# Resource 6: PeriAnesthesia Care of the Pediatric Client

This Pediatric Resource is not intended for use in exclusion, but along with other standards, resources and the overall framework of PeriAnesthesia nursing practice found in this *Standards for Practice* document.

## I. Background

PeriAnesthesia nursing care of the pediatric client requires indepth knowledge of this specialized field attained through professional experience, ongoing professional development and education, and by continuously adapting to and incorporating best practice standards as they apply to the pediatric setting.

The American Society of Pediatric Nurses states, “Nurses caring for pediatric patients must have appropriate education and experience to demonstrate competency in the care of this highly-specialized patient population” (Lewandowski, 2003, p. 446). This specialized competency should be maintained through continuing education.

The United Nations' Declaration of the Rights of the Child stresses that "the child, by reason of his physical and mental immaturity, needs special safeguards and care, including appropriate legal protection, before as well as after birth" (United Nations, 1989). This applies to healthcare of the child as well through attainment of the determinants of health. It is for this reason that the Pediatric PeriAnesthesia nurse must use critical thinking and critical inquiry skills and individual care when providing special care to the pediatric client.

By definition, a pediatric client is one who is below the age of 18 years (unless under the law applicable to the child, majority is attained earlier) (United Nations Convention on the Rights of the Child, 1989). In Canada, the pediatric client is defined through legal age for medical consent which varies between provinces and territories (Tsai, & Canadian Paediatric Society, 2008) and is based on standardized policies at the institutional level. Most institutions regard the pediatric client as one who is under the age of 18 years of age and is provided with the unique and specialized care described in this Resource when undergoing surgery with analgesia, sedation and/or any of the anesthesia agents or techniques.

NAPAN© believes that care of the pediatric client requires specialized knowledge which should reflect best practice standards based on current evidence, ongoing education, strong leadership, and continuous research activities. Where no evidence exists, expert opinion may be utilized.

## II. Pediatric Age Group Definitions and Development

### 1. Age Group Definitions

Within the pediatric population are a range of ages that can be used to determine stages of growth and development and subsequent health care protocols. In order to bridge concepts amongst the interprofessional team when caring for children of all developmental stages, it is important to have consistent pediatric terminology. The Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) have developed pediatric terminology based on a framework of developmental stages from pre-birth to 21 years of age, as outlined below in Table One.

**Table One:** Age Group Definitions

| Age Group | Definition of Age Group Terminology | |
|---|---|---|
| **Fetal Stage** | A human life stage, during prenatal development, that typically begins at the beginning of nine weeks after fertilization (full formation of the embryo) and continues until birth. | |
| **Neonatal Stage**<br>**0 - 27 days** | **Preterm Neonatal Stage** | The period at birth when a newborn is born before the full gestational period |
| | **Term Neonatal Stage** | A human life stage that begins at full term birth date and continues until twenty-seven complete days of age |
| **Infancy Stage** | A human life stage that begins at 28 days and continues until twelve complete months of age | |
| **Toddler Stage** | A human life stage that begins at thirteen months of age and continues until twenty-four complete months of age | |
| **Early Childhood** | A human life stage that begins at two years of age and continues until five complete years of age. | |
| **Middle Childhood** | A human life stage that begins at six years of age and continues until eleven complete years of age. | |
| **Early Adolescent** | A human life stage that begins at twelve years of age and continues until 18 complete years of age, generally marked by the beginning of puberty and lasting to the beginning of adulthood. | |
| **Late Adolescent** | A human life stage that begins at nineteen years of age and continues until twenty-one complete years of age. This phase includes the final stages of pubertal growth and development as well as the attainment of significant psycho-social milestones. | |

**Adapted from:** National Institute of Child Health and Human Development, 2013a; National Institute of Child Health and Human Development, 2013b; Williams, Thomson, Seto, Contopoulos-Ioannidis, Ioannidis, Curtis, Constantin et al, 2012.

### 2. Stages of Development

Piaget's theory of cognitive development and Erikson's first five (of the total of eight) stages of development for socialization (See Table Two) have been commonly referred to in order to tailor the individual nursing care in pediatric clients and their families in the perianesthesia setting (Leack, 2007; Ireland, 2006).

**Table Two:** Stages of Development

| Stages | Approximate range of age | Piaget's cognitive development stages | Erickson's psychosocial development stages |
|---|---|---|---|
| **Infancy** | At birth to 18 months of age | Sensory Motor Period (0 - 24 months) | 1/ Learning Basic Trust Versus Basic Mistrust (Hope) - period of infancy through the first one or two years of life |
| **Toddlerhood** | Between 18 months to three years of age | The Preoperational Period (2-7 years) | 2/ Learning Autonomy Versus Shame (Will) - probably between about 18 months or 2 years and 3 to 4 years of age |
| **Preschool** | Age three to six | The Preoperational | 3/ Learning Initiative Versus Guilt |

| Stages | Approximate range of age | Piaget's cognitive development stages | Erickson's psychosocial development stages |
|---|---|---|---|
| | | Period<br>(2-7 years) | (Purpose) - the later preschool years (from about 3 to, in the United States culture, entry into formal school) |
| **School age** | Six to 12 years old | Period of Concrete Operations<br>(7-12 years) | 4/ Industry Versus Inferiority (Competence) - School age |
| **Adolescent** | Age 12 through 18 | Period of Formal Operations<br>(12 years and onwards) | 5/ Learning Identity Versus Identity Diffusion (Fidelity) - adolescence, from about 13 or 14 to about 20 |
| **Adult** | Above 18 years old | | 6/ Learning Intimacy Versus Isolation (Love)<br>7/ Learning Generativity Versus Self-Absorption (Care)<br>8/ Integrity Versus Despair (Wisdom) |

**Adapted from**: Encyclopedia of Children's Health (2013); Child Development Institute (2013a); Child Development Institute (2013b).

## III. PeriAnesthesia Care of the Child

In 2003, the American Society of Pediatric Nurses released a Position Statement regarding *Safe Staffing for Pediatric Patients* which states that children and their families should receive family-centred care. It endorses the recommendation that even with family presence, no single published ratio for nurse staffing is automatically applicable in all settings where children receive care. Furthermore, these ratios may inadvertently minimize the complexity and multitude of issues that must be considered in the care of pediatric clients and their families (Lewandowski, 2003; Ireland, 2000). These authors emphasize that the child's age, anesthetized state, time from surgery, and availability of family or support personnel affect the ratios recommended for safe practice which were originally developed for adults. Therefore, NAPAN© recommends that a minimum of two competent nurses, one who is competent in PeriAnesthesia nursing, should be present when a child is in Phase I, with or without the presence of a parent.

### 1. Systems Review of the Pediatric Client in the PeriAnesthesia Environment

The Pediatric PeriAnesthesia nurse must be knowledgeable of the complexities that can follow the pediatric surgical population. With the knowledge of physical, physiological, psychosocial, and cognitive developmental stages of children and family-centered care, the nurse can ensure optimal and safe pediatric client outcomes. See Table Three with examples of the anatomic and physiological characteristics of children which are a challenge to the delivery of pediatric postanesthesia nursing care. The premature child and those children with complex medical conditions or congenital syndromes will require further nursing vigilance and are noted in Section 3 following this table.

**Table Three**: Systems Review of the Pediatric Client in the PeriAnesthesia Environment

| Health System | Developmental Age | Certain Anatomic or Physiologic Characteristics to be Considered | Potential Complications in PostAnesthesia Settings: |
|---|---|---|---|
| **Respiratory** | Neonate | The laryngeal reflex is activated by the stimulation of receptors on the face, nose, and upper airways of the newborn. Various mechanical and chemical stimuli, such as water, foreign bodies, and noxious gases can trigger this response. | Reflex apnea, bradycardia, or laryngospasm may occur through excessive suctioning |
| | | Short neck and chin often meets the chest at the level of the second rib | Prone to upper airway obstruction during sleep |
| | Infant | The chest is relatively small in relation to the abdomen, the chest muscles are still immature and fatigue easily. The respiratory center is immature and is easily depressed by the effects of sedatives, anesthesia agents, and opioids. Upper airway muscles are disproportionately sensitive to the depressant effect of anesthesia and sedation. | Increased risk of respiratory difficulty<br>Increased risk of pharyngeal airway collapse and obstruction |
| | Infant and child | At full-term birth, the lungs are still in the stage of active functional and morphologic development for more than several years. | During the first several weeks of extra uterine life, hypoxia depresses, rather than stimulates, respiration |
| | | Narrow nares, large tongue, narrowing at the cricoid ring, small tracheal diameter. Narrower laryngeal and tracheal lumens that are more easily compromised by mucosal edema. | Increased risk of upper airway obstruction<br>Prone to develop postintubation croup (Maxwell, 2009b, p.557) |
| **Cardio-vascular** | Neonate | Immaturity of the myocardium that is less compliant. An increase of 30% to 50% greater cardiac output than adult in attempting to meet oxygen requirements. | High risk of pulmonary vascular hypoxia and acidosis |
| **Fluid and Electrolytes** | Neonate and small infant | Renal tubular immaturity. Low glomerular filtration rate (GFR) Proportionally more water in the child's body and its internal distribution of water is more in the extracellular fluid (ECF) than those of the adult. Nearly half of a child's ECF is exchanged every 24 hours. Thus, greater daily fluid requirement with little fluid volume reserve. | Increase in fluid loss rapidly leads to fluid and electrolyte imbalances |
| | | Greater proportion of body surface area (BSA) than that of the adult. Thus, greater risk for fluid losses from evaporation. | Prone to dehydration |
| | | Greater insensible water loss (which is the invisible, continuous, passive loss of | Prone to dehydration |

| Health System | Developmental Age | Certain Anatomic or Physiologic Characteristics to be Considered | Potential Complications in PostAnesthesia Settings: |
|---|---|---|---|
| | Neonate and small child | water from the skin [evaporation], lung [respiration], and metabolism). Fever increases insensible water losses by about 10ml/kg for each degree centigrade above $37^0$C.<br><br>During the first two years of life, the kidneys are functionally immature and unable to effectively concentrate or dilute urine. In addition, the mechanisms for sodium regulation are not yet mature. | Low urine specific gravity may be falsely reassuring in the infant with dehydration.<br>Neonate, infant, and small child who receive excessive amounts of fluid (such as through the intravenous) may be unable to increase urine output to compensate, resulting in hypervolemia. |
| **Thermo-regulation** | Neonate and infant | Greater body surface area relative to body weight, larger head (75% of an infant's body heat can be lost) and lack of heat-insulating subcutaneous fat leads to rapid loss of heat.<br>Infants younger than 3 months do not have a shiver response (the normal response in older children and adults), and the infant relies primarily on non- shivering thermogenesis to generate heat. Both responses increase consumption of oxygen. | Prone to heat loss via radiation, convection, evaporation and conduction.<br><br>Increased oxygen and glucose use and acid metabolite formation (Lerman, Coté & Steward, 2010, pp 40-42)<br><br>Postoperative hypothermia increases oxygen consumption and may make child prone to respiratory depression. |
| **Distribution and Metabolism** | Neonate and infant | Blood-brain barrier is poorly developed. Consequently, the entry of medications such as narcotics is increased by 20% to 100%.<br>The liver is functionally immature until after the first year of life. Hence, this immaturity increases the half-life of many medications that are released through the liver. | Greater risk from the adverse effects of narcotics and many medications. |

**Adapted from:** Davis, Motoyama, & Cladis, 2011; Ireland, 2006; Molloy & Pasaron, 2013; Lerman, Coté, & Steward, 2010b; Maxwell, 2009b.

2. **Normal Pediatric Vital Signs** (See Table Four)

**Table Four:** Normal Pediatric Vital Signs

| Age | Heart Rate (beats/min) | Respiratory Rate (respirations/min) | Blood Pressure |
|---|---|---|---|
| **0-1 month** | 93-182 | 26-65 | 45-80/33-52 |
| **1-3 months** | 120-178 | 28-55 | 65-85/35-55 |
| **3-6 months** | 107-197 | 22-52 | 70-90/35-65 |

| Age | Heart Rate (beats/min) | Respiratory Rate (respirations/min) | Blood Pressure |
|---|---|---|---|
| **6-12 months** | 108-178 | 22-52 | 80-100/40-65 |
| **1-2 years** | 90-152 | 20-50 | 80-100/40-70 |
| **2-3 years** | 90-152 | 20-40 | 80-110/40-80 |
| **3-5 years** | 74-138 | 20-30 | 80-115/40-80 |
| **5-7 years** | 65-138 | 20-26 | 80-115/40-80 |
| **8-10 years** | 62-130 | 14-26 | 85-125/45-85 |
| **11-13 years** | 62-130 | 14-22 | 95-135/45-85 |
| **14-18 years** | 62-120 | 12-22 | 100-145/50-90 |

**Adapted from**: Hospital for Sick Kids. 2012; RNCeus, 2011; University of Massachusetts, 2010; Drain, 2009.

### 3. Congenital anomalies, genetic defects, hereditary conditions and medical co-morbidities

In the pediatric population, many conditions can affect outcomes from surgery and analgesia, sedation and all types and techniques of anesthesia. These will require further attention from the PeriAnesthesia nurse in tailoring the pre- and/or post-operative nursing process and care of the pediatric client.

