen, Bruce and Gibson, 2012).

Clear communication with Jack's parents regarding the fasting timelines and why it is necessary for their child to fast is also crucial (NALA, 2019). In the pre-operative period, prior to admission parents can often be very anxious which can lead to a lack of understanding and non-compliance with fasting guidelines (Kushnir *et al.*, 2015). Taking this into account the nurse utilises a simple repeat back technique by asking Jack's mother to repeat the information provided to ensure comprehension (Yen and Leasure, 2019).

Jack is transferred to the operating theatre safely. Due to implementing the nursing interventions, he has not fasted longer than required and he is not showing signs of dehydration, hypovolemia or hypoglycaemia. The healthcare professionals in the operating theatre department have now assumed care for Jack and the nurse ensures the parent's contact details are accurate and recorded, in anticipation for the phone call to return and retrieve Jack following his surgery. Jack will be discharged home once he has recovered from his surgery, has been clinically reviewed and found to be satisfactory.

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