**3.1** Congenital anomalies and genetic defects include, but are not limited to:

3.1.1 Achrondroplasia
3.1.2 Angelman syndrome
3.1.3 Apert syndrome
3.1.4 CHARGE association
3.1.5 Cormelia de Lange syndrome
3.1.6 Cri du chat syndrome
3.1.7 Crouzon's syndrome
3.1.8 Freeman-Sheldon syndrome
3.1.9 Guillain-Barré syndrome
3.1.10 Goldenhar syndrome
3.1.11 Herlitz syndrome (Epidermolysis bullosa)
3.1.12 Mucopolysaccharidosis (Hunter, Hurler, Morquio, Scheie syndromes)
3.1.13 Pierre Robin syndrome / sequence
3.1.14 Prader-Labhart-Willi syndrome
3.1.15 Treacher Collins syndrome
3.1.16 Trisomy syndromes (including Trisomy 21 [Down syndrome], Trisomy 18 [Edwards], Trisomy 13 [Patau syndrome])
3.1.17 Turner syndrome

3.1.18 VACTERL association (Lerman, Cote & Steward, 2010a; Davis, Cladis, &Motoyama, 2011).

In addition to having the potential for difficult airway management and the risk for difficult intubation, the children with these syndromes, sequences or associations may also have other underlying medical conditions such as cardiovascular problems, cognitive disabilities, and/or impaired renal function which could lead to significant postoperative complications. Special attention is required to observe for these potential adverse events in the perioperative and perianesthesia phases of care.

**3.2** Hereditary conditions include, but are not limited to:

3.2.1 Coagulation disorders:
- 3.2.1.1 Factor V Leiden (thrombophilia)
- 3.2.1.2 Hemophilia A: Classic hemophilia or Factor VIII deficiency, or Hemophilia B: Christmas disease, Factor IX deficiency
- 3.2.1.3 Von Willebrand Disease (more common and usually milder than hemophilia A or B).

3.2.2 Hereditary risk factors for general anesthesia:
- 3.2.2.1 Pseudocholinesterase deficiency
- 3.2.2.2 Malignant hyperthermia
- 3.2.2.3 Sickle cell disease
- 3.2.2.4 Thalassemia major.

**3.3** Medical comorbidities include, but are not limited to:

3.3.1 Respiratory disorders (e.g., uncontrolled asthma, obstructive sleep apnea, cystic fibrosis, bronchopulmonary dysplasia, chronic lung disease, recurrent pneumonia, recent acute upper respiratory tract infections)

3.3.2 Cardiac disorders (e.g., congenital heart disease, pulmonary hypertension)

3.3.3 Endocrine disorders
- 3.3.3.1 Glucose homeostatic disorders (e.g., Diabetes Mellitus, hypoglycemia)
- 3.3.3.2 Adrenal insufficiency (e.g., Addison's disease, primary aldosteronism)
- 3.3.3.3 Pituitary gland disorders (e.g., Diabetes Insipidus, hypopituitarism).

3.3.4 Neurological and/or neuromuscular disorders (e.g., uncontrolled seizures, cerebral palsy, congenital myopathies, hypotonia)

3.3.5 Coagulation (e.g., thrombocytopenia, coagulation disorders) (See 3.2.1)

3.3.6 Gastrointestinal disorders (e.g., gastroesophageal reflux disease, failure to thrive)

3.3.7 Obesity, eating disorders

3.3.7.1 Incidence of obesity in pediatric clients

3.3.7.1i. During the 20 years between the early 1960s and the late 1970s, the incidence of obesity in 6- to-11-year-olds increased by 54%

3.3.7.1ii. Morbid obesity increased by 98% during the same timeframe

3.3.7.1iii. Fifty percent (50%) of obese children and 75% of obese adolescents become obese adults

3.3.7.1 iv. One third of clients presenting to pediatric day surgery units are overweight or obese (Middlebrooks & Winters, 2011).

3.3.7.2 Obesity-related co-morbidities include, but are not limited to:

3.3.7.2i. Higher incidence of bronchial asthma

3.3.7.2ii. Obstructive sleep apnea syndrome

3.3.7.2iii. Reduced respiratory function including a reduction in the functional residual capacity (FRC)

3.3.7.2iv. Postoperative pulmonary atelectasis (Eichenberger, Proietti, Wicky, Frascarolo, Suter, Spahn, & Magnusson, 2002)

3.3.7.2v. Increased work of breathing and anatomical airway changes

3.3.7.2vi. Hypertension

3.3.7.2vii. Noninsulin-dependent diabetes or Type 2 diabetes mellitus (insulin resistance)

3.3.7.2viii. Fatty liver infiltration leading to non-alcoholic steatohepatitis (NASH)

3.3.7.2ix. Gastro-esophageal reflux disease (delayed gastric emptying) (Zuckerberg, & Maxwell, 2009).

3.3.8 Organ transplant (e.g., liver, kidney or other vital organ transplant).

**4. Care of the Pediatric Client by PeriAnesthesia Phase** (See also Resource 4: Client Assessment, Data Collection and Management in all Phases of the PeriAnesthesia Environment)

At the Children's Hospital of Eastern Ontario (CHEO), 70% of children requiring surgery are admitted and discharged through the day surgery ambulatory program (Letts, Davidson, Splinter, & Conway, 2001). At the Montreal Children's Hospital (MCH), an average of 62.58% of all surgeries performed were ambulatory surgeries in the years from 2008 to 2012, while in 2013 they accounted for 72.48% of all surgical/ procedural cases. Comparing the percentage of day surgery cases in 2008 (62.32%) to 2013 (72.48%), which denotes an increase of 10.16% (McGill University Health Centre, 2008-13).

In the context of a continuing increase in day surgery cases, parents are partners in taking responsibility for preparing their child for the surgery as well as giving postoperative care after discharge home (Gilmartin, & Wright, 2007).

**4.1** PreOperative/PreAdmission Phase

The PreOperative/PreAdmission visit and preparations allow children and their families the opportunity to preview the hospital experience in a supportive environment to reduce anxiety, increase knowledge about what is to be expected, and enhance coping (Ireland, 2006; Leack, 2013; Gorayeb, Lopes Petean, de Oliveira Pileggi, de Fátima, Sorita Tazima, Vicente, & Gorayeb, 2009; Perry, Hooper, & Masiongale, 2012).

The PeriAnesthesia nurse ensures that all of the competencies in Resource 4 are met plus the following specific to pediatric clients:

4.1.1 Providing the family with preoperative information

4.1.1.1 Sharing preoperative information with the family about the surgery and the sequence of the events

4.1.1.2 Giving guidance, appropriate educational materials and resources to assist the parents to support and to prepare the child for the surgical experience

4.1.1.3 Providing guidance educational materials and resources to assist the parents to make informed decisions that are in the best interest of their child

4.1.1.4 Providing parents with accurate rationale and emphasizing the importance of following the preoperative fasting guidelines (See Appendix O)

4.1.1.4i. Prolonged fasting in children may lead to thirst, hunger, irritability, headache and the risk of dehydration and hypoglycemia (Engelhardt, Wilson, Horne, Weiss, & Schmitz, 2011; Campbell, 2011)

4.1.1.4 ii. Parents tend to fast with their children and this may cause parents to have nausea and/or increase the risk of fainting due to hypoglycemia

a. Parents are advised to eat prior to coming to the hospital with their child in order to be in an optimal physical and psychological state to give support to their child during the pre-and postoperative period (Engelhardt et al, 2011; Campbell, 2011).

4.1.1.5 Assessing risk for postoperative nausea and vomiting (PONV)

4.1.1.5 i. Risk factors for postoperative vomiting (POV) in children are similar to those in adults, with the following differences:

a. Studies in children are often limited to data on vomiting only and not nausea
b. Vomiting incidence is twice as frequent among children as among adults
c. Risk increases as children age, is rare in children under 2 years of age, and decreases after puberty
d. Gender differences are not seen before puberty
e. Risk increases more consistently with specific operations which include, but are not limited to:

ei. Adenotonsillectomy
eii. Strabismus repair
eiii. Hernia repair
eiv. Orchidopexy
ev. Penile surgery (Gan, Diemunsch, Habib, Kovac, Kranke, Meyer, Watcha et al, 2014). See Illustration One. (See also Phase I, Section 4.4.5, below)

**Illustration One:** Simplified Risk Score for Postoperative Vomiting in Children

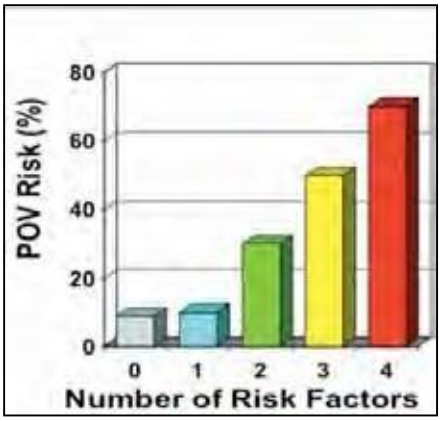
| Risk factors | Points |
|---|---|
| **Surgery ≥ 30 min** | 1 |
| **Age ≥ 3 years** | 1 |
| **Adenotonsillectomy, Strabismus, Hernia Repair, Orchidopexy, Penile surgery** | 1 |
| **History of POV or PONV in relatives** | 1 |
| **Sum =** | 0-4 |

**Adapted from**: Eberhart, Geldner, Kranke, Morin, Schäuffelen, Treiber, & Wulf, 2004

4.1.1.5 ii. Pediatric graph for predicting risk of postoperative vomiting *by percentage*, See Illustration Two.

4.1.1.6 Teaching and providing written material regarding postoperative pharmacological and non-pharmacological pain management strategies and introducing appropriate validated pain rating scales (See Pain Assessment Rating Systems, 4.4.3.2)

**Illustration Two:** Risk of Postoperative Vomiting by Percentage




**Source:** Eberhart, Geldner, Kranke, Morin, Schäuffelen, Treiber, & Wulf, 2004

4.1.1.6i. Pain management teaching is more effective when introducing it during the preoperative period and reinforcing it through the postoperative period (Kankkunen, Vehviläinen-Julkunen, Pietilä, Kokki, & Halonen, 2003; Howard, Davis, Phillips, Ryan, Scalford, Flynn-Roth, & Ely, 2014)

4.1.1.6ii. Parents receive little information about how to manage their child`s postoperative pain before discharge home (Kankkunen, Vehviläinen-Julkunen, Pietilä, Kokki, Grey, Kain, & Zisk, 2008)

4.1.1.6iii. A combination of pharmacological and non-pharmacological strategies is usually effective in pain management (Woragidpoonpol, Yenbut, Picheansathian, & Klunklin, 2013)

4.1.1.6 iv. Emphasizing to parents the importance of giving medications as prescribed and on a regular basis

a. Parents should avoid undertreatment of children's postoperative pain (Gorodzinsky, Davies, & Drendel, 2014; Zisk Rony, Fortier, MacLaren Chorney, Perret & Kain, 2010).

4.1.1.6 v. Giving accurate information regarding safe and correct use of prescribed medications and dispel parental myths about analgesics (including opioids) (Kankkunen et al, 2003; Kankkunen et al, 2008)

a. Even with mild analgesics, parents were observed to have a tendency to decrease the prescribed dose due to fear of overdosing the child, and fear of possible adverse effects of the medication (Kankkunen et al, 2003).

4.1.1.6 vi. Introducing information about non-pharmacological modalities of pain management (The Joanna Briggs Institute, 2012; Howard et al, 2014) (See Table Five)

a. As appropriate, teaching physical methods e.g., positioning (Woragidpoonpol et al, 2013), cold or hot applications to allay pain.

**Table Five:** Examples of Suggested Coping Strategies for Pain Management by Age Group

| Age Groups | Strategies |
|---|---|
| **Newborns (0 - 18 months)** | Breastfeeding/pacifier, holding, patting/ swaddling, rocking, cuddling, soft voice, singing and music, sucrose, touch, massage |
| **Toddlers (18 months - 3 years)** | Interactive toys, blowing bubbles, light wands, singing, listen to music, musical toys, pinwheels, massage |
| **Pre-schoolers (3 years - 5 years)** | Blowing bubbles, books (I SPY books or sound books), watching DVDs, storytelling, medical play |
| **School-age children (6 years - 12 years)** | Deep breathing, blowing bubbles, TV/video games, books, counting, singing, guided imagery. mental arithmetic |
| **Adolescents (over 12 years)** | Deep breathing, TV/video games, music, books, guided imagery |

**Adapted from**: Valois et al, 2013; Woragidpoonpol et al, 2013; McCarthy, & Kleiber, 2006; Koller, & Goldman, 2012; Landier, &Tse, 2010; Gold, Townsend, Jury, Kant, Gallardo, & Joseph, 2005; Idvall, Holm, & Runeson, 2005; Yamada, & Ohlsson, 2010.

4.1.2 Providing psychological preparation for the child and family which includes, but is not limited to:

4.1.2.1 Working in collaboration with a Certified Child Life Specialist (where available) (Brewer, Gleditsch, Syblik, Tietjens, & Vacik, 2006; Perry et al, 2012; Dreger, & Tremback, 2006, p. 779)

4.1.2.2 Encouraging emotional expressions, thoughts and concerns

4.1.2.3 Allowing time to ask questions

4.1.2.4 Introducing coping strategies that could be applied by the child and/or the family in decreasing anxiety and in managing pain (See Table Five)

4.1.2.5 As per institution policy and protocol, a Certified Child Life Specialist (where available) will work in collaboration with the PreOperative/ PreAdmission interprofessional team to offer the parents the option of being present at induction of anesthesia (Parental Presence at Induction or PPI)

4.1.2.5i. PPI is frequently combined with a preanesthesia/preoperative preparation program that will provide information to the parent(s) regarding what to expect and what is expected of them when present during induction (Woolley, 2012; Gavin, 2013; Romino, Keatley, Secrest, & Good, 2005)

4.1.2.5 ii. For the PPI program to be beneficial to the participating parent, the child and the interprofessional team, a thorough PreOperative/PreAdmission screening is required which includes, but is not limited to:

a. The child's history and the parent(s)' ability to cope with the medical/surgical procedure
b. The child's past hospitalization, surgical and medical experiences
c. The child's general health and health history
d. The type of surgery to be done
e. Parental level of anxiety
f. The parent(s)' ability to understand procedures that could be used during induction (e.g., mask induction) and their role in comforting their child while watching anesthesia

administration (Woolley, 2012, p.48; Cohen-Salmon, 2010; Yewande, Nickerson, & Quezado, 2012)

g. Positive outcomes from PPI are the result of effective preparation of the parents for the experience
h. Inadequate preparation may increase parental anxiety, which can result in increasing the child's anxiety.

4.1.2.5iii. Complete and systematic teaching can be achieved through the use of a video version of anesthesia induction and adequate written materials and verbal instructions

4.1.2.5iv. Parents also need to be informed of the possibility that their child may be intubated with either an endotracheal tube or a laryngeal mask airway (Romino et al, 2005).

4.1.3 Working in collaboration with the Certified Child Life Specialist (where available) who will employ different strategies to enhance the child's ability to cope (e.g., information-giving, preparation for the surgical experience) which will include, but are not limited to:

4.1.3.1 Provide age appropriate information through descriptions, pictures and audiovisual materials
4.1.3.2 Engage in therapeutic play and encourage active participation that focuses on the operative experience (Bayne, & Kirkland, 2008)
4.1.3.3 Correct any misconceptions or misunderstandings
4.1.3.4 Give honest and concrete information
4.1.3.5 Use words about illness and surgery that are at the developmental level of the child (See Table Six)

4.1.3.5i. Avoid words that may have negative connotations and replace with more suitable, less anxiety-provoking statements for preschool and school age children.

**Table Six:** Suggested Substitutions of Words and/or Phrases

| Negative connotations | Nonthreatening words or phrases |
|---|---|
| Giving a shot, bee sting, stick | Putting some medication under the skin |
| Will be put to sleep | Going to a special sleep |
| Stretcher, gurney | Rolling bed, bed on wheels |
| Cut, remove | Fix, repair, make better |
| Make a cut, incision | Make a small opening, special opening |
| "Taking your temperature" | "Let's see how warm your body is" "let's see how warm you are" |
| "Take your arm blood pressure" | Check your pressure, hug your arm |
| Organ | Special place in body |
| Test | See how (specify body part) is working |
| Edema | Puffiness |
| Dye | Special medicine |
| Stool | Child's usual term |
| Pain | Hurt, discomfort, "owie", "boo-boo" |
| Deaden | Numb, make sleepy |

| Negative connotations | Nonthreatening words or phrases |
|---|---|
| Put to sleep, anesthesia | Special sleep |
| Catheter | Tube |
| Anesthesiologist | Sleep doctor |
| Monitor | Television screen |
| Electrodes | Stickers, ticklers |
| Specimen | Sample |

**Adapted from**: Justus, Wyles, Wilson, Rode, Walther, & Lim-Sulit, 2006; Valois et al, 2013, pp. 13, 30; Browne, 2005, p. 693.

4.1.3.6 Preparation of pediatric clients and their parents bydevelopmental stage as follows in Table Seven:

**Table Seven:** Examples of Preoperative and Postoperative Preparation for Parents and Children Based on the Piaget's Cognitive Developmental Age and Erikson's Developmental Stages

| Stages | Stressors of surgical process | Possible reactions to the stressors | Strategies and interventions |
|---|---|---|---|
| **Infancy**<br><br>**(At birth to 18 months of age)** | Separation from caregivers<br><br>Fear of strangers and unfamiliar environment<br><br>Pain | Three stages in response to separation:<br><br>• Protest (crying)<br>• Despair<br>• Detachment.<br><br>The first two stages, protest and despair, are often observed even with a brief separation from either parent.<br><br>Distrust<br><br>Anxiety | Preparation at this stage focuses on the parent due to the limited cognitive abilities of the child.<br><br>Inform the parents about the surgery and provide support. This can help release much of their anxiety which in turn reflects in their calming manner. Infant is likely to be less anxious if the parents are calm.<br><br>Maximize parental involvement in the PreOperative/ PreAdmission assessment process as much as possible, such as during vital signs being taken.<br><br>Encourage parents to bring security items such as a blanket, a stuffed animal or a favorite toy to help soothe the infant when separated from his parents on the date of the surgery.<br><br>Ensure parents' presence after the surgery. Inform parents that they will be called to reunite with their infant as soon as possible and not to leave the hospital premise without informing the PACU nurse.<br><br>Inform parents that other comfort measures and distraction methods such as breast feeding, soft voice, singing or music, a pacifier, cuddling, gentle stroking, patting/swaddling or rocking might help to calm their infant as well as to help them cope with pain. |
| **Toddler** | Separation anxiety/ fear of | In addition to the reactions | Parental information |

| Stages | Stressors of surgical process | Possible reactions to the stressors | Strategies and interventions |
|---|---|---|---|
| **(Between 18 months and three years of age)** | abandonment<br><br>Reduced autonomy/ lack of opportunities for self control<br><br>Threat to body boundary/ fear of bodily injury and pain<br><br>Frightening fantasies | experienced by the infants, all of the following are applicable to each stressor:<br>• Resistance<br>• Physical and verbal aggression<br>• Un-cooperativeness<br>• Regression<br>• Despair<br>• Negativism<br>• Temper tantrums | In general, preparation of the child should be completed a day or two before surgery at a cognitive level the child will understand.<br><br>If the PreOperative/PreAdmission visit and/or preparation occurs greater than two days before the surgery, advise the parents to go over the preoperative processes a day or two prior to the day of surgery with the child.<br><br>Toddlers possess a limited concept of time, so use explanations the child is familiar with. For example, tell the child, "The surgery will be in two sleeps". Provide simple, concrete explanations about what the toddler will hear, feel, smell, taste, and see.<br><br>Encourage parents to participate in the PreOperative/PreAdmission assessment process and postoperative care as much as possible, such as after demonstrating applying the oxymeter clip to the parents' finger, let the parent in turn put it on the child's finger.<br><br>Encourage normalization through therapeutic and medical play and exploration of environment and material e.g., allow the child to handle medical equipment (such as a blood pressure cuff).<br><br>Encourage parents to bring the child's favorite activities or toys, stuffed animal to offer comfort, and to distract the child from boredom, fear, and the new routine.<br><br>As per institution protocol and policies, assessment and preparation of the parent(s) for possible at Induction (PPI).<br><br>Ensure parents' presence as soon as possible after the surgery.<br><br>Toddlers may regress to a pre-toilet-training stage postoperatively. Provide reassurance that this is to be expected and encourage family members to be accepting and supportive.<br><br>Allowing toddlers freedom to express feelings of protest within safe limits. Accept regressive behavior without commenting.<br><br>Providing simple choices whenever possible to heighten a toddler's sense of independence and control e.g., which arm to have a blood pressure |

| Stages | Stressors of surgical process | Possible reactions to the stressors | Strategies and interventions |
|---|---|---|---|
| | | | measurement taken or which toy will be chosen to bring on the day of surgery. |
| **Preschool**<br><br>**(Age 3 to 6 years)** | Separation anxiety<br><br>Fear of loss of control, sense of own power<br><br>Fear of bodily mutilation or injury<br><br>Magical thinking and egocentric thoughts resulting in mis- understanding, fear<br><br>Imagined threats | Regression<br><br>Anger toward primary caregiver<br><br>Acting out<br><br>Protest<br><br>Despair and detachment<br><br>Physical and verbal aggression<br><br>Dependence<br><br>Withdrawal | Preparation for surgery for this developmental stage is recommended two to four days in advance. If the PreOperative/PreAdmission visit and/or preparation occur longer than four days prior to surgery, advise the parents to go over the child about the preoperative processes two to four days prior to the day of surgery.<br><br>Ensure parental presence.<br><br>Avoid using words that may have negative connotations (See 4.1.3.5i.).<br><br>Increase opportunity for control via direct, simple and concrete explanations and descriptions, focusing on what the child will hear, feel, smell, taste, and see, as well as what the child is expected to do:<br>• Allow the child to see and handle some of the medical equipment that will be used.<br>• Demonstrate with props, models, and pictures.<br>• Offer choices whenever possible to promote a sense of control.<br>Y One example might be the choice of flavored lip preparations used on the anesthesia mask to provide a more pleasing scent for the child<br>Y Another choice might be the type of transport to surgery the child would prefer such as walking, riding in a wagon, or being carried by the nurse<br>As a preschooler's concept of time is limited, review and reinforce the sequence and duration of all events. Use time concepts the child is familiar with: "The operation will take less time than it takes to watch a cartoon".<br><br>Preschool children fantasize and may feel that their operation is punishment for bad behavior:<br>• Ask the child to explain what they understand so any misconceptions or misunderstandings can be corrected.<br>• Reassure the child that he isn't to blame and that the surgery is to fix something specific.<br>• Explain the surgery using simple words without giving too many details and emphasize why it needs to be done.<br>• Reading books about surgery and hospital admission as well as playing with a pretend medical set may help the child explore his/her feelings about the surgery.<br><br>Be honest, especially about separation and potential pain. |

| Stages | Stressors of surgical process | Possible reactions to the stressors | Strategies and interventions |
|---|---|---|---|
| | | | As per institution protocol and policies, assess parental desire and prepare the parent for possible Parental Presence at Induction (PPI).<br><br>Create distraction through play during the PreOperative/PreAdmission phase to alleviate distress.<br><br>Encourage parents to bring security objects such as a familiar toy, stuffed animal, or photograph. |
| **School age (6 to 12 years old)** | Separation from family and peers<br><br>Fear of loss of control/ mastery<br><br>Fear of bodily mutilation/ injury and pain<br><br>Concrete literal thought resulting in misunderstanding, reduced self-esteem | Regression<br><br>Inability to complete some tasks<br><br>Uncooperative<br><br>Withdrawal<br><br>Depression<br><br>Displace anger and hostility<br><br>Frustration | Preparation should begin one to two weeks in advance of the surgery.<br><br>Simple and concrete explanation and reason for the surgery:<br><br>School-age children have an increased awareness of internal body parts and body function.<br><br>They are also able to understand a series of actions and can therefore benefit from hearing about all steps involved in the surgical process. Thus, the child needs to know what will happen before, during and after surgery.<br><br>Provide a sense of control through:<br>• Allowing the school-age child to participate in care when possible and encourage acceptance of treatment e.g., ask the child to help hold the anesthesia mask<br>• Provide choices when possible such as which arm to measure the blood pressure<br>• Offer simple explanations about sensory and procedural information as well as what is expected of the child e.g., when starting an intravenous line, tell the child, "your job is to hold your arm very still".<br>• Try to use language that's accurate, but not frightening (See 4.1.3.5i.).<br><br>Be honest if something is going to hurt. When asked, the nurse can respond, "some kids say it feels like a pinch and some kids say they don't feel anything at all. You'll have to tell me how it felt to you." (Bayne, & Kirkland, 2008).<br><br>School-age children may fear other body parts will be hurt during the operation.<br>• Offer a simple explanation of what part of the body the operation will affect<br>• Body outlines, pictures, or dolls may be helpful e.g., a child's understanding of a surgical site can be quickly assessed by |

| Stages | Stressors of surgical process | Possible reactions to the stressors | Strategies and interventions |
|---|---|---|---|
| | | | asking him to mark the site on the doll<br>• Any misconceptions revealed can then be corrected.<br><br>Fear of death is common; the child's previous experience with illness and death will determine the explanation needed for reassurance.<br>• Fear of waking up in the middle of surgery might occur<br>• It is important to tell the child that this will not happen.<br>• An anesthesiologist ("sleep doctor") will be there to make sure he/she does not wake up until the surgery is finished.<br><br>As per institution protocol and policies, assessment and preparation the parent for possible Parental Presence at Induction (PPI). |
| **Adolescent**<br><br>**(Age 12 through 18 years)** | Loss of self control or autonomy<br><br>Separation from family and peers<br><br>Fear of body injuries and pain<br><br>Fear of loss of identity<br><br>Concern with perspective of others, body image and sexuality<br><br>Disfigurement<br><br>Disability | Uncooperative<br><br>Withdrawal<br><br>Anxiety<br><br>Depression | During adolescence , abstract thinking begins and adolescents can understand how the body functions, the nature of the problem, and the reason for surgery. It is recommended that the adolescent be included in talks and decision-making about his/her surgery. Give explanations that focus on the adolescent's concern<br>• Provide honest, detailed explanations about the diagnosis, the need for and the results of the surgery and what will happen next, including what the adolescent will hear, feel, smell, taste, and see.<br>• Inform if the surgery will change his/her looks, or how it will change daily activities with his/her friends.<br>• As much as possible, involve the adolescent in decisions about their health, such as giving rational about to stop smoking preoperatively as soon as possible or to respect the fasting guideline. The location and extent of surgical scars are often a major concern as adolescents may worry about how surgery will affect their appearance. If the adolescent wants to, allow him to see any changes after the surgery using mirrors as necessary. Provide reassurance that changes are temporary if that's true, but if not, be honest.<br><br>Common fears include waking during the procedure, pain, and the possibility of death.<br>• Provide reassurance and explanation that they won't wake up during the procedure but will wake up afterward.<br>• Teaching multimodal pain managements including pharmacological and non-pharmacological approach. |

| Stages | Stressors of surgical process | Possible reactions to the stressors | Strategies and interventions |
|---|---|---|---|
| | | | • Encourage self expression regarding anesthesia and surgery<br><br>Teaching different coping strategies (See 4.1.3)<br><br>Respect the need for privacy such as avoid unnecessary exposure of the body, announcing your presence before opening a curtain or knock on the door to avoid embarrassing the adolescent if he/she is undressing.<br><br>As per institution protocol and policies, involve the adolescent in decision making about having Parental Presence at Induction.<br><br>Encourage parents to be available to talk after the surgery if the adolescent is willing.<br><br>Adolescents may become uncooperative or withdrawn, so promote their independence as possible and reinforce expectations<br>• Provide opportunities to make realistic choices when possible, which will increase their sense of independence e.g., when they are ready to drink postoperatively, encourage choices.<br>• During the preoperative phase, encourage the adolescent to pack personal items to promote a return to normalcy during the postoperative phase. |

**Adapted from:** Pearson, 2005; Leack, 2013; Turner, 2009; Squires & Allen, 2009; Ireland, 2006; Bayne & Kirkland, 2008; Mahan, 2005; Gold, Townsend, Jury, Kant, Gallardo & Joseph, 2006; Valois, Drudi & Le, 2013; Perry, Hooper, & Masiongale, 2012; Thompson, 2009, pp. 30, 134; Dreger, & Tremback, 2006, pp. 789-799.

4.1.4 Coordinate history, physical examination, consultations and appropriate preoperative tests

4.1.4.1 "Routine preoperative laboratory testing is no longer recommended in the absence of a definite medical indication" in pediatric surgery (Ireland, 2006, p. 274) which is in alignment with the adult guidelines including the Canadian Anesthesiologists' Society guidelines (Canadian Anesthesiologists' Society, 2014, pp. 53-54)

4.1.4.2 A preoperative Hgb value is usually determined for surgeries with the potential for blood loss, those clients with specific risk factors for hemoglobinopathy, former preterm infants and infants under 6 months of age to determine risk for anemia prior to general anesthesia (Ghazal, Mason, & Cote, 2013, p. 38)

4.1.4.3 If a newborn screen for sickle cell anemia was completed at birth, this test may not need to be repeated, but this information is required prior to surgery (Ghazal, Mason, & Cote, 2013, p. 38)

4.1.4.4 The guidelines recommend routine pregnancy screening of all menarcheal adolescents (Zuckerberg, & Maxwell, 2009, pp. 544-545; Canadian Anesthesiologists' Society, 2014, p. 54; Ghazal, Mason, & Cote, 2013, p. 38)

4.1.4.4i. Screening (serum, urine) is recommended prior to surgery for the safety of the client, and informed consent is required 4.1.4.4ii. If a positive result is obtained:

a. The surgeon and the anesthesiologist are notified
b. The surgery may be cancelled
c. The client is notified
d. Appropriate interprofessional team members (e.g., social worker, adolescent clinic team) are consulted to give support and to assist the client in identifying alternative choices regarding the pregnancy and future plans for surgery (Zuckerberg, & Maxwell, 2009, pp. 544-545).

4.1.4.5 As required, other testing may include, but is not limited to:

4.1.4.5i. Serum electrolytes
4.1.4.5ii. Blood glucose
4.1.4.5iii. Renal and/or liver function tests
4.1.4.5iv. Coagulation
4.1.4.5v. Blood gases
4.1.4.5vi. Serum levels of medications (antiepileptic, cardiac)
4.1.4.5vii. ECG, echocardiography
4.1.4.5viii. CT, MRI (Ghazal, Mason, & Cote, 2013, p. 38).

4.1.4.6 Inform surgeon and/or anesthesiologist of abnormal test results.

4.1.5 Ensure a safe transfer of communication report is completed which includes, but is not limited to:

4.1.5.1 PreOperative/PreAdmission evaluation document
4.1.5.2 Verbal report as required prior to the day of surgery to the Day of Surgery unit and/or Operating Room, PACU and/or most responsible physician
4.1.5.3 Alerts added to the surgical schedule. (See also Resource 6: Transportation and Communication for Safe Transfer of Care)

## 4.2 Day of Surgery Phase

The PeriAnesthesia nurse ensures that all of the competencies in Resource 4 are met plus the following specific to pediatric clients:

4.2.1 Provide a flexible environment that decreases anxiety for the child such as:

4.2.1.1 Allow for the removal of underpants or pyjama bottoms after induction of anesthesia (Browne, 2005, p. 717)
4.2.1.2 Avoid separating the child from the parent while completing the PreOperative/PreAdmission assessment
4.2.1.3 Work in collaboration with the Certified Child Life Specialist (where available) to provide distraction during the assessment (e.g., books, music, interactive games, mobile devices such as I - Pad, laptop to watch a movie playing, and watching videos)
4.2.1.4 Identify children that appear anxious to the attending anesthesiologist for consideration of oral preoperative sedation such as midazolam, or referrred to the Certified Child Life Specialist (where available) for further preparation and follow-up
4.2.1.5 Avoid intramuscular injections unless they are required for specific conditions (Ireland, 2006, p. 275; McMurtry, 2007, p.102)

4.2.1.6 Use a topical anesthesia agent (e.g., cream, aerosol, jellies) prior to initiating an intravenous site for induction (McCarthy, & Kleiber, 2006, p. 94; McMurtry, 2007, p.102).

4.2.2 Monitor children following administration of any medication (Ireland, 2006, p. 276)

4.2.2.1 Independent double-check of all medications administered to pediatric clients is recommended prior to administration due to the variability of weight-based dosages (Institute for Safe Medication Practices, 2001, p. 432)

4.2.2.2 Instruct parents regarding the effects of the pre-medication and the possible changes in the child's behaviour and sensorium.

4.2.3 Allow the child a sense of control if appropriate

4.2.3.1 Let the child decide which arm to have the armband or blood pressure applied

4.2.3.2 Offer the child one of the appropriate methods to transfer to the Operating Room e.g., transportation by walking, stretcher or crib

4.2.3.3 Prepare child's favourite stuffed animal for the surgery with identification band to take to the Operating Room.

4.2.4 Ensure all routine and necessary testing has been completed and results available

4.2.4.1 Pregnancy testing may be completed by a point-of-care urine test on the day of surgery to expedite the results

4.1.4.2 If a positive result is obtained:

4.1.4.2i. Surgery is cancelled

4.1.4.2ii. Client is notified of the result

4.1.4.2iii. Appropriate interprofessional team members (e.g., social worker, adolescent clinic team) are consulted to give support and to assist the client in identifying alternative choices regarding the pregnancy and future plans for surgery (Zuckerberg, & Maxwell, 2009, pp. 544-545).

4.2.5 As per institutional policies and procedures, appropriate interprofessional personnel confirm the potential for parental presence at induction

4.2.5.1 This includes review of the procedure, reassessment of parent(s)' readiness and preparation of the parent(s) for the experience

4.2.5.2 Parental presence at induction seems to be more effective when combined with other behavioural methods (e.g., distraction) or pharmacological interventions (e.g., midazolam) (Scully, 2012; Kazak, Sezer, Yılmaz, & Ates, 2010; Gavin, 2013).

4.2.6 In the event of delayed surgical start time, monitor for signs of dehydration (e.g., lethargy, fatigue, dryness of mucous membranes)

4.2.6.1 If dehydration seems apparent, alert the anesthesiologist.

4.2.7 Provides appropriate support to the parents as necessary.

## 4.3 Anesthesia Phase

The PeriAnesthesia nurse ensures that all of the competencies in Resource 4 are met plus the following specific to pediatric clients:

4.3.1 Anxiety

4.3.1.1 Is reduced by parental presence at induction with the anesthetic administration of *sevoflurance* anesthesia

4.3.1.1 i. This method is equally as effective as midazolam premedication in decreasing the incidence of postoperative agitation (Zand, Allahyary, & Hamidi, 2009).

4.3.1.2 Is decreased postoperatively with premedication of midazolam when inhalation agents are used as the anesthetic agent, whether a parent is present at emergence or not (Zand et al, 2009; Kain, Caldwell-Andrews, Mayes, Weinberg, Wang, Maclaren, & Blount, 2007)

4.3.1.3 Is effectively reduced using distraction and other techniques such as playing video clips during the inhaled induction of the child (Mifflin, Hackmann, & MacLaren Chorney, 2012).

4.3.2 Pain Management

4.3.2.1 Healthcare professionals have had a tendency to underestimate or ignore the pain children experience in the past (Schechter, 1999) but practice of pain management in children has advanced (Malviya, Polaner, & Berde, 2013, p.909)

4.3.2.2 The management of pain should begin during anesthesia

4.3.2.3 Sufficient anesthesia and analgesia should be provided to prevent intraoperative pain and stress responses, and to decrease postoperative analgesic requirements

4.3.2.4 The postnatal period in the child is a time of considerable synaptic growth and reorganization in the dorsal horn of the spinal cord (Fitzgerald, & Koltzenburg,1986; Fitzgerald, 2000; Fitzgerald, & Howard, 2003) and the developing nociceptive system responds differently to injury (i.e., increased excitability and sensitization)

4.3.2.5 Repeated mechanical stimulation at strong (but not pain-inducing) intensities can cause sensitization in very young infants (Fitzgerald, Shaw, & MacIntosh, 1988)

4.3.2.5 i. Studies have noted a striking hypersensitivity to touch as well as to pain in infants after surgery (Andrews & Fitzgerald, 1994; 1999; 2002).

4.3.2.6 Pain experienced by neonates has both immediate and longer-term effects on their pain reactivity system because differences exist with immediate, short-term, and long-term effects of pain exposure on the developing nervous system (Charlton, 2005; Malviya, Polaner, & Berde, 2013, p.909)

4.3.2.7 Neonatal and child analgesia administration guidelines are available for pharmacokinetics and pharmacodynamics specific to the major opioids, non-steroidal anti-inflammatory drugs (NSAIDs), and adjunctive analgesics system (Charlton, 2005)

4.3.2.8 Practical interventions for managing pain and distress in infants such as developmental care, containment (such as child carriers), sucrose, feeding, and kangaroo care system (bundling) are also effective (Charlton, 2005)

4.3.2.9 Age and developmental level influence children's perception of pain (McGrath, & Unruh, 1987; Ross, & Ross, 1988; McGrath, 1990)

4.3.2.10 Memories of past pain experiences and pain-coping efficacy shape children's responses to present pain situations and heighten anxiety and sensation to pain (Charlton, 2005; Malviya, Polaner, & Berde, 2013, p.909)

4.3.2.11 Analgesics that are effective in managing pain include opioids and adjuvant analgesics (including acetaminophen, NSAIDs and a variety of drugs with analgesic properties that were initially developed to treat other health problems, such as anticonvulsants and antidepressants) (World Health Organization, 2008) (See Appendices T and U)

4.3.2.12 Neonates, infants and children require the same three categories of analgesic drugs

4.3.2.12 i. Caution should be exercised with premature and term newborns, since they show reduced clearance of most opioids.

4.3.2.13 Preoperative/preemptive analgesia is effective e.g., acetaminophen (oral, rectal), NSAIDS, Ketamine, non-opioids via regional infiltration

4.3.2.13i. Regional techniques for the administration of local anesthetics and analgesics are an integral part of pain control for children (Charlton, 2005)

4.3.2.13ii. Local anesthesia supplementation decreases the severity of incisional pain in the early postoperative period (White, 2002)

4.3.2.13 iii. Outpatients/day surgery clients may still experience significant pain after discharge home because of difficulty in anticipating the degree of pain when the local anesthesia effect wears off (White, 2002) and measures should be taken to ensure an alternative analgesic is available following discharge.

4.3.2.14 Active participation of children and parents is important in pain management.

4.3.3 Postoperative Nausea and Vomiting (PONV)

4.3.3.1 Increased incidence with certain surgical interventions e.g., laparoscopy/laparotomy, ear-nose-throat, strabismus (Gan et al, 2014)

4.3.3.2 Anesthetic agents and medications known to exacerbate nausea and vomiting include:

4.3.3.2i. Volatile inhalational anesthesia agents within the first 0 to 2 hours

4.3.3.2ii. Nitrous oxide

4.3.3.2 iii. Intraoperative and postoperative opioids (Gan, Meyer, Apfel, Chung, Davis, Eubanks, Kovac et al, 2003).

4.3.3.3 All prophylactic medication in children at moderate or high risk for postoperative nausea and vomiting should be administered with a combination therapy using 5-HT3 antagonists e.g., granisetron or ondansetron, and a second drug of a different category (Gan et al, 2003)

4.3.3.4 Dexamethasone is an established medication used in decreasing postoperative nausea and vomiting (De Oliveira, Castro-Alves, Ahmad, Ahmad, Kendall, & McCarthy, 2013)

4.3.3.4i. A dosage of 0.25 mg/kg of dexamethasone is effective for preventing postoperative nausea and vomiting in children and larger doses are no more effective (Madan, Bhatia, Chakithandy, Subramaniam, Rammohan, Deshpande, Singh et al, 2005).

4.3.4 Other Anesthetic Considerations to Reduce Postoperative Complications

4.3.4.1 Airway protection:

4.3.4.1i. Due to a larger occiput, premature infants and babies may require support under the shoulders to maintain the head in a normal position and keep the airway patent when supine (e.g., with a towel under the shoulders), or be placed in a lateral position if possible

4.3.4.1 ii. “Head-extension and neutral head-position angles differed in pre-school and school children

a. "In pre-school children, neutral head position or head extension with an angle of −1° to 13°
b. "In school children head extension of 16° may be used to achieve optimal ventilation of an unprotected airway"

(Paal, Niederklapfer, Keller, von Goedecke, Luckner, Pehboeck, Mitterlechner et al, 2010).

4.3.4.2 Obstructive sleep apnea syndrome:

4.3.4.2i. Requires selective induction with anesthesias to minimize respiratory deterioration

4.3.4.2 ii. Should include a preoperative sleep study for children at risk previously completed with review of the results prior to the administration of analgesia/sedation and/or anesthesia, to determine this potential diagnosis

a. A possible change of anesthesia type to regional if possible and once the diagnosis is confirmed.

4.3.4.2iii. Necessitates vigilant monitoring of respiratory status and ensuring the availability of equipment for managing acute respiratory failure (during and following anesthesia)

4.3.4.2iv. Requires assessment and skills appropriate for the management of coexisting cardiac or pulmonary diseases, management of the airway, minimizing opiate administration

4.3.4.2 v. Includes a plan for postoperative monitoring as noted in Phase I

4.3.4.2vi. Requires positioning of the child in a later position following extubation, during the transfer to Phase I (or high Fowler's if the child is able to support his/her own head) to ensure an open airway.

4.3.4.3 Postextubation/postintubation croup/stridor:

For 1-6% of clients, this postoperative complication may be seen with prior signs of onset including, but not limited to:

4.3.4.3 i. Postextubation subglottic edema, the physiological condition causing postintubation croup, which also includes:

a. Narrowed laryngeal and tracheal lumens
b. Mucous obstructing narrow lumens
c. Narrowest portion of the lumen is at the level of the cricoid cartilage
d. Endotracheal tube (ETT) can become wedged in subglottic area causing tracheal mucosal injury on intubation
e. Develops from repeated intubation, coughing, changing the client's position, current or recent upper respiratory tract infections, Down syndrome (subglottic narrowing).

4.3.4.3 ii. Prevention:

a. Humidification of all gases including oxygen
b. The PeriAnesthesia nurse is aware of, and must collaborate with the anesthesia provider who intubates the child to ensure that the correct type and size of endotracheal tube is used for intubation:

bi. The use of a sterile, implant-tested endotracheal tube in the Anesthesia phase (Paul, 2006).

bii. The use of appropriate sized (with air leak pressure of less than 30 cm water), cuffed or uncuffed endotracheal tubes in children under 5

biii. It is possible to intubate the pediatric client with either uncuffed or cuffed endotracheal tubes as long as:

i. Proper sized tube is used (age divided by (÷) 4, plus 4) (Levitan, 2013)
ii. Ongoing correct positioning is confirmed
iii. Continuous correct cuff pressure is maintained.

c. Preemptive treatment with epineprhine by inhalation.

4.3.5 Surgical Safety Checklist (See Illustration Three)

4.3.5.1 The PeriAnesthesia nurse ensures that the checklist is completed, and is aware that this checklist results in:

4.3.5.1i. Multidisciplinary teamwork

4.3.5.1ii. Increased communication in the operating rooms and in other areas

4.3.5.1iii. Higher standards of care, improved patient/client outcomes

4.3.5.1iv. Improved efficiency

4.3.5.1v. Reduced patient/client morbidity and mortality (Norton & Rangel, 2010).

4.3.6 Obesity and Anesthesia-related Complications

4.3.6.1 Difficult mask induction, laryngoscopy, intubation and ventilation in the operating room (Middlebrooks, & Winters, 2011)

4.3.6.2 Arterial haemoglobin desaturation and decreased tissue oxygenation (El-Metainy, Ghoneim, Aridae, & Abdel Wahab, 2011)

4.3.6.3 Airway obstruction and higher risk of obstructive sleep apnea syndrome

4.3.6.3i. The recumbent position may be helpful (bed tilted with head elevated, feet lowered) as it allows the abdomen to shift away from the airway, assists with airway opening, reduces gastric aspiration into lungs.

4.3.6.4 Bronchospasm (El-Metainy et al, 2011)

4.3.6.5 Risk of aspiration increases in the client with obstructive sleep apnea syndrome

4.3.6.6 Respiratory depression increases with premedication for anxiolysis

4.3.6.7 Revision of calculations for medication dosages, since they are usually calculated based on lean body mass, increases risk of under-over-medicating (Middlebrooks, & Winters, 2011)

4.3.6.8 Intravenous catheter insertion is hampered by the presence of adipose tissue

4.3.6.9 Monitoring may be difficult, proper sizing of the blood pressure cuff and other monitoring equipment which should be available in adult size

4.3.6.10 Increased need for antiemetic agents related to delayed gastric emptying.

4.3.7 Succinylcholine (suxamethonium) is a short-acting, depolarizing muscle relaxant, used for intubation and includes the following risks:

4.3.7.1 Fatal hyperkalemia when administering succinylcholine to children with undiagnosed Duchenne muscular dystrophy (DMD)

4.3.7.2 It is safe for use only when it is known that there is no risk of malignant hyperthermia, Duchenne muscular dystrophy or hyperkalemia and when rapid sequence intubation is imperative due to intestinal obstruction or increased gastric contents

4.3.7.3 Rocuronium should be used instead of succinylcholine to reduce the risk of complications when other diagnoses may not be known (Rawicz, Brandom, & Wolf, 2009).

**Illustration Three**

## PEDIATRIC SURGICAL SAFETY CHECKLIST

| Before Induction of Anesthesia in OR | Before Skin Incision/Procedure | Before Patient Leaves OR |
|---|---|---|
| **SIGN IN - INITIATED BY CIRCULATING NURSE** | **TIME OUT - INITIATED BY SURGEON** | **SIGN OUT -INITIATED BY SURGEON** |
| **VERIFICATION STEPS VERBALIZED OUT LOUD FOR ALL TEAM MEMBERS TO REVIEW:** | | |
| **ANESTHESIOLOGIST AND CIRCULATING NURSE VERIFY:**<br>1. Patient Identification<br>• Matching 2 identifiers with name band<br>• Engage parents and patient when applicable<br>2. Procedure and site/side<br>• Engage parents and patient when applicable<br>3. Site marked by surgeon performing procedure<br>4. Weight and allergies<br><br>**WHEN CLINICALLY INDICATED:**<br>5, Compression boots used for DVT prophylaxis<br>6. Warmers in place to prevent hypothermia | **ALL TEAM MEMBERS:**<br>1. Introduce self by name and role<br><br>**SURGEON VERIFIES:**<br>1. Patient/procedure/site/side and position<br>2. Critical steps/Anticipated risks/EBL/duration<br>3. Special Equipment/Implants needed<br>4. Imaging, labs, and other relevant preoperative tests reviewed and available<br><br>**ANESTHESIOLOGIST VERIFIES:**<br>1. Antibiotics given within 60 minutes of incision<br>2. IV access appropriate for estimated EBL<br>3. Blood (or cross-match) available if needed<br><br>**CIRCULATING/SCRUB NURSE VERIFIES:**<br>1. Consent matches verbalized procedure<br>2. Site marking visible in prepped field<br>3. Special Equipment/implants available<br>4. Medications/solutions labelled on field<br><br>**STOP!**<br>**Any questions from team?** | **SURGEON VERIFIES:**<br>1. Name of procedure to be verified<br><br>**CIRCULATING /SCRUB NURSE VERIFIES**:<br>1. Final counts (sponges/instruments/needles)<br>2. Correct labelling of specimens<br>3. Equipment problems to be addressed<br><br>**ALL TEAM MEMBERS DISCUSS:**<br>1.Key Concerns for postoperative period<br>2.Airway concerns during recovery<br>3.EBL and likelihood of ongoing blood loss 4.Need and timing for postop labs/imaging 5.Plan for communicating key recovery issues to receiving team (safe transfer of accountability) |

**Source**: Norton, & Rangel, 2010, p. 65.

4.4 Phase I

The PeriAnesthesia nurse ensures that all of the competencies in Resource 4 are met plus the following specific to pediatric clients:

4.4.1 Pain Management (See also Resource 10)

4.4.1.1 Is a priority in providing quality postoperative care

4.4.1.2 Requires protocols in place through a collaborative strategy with the entire interprofessional team

4.4.1.3 Optimal pain management in children following surgery can be accomplished by:

4.4.1.3i. Effective dosing related to child's age and weight

4.4.1.3ii. Informed clinical decision making

4.4.1.3 iii. Understanding myths about pain for the pediatric client

4.4.1.3iv. Understanding parental concerns (e.g., over-sedation, respiratory depression, addiction) (Schechter, 1999).

4.4.1.4 Appropriate management of children who are unable to verbalize sensation of pain:

4.4.1.4i. Child may exhibit alternate behaviours e.g., restlessness, agitation, crying (Carney, Nicolette, Ratner, Minerd, & Baesl, 2001)

4.4.1.4ii. Parents and professionals may be uncertain about the source of this behaviour

4.4.1.4 iii. Include the family in the assessment of the non-verbal child.

4.4.1.5 Appropriate management of pain includes adequate assessment and attention to symptoms of pain in children using age-appropriate pain assessment rating scales (See 4.4.3) and objective and subjective data, and by incorporating knowledge of cultural diversity in response to pain, in order to:

4.4.1.5 i. Provide adequate use of analgesia in a timely manner

4.4.1.5ii. Communicate effectiveness of pain treatments to other interprofessional team members which leads to better pain management (Dahl, 2002).

4.4.1.6 Treat with the appropriate opioids in Phase I (*excluding codeine,* See 4.4.2) according to neonatal and child administration guidelines after major surgery in the absence of regional anesthesia

4.4.1.6 i. As with adults, morphine is the most frequently used opioid to treat pain in children (Ghazal, Mason, & Cote, 2013).

4.4.1.7 Use acetaminophen after surgery as an adjunct to regional anesthesia or opioids for effective pain management (Jin, & Chung, 2001)

4.4.1.8 Ketorolac provides pain control equivalent to opioids without greater risk of bleeding, and with less nausea and vomiting than opioids

4.4.1.8 i. Ketorolac should be considered for surgical procedures where postoperative vomiting is a concern (Laskowski, Stirling, McKay, & Lim, 2011).

4.4.1.9 The administration of dexamethasone and tramadol effectively treat pediatric postoperative pain (Rudra et al, 2010).

4.4.1.10 Non-pharmacological therapies which are available to treat children's pain include counseling, guided imagery, hypnosis, biofeedback, behavioural management, acupuncture, massage, homeopathic remedies, naturopathic approaches, and herbal medicines (Charlton, 2005)

4.4.1.11 The priority in pain management is the same as in the adult: subjective comfort, enhancement of the child's ability to deep breathe, cough and move easily, thus avoiding postoperative complications, and preventing chronic pain due to under-management (Kehlet, & Dahl, 2003).

4.4.2 Codeine

4.4.2.1 Is no longer recommended for use in children under 12 years of age (Federal Drug Administration Black Box warning, 2013; Health Canada, 2013):

4.4.2.1i. The PeriAnesthesia nurse is aware that codeine *was* an opioid commonly used following adenotonsillectomy, a common surgical procedure to correct obstructive sleep apnea syndrome in children, and for pain from other surgical procedures

a. Codeine is metabolized to morphine by the CYP2D system in the liver in order to be effective

b. The genetics of the CYP2D is to date unknown
c. It is known that some people are homozygotes or heterozygotes for enzyme deficiencies resulting in slow or absent metabolism of codeine to morphine
d. Alternatively, others are *rapid metabolizers* resulting in rapid conversion and toxic accumulation of morphine following administration of codeine

di. This occurs more rapidly in children

dii. Codeine is not recommended for use in the pediatric population because of this inter-individual variation (Ciszkowski, Madadi, Phillips, Lauwers, & Koren, 2009; Fernandez, & Schwengel, 2011; Kelly, Rieder, van den Anker, Malkin, Ross, Neely, Carleton et al, 2012).

4.4.3 Pain Assessment Rating Scales (See Table Eight) (See also Resource 10)

4.4.3.1 The PeriAnesthesia nurse uses age-appropriate pain assessment rating scales to effectively assess and manage postoperative pain

4.4.3.1i. Postoperative analgesia should be utilized as long as pain assessment rating scales demonstrate that it is required

4.4.3.1ii. Pain should be routinely assessed using an age-appropriate rating scale designed for postoperative or prolonged pain from newborns to adolescence

4.4.3.1 iii. Observational scales are the primary method of pain assessment for infants and children less than 3 yrs old, and for those with developmental disabilities.

4.4.3.2 Use of validated, reliable, age-appropriate, pain assessment tools:

4.4.3.2 i. von Baeyer, Christopher, & Hewson (2011) suggest a minimum of three sets of pain intensity measurements by age and/or special population

a. They are the most commonly used and their scales are based on a familiar 0-10 metric, in which 0 indicates no pain and 10 denotes the worse possible pain that can be experienced.

4.4.3.2 ii. Other pain assessment scales include, but are not limited to:

a. Visual analogue scale (VAS)
b. CRIES: Assesses crying, oxygen requirement, increased vital signs, facial expression (Krechel, & Bildner, 1995)
c. CHEOPS (Children's Hospital of Eastern Ontario Pain Scale) for ages 1-7 years: Assesses crying, facial expression, verbalization, torso movement, if child touches affected site, and position of legs. A score of 4 indicates no pain while 13 points signifies the worst pain (McGrath, Johnson, Goodman, Schillinger, Dunn, & Chapman, 1985).
d. NCCPC-PV: Non-communicating Children's Pain Checklist - Postoperative Version (Breau, Finley, McGrath, & Camfield, 2002). (See Illustration Four: NCCPC-PV)

4.4.3.3 Uses appropriate pain assessment rating scales to evaluate effectiveness of pharmacological and non-pharmacological interventions (See 4.1.1.6vi.) (Brown, 2008).

**Table Eight:** Age-specific Pain Intensity Measurement Tools

| Age groups | Pain rating scale | Proven valid | Proven reliable |
|---|---|---|---|
| Age 8 years through adult | **Verbal Numerical Scale** (VNS), also called **Numerical Rating Scale** (NRS) | Williamson et al, 2005; Ferreira-Valente & Hoggart, 2011 | Williamson et al, 2005; Ferreira-Valente, & Hoggart, 2011 |
| Age 4 to 12 years | **Faces Pain Scale – Revised** (FPS-R) , **Wong-Baker FACES Pain Rating Scale** (WBS)<br>(See Appendix Q)<br>Available in multiple languages from the following sources: http://www.wongbakerfaces.org/public_html/wp-content/uploads/2013/11/TranslationsA ll.pdf OR: http://www.iasp-pain.org/Education/Content.aspx?ItemNumber=1823 | Valente, & Hoggart, 2011 | Garra et al, 2010 |
| 2 months and up (when self-report is not available or not trusted) | **Face Legs Arms Cry Consolability** (FLACC) scale<br>"Although similar in content to other behavioral pain scales, the FLACC scale can be used across populations of clients and settings. Scores are comparable to those of the commonly used 0-to-10 number rating scale."<br>(Voepel-Lewis et al, 2010) | Voepel-Lewis et al,2010 | Voepel-Lewis et al, 2010 |

**Adapted from:** von Baeyer, Christopher, & Hewson, 2011

**Illustration Four:** Non-communicating Children's Pain Checklist - Postoperative Version (NCCPC-PV)

NAME:_____ UNIT/FILE #:_____ DATE:_____ (dd/mm/yy)

**How often has this child shown these behaviours in the last 10 minutes? Please circle a number for each behaviour. If an item does not apply to this child (e.g., this child cannot reach with his/her hands), then indicate "not applicable" or "0" for that item.**

| 0 = NOT AT ALL | 1 = JUST A LITTLE | 2 = FAIRLY OFTEN | 3 = VERY OFTEN | NA = NOT APPLICABLE |
|---|---|---|---|---|
| I. Vocal | | | | |
| 1. Moaning, whining, whimpering (fairly soft) | 0 | 1 | 2 | 3 | NA |
| 2. Crying (moderately loud)… | 0 | 1 | 2 | 3 | NA |
| 3. Screaming/yelling (very loud) | 0 | 1 | 2 | 3 | NA |
| 4. A specific sound or word for pain (e.g., a word, cry or type of laugh) | 0 | 1 | 2 | 3 | NA |
| II. Social | | | | |
| 5. Not cooperating, cranky, irritable, unhappy | 0 | 1 | 2 | 3 | NA |
| 6. Less interaction with others, withdrawn | 0 | 1 | 2 | 3 | NA |
| 7. Seeking comfort or physical closeness | 0 | 1 | 2 | 3 | NA |
| 8. Being difficult to distract, not able to satisfy or pacify | 0 | 1 | 2 | 3 | NA |
| III. Facial | | | | |
| 9. A furrowed brow | 0 | 1 | 2 | 3 | NA |
| 10. A change in eyes, including: squinching of eyes, eyes opened wide, eyes frowning | 0 | 1 | 2 | 3 | NA |
| 11. Turning down of mouth, not smiling | 0 | 1 | 2 | 3 | NA |
| 12. Lips puckering up, tight, pouting, or quivering | 0 | 1 | 2 | 3 | NA |
| 13. Clenching or grinding teeth, chewing or thrusting tongue out | 0 | 1 | 2 | 3 | NA |
| IV. Activity | | | | |
| 14. Not moving, less active, quiet | 0 | 1 | 2 | 3 | NA |
| 15. Jumping around, agitated, fidgety | 0 | 1 | 2 | 3 | NA |
| V. Body and Limbs | | | | |
| 16. Floppy | 0 | 1 | 2 | 3 | NA |
| 17. Stiff, spastic, tense, rigid | 0 | 1 | 2 | 3 | NA |
| 18. Gesturing to or touching part of the body that hurts | 0 | 1 | 2 | 3 | NA |
| 19. Protecting, favoring or guarding part of the body that hurts | 0 | 1 | 2 | 3 | NA |
| 20. Flinching or moving the body part away, being sensitive to touch | 0 | 1 | 2 | 3 | NA |
| 21. Moving the body in a specific way to show pain (e.g., head back, arms down, curls up, etc.) | 0 | 1 | 2 | 3 | NA |
| VI. Physiological | | | | |
| 22. Shivering | 0 | 1 | 2 | 3 | NA |
| 23. Change in color, pallor | 0 | 1 | 2 | 3 | NA |
| 24. Sweating, perspiring | 0 | 1 | 2 | 3 | NA |
| 25. Tears | 0 | 1 | 2 | 3 | NA |
| 26. Sharp intake of breath, gasping | 0 | 1 | 2 | 3 | NA |
| 27. Breath holding | 0 | 1 | 2 | 3 | NA |

**SCORE SUMMARY:**

| Category: | I | II | III | IV | V | VI | TOTAL |
|---|---|---|---|---|---|---|---|
| **Score:** | | | | | | | |

Comments:

**Source**: Breau, Finley, McGrath, & Camfield, 2002

4.4.4 Postintubation/Postextubation Croup/Stridor

4.4.4.1 Ongoing monitoring of symptoms which follow extubation of endotracheal tube or laryngeal mask airway, or exacerbation of symptoms that may have been present in the Anesthesia phase:

4.4.4.1i. Sore throat is the first and most common symptom

4.4.4.1 ii. Post extubation subglottic edema signified by stridor, coughing, laryngospasm, noisy, raspy respirations, decreased oxygen saturation, circumoral cyanosis, and excess secretions.

4.4.4.2 Prevention:

4.4.4.2i. Humidification of all gases including oxygen

4.4.4.2ii. Preemptive treatment with epinephrine by inhalation.

4.4.5 Postoperative Nausea and Vomiting (See also Resource 11: Management of Postoperative Nausea and Vomiting in all PeriAnesthesia Phases)

4.4.5.1 Postoperative nausea and vomiting is the most frequent complication of general anesthesia and is the most common cause of delayed discharge from the PostAnesthesia Care Unit (PACU) and unanticipated hospitalization after outpatient surgery (Gan et al, 2003)

4.4.5.2 Risk factors are multifactoral and include, but are not limited to:

4.4.5.2i. Predisposition

4.4.5.2ii. History of postoperative vomiting

4.4.5.2iii. Susceptibility to motion sickness

4.4.5.2iv. Anesthetic drugs or techniques used

4.4.5.2v. Skill of the anesthesiologist providing anesthesia

4.4.5.2vi. Motion/movement

4.4.5.2vii. Type of surgery is associated with a greater than 50% incidence of postoperative vomiting e.g., strabismus surgery, middle ear surgery, orchidopexy, umbilical hernia repair

4.4.5.2viii. Perioperative use of *any* opioid

4.4.5.2 ix. General anesthesia inhalation drugs (Gan et al, 2014).

4.4.5.3 Antiemetic rescue therapy should be administered to pediatric clients who have an emetic episode after surgery

4.4.5.4 If postoperative nausea and vomiting occurs within six hours after surgery, the child should not receive a repeat dose of the prophylactic antiemetic but a new category of antiemetic should be used (Gan et al, 2003)

4.4.5.5 An emetic episode more than six hours after surgery can be treated with any of the drugs already used for prophylaxis except dexamethasone (Gan et al, 2003)

4.4.5.6 Dexamethasone has been shown to reduce postoperative nausea and vomiting as well as being effective as an analgesic (Rudra et al, 2010)

4.4.5.7 Long-lasting preoperative fasting causes nausea in the child, and can be prevented by implementation of a fasting protocol which requires only eight hours fasting without solids, six hours without milk/formula, four hours without breast milk and two hours thirsting without fluids (Canadian Anesthesiologists' Society, 2014; American Society of Anesthesiologists, 2011) (See Appendix O)

4.4.5.7 i. Supplements of clear fluids are to be given with this protocol on two occasions, with the later portion two hours preoperatively (Klemetti, Kinnunen, Suominen, Antila, Vahlberg, Grenman, & Leino-Kilpi, 2010).

4.4.5.8 Risk Factor Assessment Scales: (See Section 4.1.1.5 and Illustrations One and Two).

4.4.6 Family visitation

4.4.6.1 Family visitation in the PACU decreases client anxiety scores when compared with no visitation (Vogelsang, 1987)

4.4.6.2 Family presence is also responsible for a reduction in iatrogenic events including medication errors, wrong client errors, wrong site/side/level surgery, and an increased awareness of negative changes in client's condition (Institute of Patient- Family- Centred Care, 2013)

4.4.6.3 Family visitation improves pediatric client and family satisfaction and is related to reduced anxiety, reduced need for analgesics, fewer episodes of behavioural issues including crying (Fina, Lopas, Stagnone, & Santucci,1997; Kamerling, Lawler, Lynch, & Schwartz, 2008)

4.4.6.4 Family visitation and patient- family-centred care have been shown to reduce length of stay, reduce medication use, and reduce workload in nursing care hours (Institute of Patient- Family- Centred Care, 2013; Gavin, 2013).

4.4.7 Emergence Delirium

4.4.7.1 Symptoms that occur during emergence from general anesthesia:

4.4.7.1i. Disorientation, hallucinations, intermittent uncontrollable physical activity, hyperexcitability (Reduque, & Verghese, 2013)

4.4.7.1 ii. A "dissociated state of consciousness in which the child is irritable, uncompromising, uncooperative, incoherent, and inconsolably crying, moaning, kicking, or thrashing" (Reduque, & Verghese, 2013)

a. Emergence delirium can disrupt the surgical repair, be distressing for parents and staff and may cause parental dissatisfaction with their child's care (Reduque, & Verghese, 2013).

4.4.7.2 Etiology of emergence delirium includes:

4.4.7.2i. Rapid emergence from anesthesia

4.4.7.2ii. Use of short-acting volatile anesthesia agents

4.4.7.2iii. Postoperative pain

4.4.7.2iv. Type of surgery: otorhinolaryngological and ophthalmological surgeries in comparison with urological and general surgery procedures

4.4.7.2v. Age

4.4.7.2vi. Preoperative anxiety

4.4.7.2vii. Child temperament (Reduque, & Verghese, 2013)

4.4.7.2viii. Sensory deprivation (eye bandage, eye lubricant)

4.4.7.2 ix. Awakening in a strange environment (Kazak, Sezer, Yılmaz, & Ates, 2010).

4.4.7.3 Behavioral abnormalities may persist for 12 - 24 hours, including:

4.4.7.3i. Sleep disturbances

4.4.7.3ii. Nightmares (terrors)

4.4.7.3iii. Separation anxiety

4.4.7.3iv. Aggression toward authority

4.4.7.3v. Loss of night-time bladder control

4.4.7.3 vi. Transient symmetrical neurologic changes following general anesthesia (within minutes of discontinuation of general

anesthesia), which may last for hours and include, but are not limited to:

a. Sustained and non-sustained ankle clonus
b. Bilateral hyperreflexia
c. Babinski reflex
d. Decerebrate posturing.

4.4.7.3vii. Prolonged neurologic changes are:

a. Never normal if focal neurologic deficits are present
b. An indication of central or peripheral nervous system injury
c. An indication that investigation is required (Kazak et al, 2010).

4.4.7.4 The PeriAnesthesia nurse reduces the incidence of emergence delirium through knowledge regarding:

4.4.7.4i. Parental presence alone is not sufficient to prevent emergence delirium, but in combination:

a. Parental presence with a premedication of a low dose of midazolam 0.25 mg/kg is equally effective as a higher dose of midazolam (0.5 mg/kg) alone (Kazak et al, 2010).

4.4.8 Postoperative Hyponatremia

4.4.8.1 Defined as a reduction in serum sodium from a normal level to less than 130 mmol/L within 48 hours

4.4.8.1i. At risk populations include children undergoing surgery, those with acute medical illnesses including meningitis, encephalitis, bronchiolitis and pneumonia (Hospital for Sick Kids, 2011).

4.4.8.2 Related to/caused by:

4.4.8.2i. Negative sodium balance in the first 12 postoperative hours from administration of hypotonic saline solutions (e.g., 2/3 & 1/3 [0.3% NaCl with 3.3% dextrose] or 0.2% NaCl solutions)

4.4.8.2ii. A positive fluid balance related to excessive replacement therapy, boluses for hypotension, anuria, gastric replacement therapy (Eulmesekian, Pérez, Minces, & Bohn, 2010)

4.4.8.2iii. Excessive vomiting or prolonged postoperative nausea and vomiting (PPONV) or diarrhea and/or dehydration.

4.4.8.3 A low serum sodium (Na) level of *less than 140 mmol/l* is exhibited by hyponatremic encephalopathy symptoms which vary and include, but are not limited to:

4.4.8.3i. Mild symptoms:

a. Headache, mental confusion
b. Nausea, vomiting
c. Weakness, lethargy.

4.4.8.3ii. Advanced symptoms:

a. Cerebral herniation and seizures
b. Respiratory arrest
c. Noncardiogenic pulmonary edema
d. Dilated pupils, decorticate or decerebrate posturing (Institute for Safe Medication Practices, 2009).

4.4.8.4 Acute hyponatremia or a critical serum sodium (Na) level *less than 130 mmol/l* should be suspected where there is a new onset of seizures, the child remains unconscious following anesthesia, or the child is in a coma

4.4.8.5 The PeriAnesthesia nurse has the knowledge regarding prevention and is able to collaborate with the interprofessional team regarding options for prevention which include, but are not limited to:

4.4.8.5i. Maintenance fluid therapy with isotonic saline solutions (0.9% NaCl or Ringers Lactate solutions) should replace estimated normal physiologic urine output and insensible losses in clients with reduced or no oral intake

4.4.8.5ii. Use of isotonic saline solutions (0.9% NaCl or Ringers Lactate solutions) for bolus fluid therapy to expand the circulating volume in children with hypovolemia or shock

4.4.8.5 iii. Fluid therapy to replace abnormal losses from the GI tract and other body cavities should only be with isotonic saline solutions (0.9% NaCl or Ringers Lactate solutions) (Hospital for Sick Kids, 2011).

4.4.8.6 The PeriAnesthesia nurse is aware of treatment options when hyponatremia is detected which include, but are not limited to:

4.4.8.6i. Discontinuation of any hypotonic IV fluids being administered and give 2 - 3 mls/kg of 3%NaCl or 1 gm/kg mannitol (hypertonic solutions) (Hospital for Sick Kids, 2007)

4.4.8.6ii. Notify the critical care unit of a pending admission; correction of low serum Na must be made slowly

4.4.8.6iii. Continue to measure the serum electrolytes every four hours and correct the serum Na level to above 130 mmol/l acutely, using either 2 - 3 mls/kg of 3% saline (repeat if necessary) or 1 gm/kg mannitol

4.4.8.6iv. Change IV maintenance fluid to isotonic solutions at minimal levels (Hospital for Sick Kids, 2007).

4.4.9 Obstructive Sleep Apnea Syndrome (See also Resource 13: Airway Management in Phase I)

4.4.9.1 The PeriAnesthesia nurse is aware of the incidence, prevalence, cause and symptoms which include:

4.4.9.1i. Highest risk groups are those younger than 3 years old, with associated syndromes or medical conditions (See Table Nine)

4.4.9.1ii. Absolute indicator: Apnea/hypopnea index (AHI) (respiratory disturbance index) greater than 40 (See Resource 13: Airway Management in Phase I for an explanation and Glossary for definition)

4.4.9.1iii. Most common cause in children of all ages (2-8 yrs) is adenotonsillar hypertrophy

4.4.9.1iv. Prevalence: 2% of pediatric population

4.4.9.1v. Symptoms include: Supraglottic obstruction exhibited during rapid eye movement (REM) sleep by breath holding, snoring

4.4.9.1 vi. Complications with anesthesia: desaturation on anesthesia induction and emergence.

**Table Nine:** Obstructive Sleep Apnea Incidence and Symptoms in Children

| Clinical features of OSA in Children: Type I OSA | | Adults and Children Type II OSA |
|---|---|---|
| | **Incidence** | |
| **Peak age** | 2-6 years | Middle Age |
| **Gender** | Male = Female | Male > Female |
| **Etiology:** | Adenotonsillar hypertrophy, Craniofacial disorders, Chromosomal abnormalities Down syndrome (mild mid-face hypoplasia, large tongue, generalised hypotonia)<br>• Severe mid-face hypoplasia such as Aperts or Crouzons syndrome; Treacher-Collins or Pierre Robin sequence (micrognathia)<br>• Cerebral palsy (hypotonia); sickle cell disease (lymphoid hyperplasia); papillomatosis,<br>• Cystic hygroma (foreign body)<br><br>Obesity is becoming an increasingly common cause of OSA in older children.<br><br>Hypotonia | Obesity |
| | **Symptoms** | |
| **Weight:** | Failure to thrive | Obese |
| **Daytime sleepiness:** | Uncommon | Common |
| **Neurobehavioral:** | Hyperactive, poor school performance, Secondary enuresis | Cognitive impairment Poor vigilance |

**Adapted from**: Walker, 2009

4.4.9.2 Postanesthesia complications of obstructive sleep apnea syndrome are related to:

4.4.9.2i. The effects of residual anesthesia, sedation and analgesia, which exacerbate blunted ventilatory response to carbon dioxide in obstructive sleep apnea syndrome, further depressing the respiratory drive and relaxing the pharyngeal dilator muscles

4.4.9.2ii. Edema of pharyngeal tissue

4.4.9.2 iii. Twenty percent (20%) of children with obstructive sleep apnea syndrome who undergo urgent adenotonsillectomy may experience perioperative respiratory complications which may necessitate tracheal reintubation and mechanical ventilation or the use of non-invasive mechanical ventilation such as CPAP (Rudra, Ray, Sengupta, Iqbal, & Maitra, 2010).

4.4.9.3 Prevention of respiratory distress includes, but is not limited to:

4.4.9.3i. Positioning: lateral position improves maintenance of passive pharyngeal airway following extubation and on transfer from Operating Room (Rudra et al, 2010)

4.4.9.3 ii. CPAP-assisted ventilation prior to surgery which will reduce incidence of respiratory complications (Rudra et al, 2010).

4.4.9.4 Recommendations for length of stay in Phase I for children with obstructive sleep apnea:

4.4.9.4i. The ASA practice guidelines (2006) recommended that clients with obstructive sleep apnea should be observed for an additional 3 hours before discharge home after ambulatory surgery (following general or regional anesthesia) with an additional 7 hours of observation if any significant episode of airway obstruction or apnea occurred during the first 3 hour period.

4.4.9.4ii. However, *these recommendations were based on expert reviews and were not supported by clinical evidence* (Adesanya, Lee, Greilich, & Joshi, 2010).

4.4.9.4iii. In 2014, the ASA updated practice guidelines noted that the literature is insufficient to examine the impact of monitored postoperative settings (e.g., stepdown or intensive care unit) *versus* routine hospital wards for clients with known or suspected obstructive sleep apnea.

4.4.9.4iv. An observational study reports lower frequencies of rescue events and transfers to the intensive care unit when a continuous pulse oximetry surveillance system was introduced into the postoperative care setting for a general client population

a. Alternatively, ongoing observation and monitoring of oxygen saturation may be accomplished by telemetry in a Phase II area.

4.4.9.4v. The literature is insufficient to offer guidance regarding the appropriate duration of postoperative respiratory monitoring in clients with obstructive sleep apnea (Gross et al, 2014).

4.4.9.4vi. Ambulatory surgery should be considered when/if obstructive sleep apnea clients are *deemed eligible* for ambulatory surgery (with milder obstructive sleep apnea and lower STOP-Bang scores)

a. These clients should be scheduled for surgery early in the day or have their surgery performed as the first case of the day to enable longer monitoring times in the postanesthesia period (Gross et al, 2014).

4.4.9.5 Following adenotonsillectomy, the child may still have disturbed breathing patterns and sleep interruptions in the immediate postoperative period, as well as airway edema due to the surgical procedure (Tauman, Gulliver, Krishna, Montgomery-Downs, O'brien, Ivanenko, & Gozal, 2006).

4.4.10 Postoperative Fever

4.4.10.1 The PeriAnesthesia nurse is aware that postoperative fever can be caused by any one of the "4 Ws" (See Table Ten)

4.4.10.1i. Wind (lungs) atelectasis

4.4.10.1ii. Wound (surgical site): infection

4.4.10.1 iii. Water (urinary tract): urinary tract infection

4.4.10.1iv. Walker (legs): deep vein thrombosis.

4.4.10.2 Early fever may be related to operative trauma, general anesthesia

4.4.10.2i. Temperature greater than 38.5°C within 24 hours of an operation and general anesthesia is common

a. Atelectasis is the most common cause due to the reduced ciliary motion of tracheal-bronchial tree depressed by endotracheal intubation, inhalational general anesthesia, or use of nonhumidified gases
b. Combining the above with small tidal volume breathing, somnolence, splinting from pain, and/or cough suppression from opioid analgesics.

**Table Ten:** Etiology of Postoperative Fever

| Site | Etiology | Time | Incidence | Sign or Symptoms | Diagnosis | Therapy |
|---|---|---|---|---|---|---|
| **Wind (lungs)** | Atelectasis | 24–48 hrs | Very common | Cough, shortness of breath, retractions | Examination, chest radiography | Cough, deep breathing, incentive spirometer |
| **Wound (surgical site)** | Infection | < 24 hrs–7 days | Rare | Pain, erythema, induration | Examination wound cultures | Antibiotics, open wound |
| **Water (urinary tract)** | Urinary tract infection | 3–5 days | Very rare | Dysuria, hematuria | Examination urinalysis, culture | Remove indwelling catheter, antibiotics |
| **Walker (legs)** | Deep-vein thrombosis | > 3 days | Extremely rare | Swelling, heaviness of lower extremities, superficial venous congestion, palpable cord | Examination, duplex Doppler, venography | Bed rest, elevation, heparin (Coumadin), thrombolytics |

**Adapted from:** American Academy of Paediatrics, 2010

4.4.10.3 Other causes which are rare and may occur later in the postoperative period (over 24 hours) include, but are not limited to:

4.4.10.3i. Urinary tract infection (dysuria, hematuria)

4.4.10.3ii. Dehydration

4.4.10.3 iii. Infected IV site(s)

4.4.10.3iv. Thyroid storm

4.4.10.3v. Pheochromocytoma

4.4.10.3vi. Malignant hyperthermia

4.4.10.3vii. Wound infection.

4.4.10.4 Management of postoperative fever in Phase I

4.4.10.4i. Frequent temperature monitoring, on admission to Phase I and a minimum of every 15 minutes until temperature is within normal range

4.4.10.4ii. Notify most responsible physician of abnormal temperature (<36° C or >38° C)

4.4.10.4 iii. Serum blood cultures, cultures of operative site, urine, sputum.

4.4.10.5 Treatment options include, but are not limited to:

4.4.10.5i. Treat temperature with antipyretics e.g., acetaminophen

4.4.10.5ii. Continue prophylactic antibiotic as ordered preoperatively

4.4.10.5iii. Broad-spectrum antibiotic for suspected source of infection based on symptoms (American Society of Anesthesiologists,

2011; Ireland, 2006; Kehlet, & Dahl, 2002; Molloy, & Pasaron, 2013).

4.4.11 Post-tonsillectomy Hemorrhage

4.4.11.1 Incidence: 5-10%, occurs early or late

4.4.11.1 i. Early hemorrhage: within first 24 hours, usually after discharge

a. Failure of hemostasis, coagulopathy.

4.4.11.1ii. Late hemorrhage: 5-14 days postoperatively

a. Dislodgement of scab from operative site.

4.4.11.2 Severe, life-threatening

4.4.11.3 Associated with poor postoperative fluid intake and volume reduction resulting from blood loss (American Academy of Paediatrics, 2010).

4.4.12 Other postoperative complications in the pediatric postoperative period include, but are not limited to:

4.4.12.1 Early complications: Wound infection, drainage, postoperative bleeding, urinary retention, scrotal edema, venous thromboembolism

4.4.12.2 Late complications: Wound infection, pyrexia, scar formation (American Academy of Paediatrics, 2010).

4.4.13 Obesity Postoperative Complications

4.4.13.1 Difficult intubation, respiratory distress (Middlebrooks, & Winters, 2011)

4.4.13.2 Arterial haemoglobin desaturation and decreased tissue oxygenation (El-Metainy, Ghoneim, Aridae, & Abdel Wahab, 2011)

4.4.13.3 Airway obstruction

4.4.13.3i. Positioning of the client during the Phase I stay should be carefully considered, especially if the client has a history of obstructive sleep apnea syndrome

4.4.13.3 ii. The recumbent position may be helpful (bed tilted with head elevated, feet lowered) as it allows the abdomen to shift away from the airway, assists with airway opening, reduces gastric aspiration into lungs.

4.4.13.4 Bronchospasm (El-Metainy et al, 2011)

4.4.13.5 Risk of aspiration increases in the client with obstructive sleep apnea syndrome

4.4.13.6 Respiratory depression increases postoperatively with premedication for anxiolysis

4.4.13.7 Revision of calculations for medication dosages, since they are usually calculated based on lean body mass, increases risk of under-or-over-medicating (Middlebrooks, & Winters, 2011)

4.4.13.8 Intravenous catheter maintenance/reinsertion is hampered by the presence of adipose tissue

4.4.13.9 Medications should not be administered intramuscularly since the medication may only reach adipose tissue and not muscle

4.4.13.10 Monitoring may present a problem especially with proper sizing of the blood pressure cuff and other monitoring equipment which should be available in adult size

4.4.13.11 Wound evisceration or dehiscence (Lawrence, 2005)

4.4.13.12 Increased need for antiemetic agents related to delayed gastric emptying

4.4.13.13 Prolonged stay in Phase I compared to the leaner pediatric clients (Middlebrooks, & Winters, 2011)

4.4.13.14 Delayed or complicated wound healing (Lawrence, 2005).

4.4.14 Death and Dying in Pediatric Perianesthesia Environments, Do-Not-Resuscitate (DNR) Status, Advance Directives or Goals of Care (Alberta Health Services, 2014)

4.4.14.1 Related to the following types of surgery:

4.4.14.1i. Scheduled surgery 4.4.14.1ii.

Emergency surgery

4.4.14.1 iii. Palliative surgery e.g., feeding tubes, invasive vascular access for therapy.

4.4.14.2 Options that require consideration for pediatric clients with advance directives undergoing surgery:

4.4.14.2 i. Scheduled surgery

a. Unexpected poor outcome and prognosis
b. Parental presence and decision-making
c. Resuscitation efforts to perform.

4.4.14.2ii. Emergency surgery

a. DNR or full resuscitation
b. Previous DNR order in place, and possible suspension or revision
c. DNR suspension interval may be during the perioperative period only (procedural-directed), for the full hospitalization, or completely suspended
d. Client's and family's goals, values, preferences
e. Special interventions to be considered with DNR status placed in context of child's quality of life are each reviewed prior to surgery (Fallat, Deshpande & Section on Surgery, Anesthesia and Pain Medicine, 2004).

4.4.14.2 iii. Palliative surgery

a. Provide nutrition, comfort, and treatment to child with terminal illness or poor quality of life
b. DNR status in place or not in place
c. Prognosis of survival following intervention and anesthesia
d. DNR suspension or revision as in 5.4.12.2ii. (b-e.), support decisions (Fallat et al, 2004).

4.4.14.2 iv. Resuscitation efforts to perform include, but are not limited to:

a. Airway management
b. Supplemental oxygen
c. Oropharyngeal and nasopharyngeal airways
d. Bag-valve-mask ventilation
e. Intubation with endotracheal tube
f. Arterial puncture
g. Needle thoracentesis
h. Chest tube insertion
i. Blood product transfusion/fluid resuscitation
j. Invasive monitoring
k. Chest compressions
l. Defibrillation
m. Cardiac pacing
n. Resuscitative medications (epinephrine, atropine, sodium bicarbonate, calcium, other vasoactive or inotropic drugs)
o. Postoperative ventilatory support (Fallat et al, 2004).

4.5 PostAnesthesia Phase II

The PeriAnesthesia nurse ensures that all of the competencies in Resource 4 are met plus the following specific to pediatric clients.

4.5.1 Postoperative Complications

4.5.1.1 Pain management (See 4.4.1):

4.5.1.1i. Continuous monitoring for pain using validated and age-appropriate pain assessment rating scales (See 4.4.3)

4.5.1.1ii. Treatment as often as scheduled and not on a rescue basis (See Resource 10)

4.5.1.1 iii. Reduce the administration of intravenous opioids (unless pain score in the higher range) and replace with oral medications.

4.5.1.2 Postintubation/postextubation croup/stridor (See 4.4.4):

4.5.1.2i. Ongoing airway monitoring for possible return of symptoms if present in Anesthesia phase and/or Phase I, or exacerbation of residual symptoms (e.g., sore throat or postextubation subglottic edema) (See 4.4.4.1)

4.5.1.2 ii. Prevention (see 4.4.4.2).

4.5.1.3 Postoperative nausea and vomiting (See 4.4.5):

4.5.1.3i. Continue to monitor using validated postoperative nausea and vomiting assessment scoring system (See Resource 11)

4.5.1.3ii. Continued treatment as often as scheduled and not on a rescue basis

4.5.1.3iii. If no relief within the first six hours from the initial pharmacological management choice, administer a medication from a different category of antiemetic drugs

4.5.1.3 iv. After 6 hours following first treatment of postoperative nausea and vomiting, the drug that was first used may be administered again *except* dexamethasone (Gan et al, 2003).

4.5.1.4 Family visitation:

4.5.1.4i. Continues in Phase II, with parent assisting to meet the needs of the client

4.5.1.4ii. Reduces emergence delirium related to separation anxiety as the child becomes more aware of unfamiliar surroundings (Volgelsang, 1987)

4.5.1.4 iii. Family visitation improves client satisfaction and is related to reduced anxiety, reduced need for analgesics, fewer episodes of behavioural issues including crying (Fina et al, 1997; Kamerling et al, 2008).

4.5.1.5 Postoperative hyponatremia (See 4.4.8):

4.5.1.5 i. Negative sodium balance may be present during the first 12 postoperative hours, including Phase II, caused by:

a. Administration of hypotonic saline solutions
b. A positive fluid balance related to excessive replacement therapy, boluses for hypotension, anuria, gastric replacement therapy (Eulmesekian, Pérez, Minces, & Bohn, 2010)
c. Continuous and prolonged postoperative nausea and vomiting (PPONV) or diarrhea and/or dehydration.

4.5.1.5 ii. Symptoms to be aware of include:

a. Lethargy
b. Weakness in the child's movements

c. Nausea and vomiting
d. Headache
e. Confusion
f. Loss of energy
g. Fatigue
h. Restlessness and irritability
i. Muscle weakness, spasms or cramps
j. Seizures, coma (severe).

*4.5.1.5* iii. Treatment for serum Na *less than 130 mmol/l*

a. Loading dose of 2 - 3 mls/kg of 3% NaCl or 1 gm/kg mannitol (Hospital for Sick Kids, 2007)
b. Transfer to a unit capable of cardiac monitoring e.g., Phase I (PACU).

*4.5.1.5* iv. Treatment for serum Na *between 130-140 mmol/l*

a. Isotonic intravenous solutions (0.9% NaCl) may continue
b. Frequent serum testing to ensure rise of serum sodium
c. Ongoing treatment of cause e.g., vomiting.

4.5.1.6 Obstructive sleep apnea syndrome (See 4.4.9):

4.5.1.6i. Ongoing monitoring for:

a. Symptoms of respiratory depression or laryngeal edema e.g., snoring or stertorous respirations, sleepiness, failure to rouse or respond to spoken word
b. Reduction in oxygen saturation, or increase in capnography value
c. Increase in pulse rate
d. Circumoral cyanosis.

4.5.1.6 ii. Notification of appropriate interprofessional team member if symptoms exist

a. Reversal agents (for anesthesia, opioids, sedatives)
b. CPAP-assisted non-invasive ventilation
c. Overnight observation in area capable of continuous monitoring (e.g., PACU, ICU) (Rudra et al, 2010).

4.5.1.7 Postoperative fever (temperature greater than 38.5°C) (See 4.4.10):

4.5.1.7i. Early fever can occur at any time within first 24 hours, including while in Phase II:

a. May be related to operative trauma or general anesthesia (See 4.4.10.2i.).

4.5.1.7 ii. Management of postoperative fever in Phase II

a. Frequent temperature monitoring, on admission to Phase II and a minimum of every hour until temperature is within normal range
b. Notify most responsible physician
c. Treatment options include, but are not limited to:

ci. Serum blood cultures, cultures of operative site, urine, sputum

cii. Treat temperature with antipyretics e.g., acetaminophen

ciii. Continue prophylactic antibiotic as ordered preoperatively

civ. Broad-spectrum antibiotic for suspected source of infection based on symptoms (American Society of Anesthesiologists, 2011; Ireland, 2006; Kehlet, & Dahl, 2002; Molloy, & Pasaron, 2013).

4.5.1.8 Obesity (See 4.4.13):

4.5.1.8 i. Obesity results in

a. Difficult airway
b. Difficult positioning
c. Compromised intravenous access
d. Increased incidence of nausea and vomiting
e. More difficult BP monitoring
f. Resultant prolonged stay in Phase II (Middlebrooks, & Winters, 2011).

4.5.1.8 ii. The PeriAnesthesia nurse manages these complications by:

a. Recumbent positioning (head elevated, feet lowered) allows the abdomen to shift away from the airway, assists with airway opening, reduces gastric aspiration into lungs
b. Promotion of deep breathing, coughing and early mobilization which reduces incidence of broncho/laryngospasm and length of stay in Phase II
c. Medication dosages should be relevant to BMI and not lean body mass (Middlebrooks, & Winters, 2011) and should not be administered intramuscularly
d. Prophylactic treatment of anxiety may reduce respiratory distress (El-Metainy et al, 2011)
e. BP cuffs and other monitoring equipment should be available in adult size
f. Monitor wound for approximation, evisceration, dehiscence (Lawrence, 2005)
g. Increased need for antiemetics due to delayed gastric emptying (Middlebrooks, & Winters, 2011).

## 4.6 Extended Observation

The PeriAnesthesia nurse ensures that all of the competencies in Resource 4 are met plus the following specific to pediatric clients:

4.6.1 Pain: Continue multimodal pain management including non-pharmacological techniques (e.g., relaxation, distraction) until pain acceptable to the client

4.6.2 Nausea and Vomiting: Continue with pharmacological and non-pharmacological antiemetic therapy, for late or prolonged postoperative nausea and vomiting (PPONV)

4.6.3 Family Visitation: Should continue in the Extended Observation phase

4.6.4 Obstructive Sleep Apnea Syndrome: Continuous monitoring following emergence from anesthesia

4.6.5 Postoperative Fever:

4.6.5.1 Late causes which are rare and may occur later in the postoperative period (over 24 hours) relevant to Phase II and Extended Observation phases include, but are not limited to:

4.6.5.1i. Urinary tract infection (dysuria, hematuria)

4.6.5.1ii. Dehydration

4.6.5.1iii. Infected IV site(s)

4.6.5.1iv. Thyroid storm
4.6.5.1v. Pheochromocytoma
4.6.5.1vi. Malignant hyperthermia
4.6.5.1vii. Wound infection.

4.6.6 Obesity:

4.6.6.1 Continue to promote of deep breathing, coughing and early mobilization to reduce the incidence of broncho/laryngospasm and length of stay in Extended Observation

4.6.6.2 Medication dosages should be relevant to BMI and not lean body mass (Middlebrooks, & Winters, 2011) and should not be administered intramuscularly

4.6.6.3 Monitor wound for approximation, evisceration, dehiscence (Lawrence, 2005)

4.6.6.4 Increased need for antiemetics ongoing due to delayed gastric emptying and may result in prolonged postoperative nausea and vomiting (PPONV) (Middlebrooks, & Winters, 2011).

**5. Patient/Client Safety in all Pediatric PeriAnesthesia Phases**:

Patient /client safety is defined as “freedom from accidental injury” caused by medical care, such as harm or death attributable to adverse drug events, patient/client misidentifications, and health care-associated or healthcare-acquired infections (American Association of Pediatrics, 2011).

The “Canadian Paediatric Adverse Events Study”, released in 2013, is the first national study completed on the incidence of adverse events in hospitalized *children*, identifying areas to focus efforts on reducing harm. There has been no similar national study describing the magnitude of the problem in the pediatric population anywhere else in the world.

In this study, supported by the Canadian Patient Safety Institute (CPSI), The Hospital for Sick Children (SickKids) and other academic pediatric centres across the country, researchers found the overall rate of adverse events in children hospitalized in Canada to be 9.2 per cent (%) (Canadian Patient Safety Institute & Hospital for Sick Kids, 2013). Children in academic pediatric centres were more than **three** times as likely to experience an "adverse event"/harmful incident as those in community hospitals (11.2% versus 3.3%). This is due in part to the acuity of the ill children and the intensity of surgical procedures performed at each type of institution.

The results also indicate that the priority for patient/client safety in academic hospitals should be on ***surgical*** and intensive care, while in community hospitals, the evidence suggests that the focus should be in emergency and obstetrical care.

Surgical harmful incidents, which were the most common cause of harmful incidents overall, occurred significantly more commonly in academic pediatric centres, and along with harmful incidents due to medical/surgical procedures and clinical care, accounted for just over 70% of the total of harmful incidents. "*The single most effective strategy for improving the overall safety of acute care in paediatrics in Canada would be to focus on improving surgical safety, particularly in Academic Pediatric Centres"* (Canadian Patient Safety Institute & Hospital for Sick Kids, 2013, p. 9).

**5.1** Communication in Pediatric Patient/Client Safety

Failures in communication are a leading cause of adverse events in the health care setting (Weingart, Herstich, Baker, Garrett, Bird, Billock, Schwartz et al, 2013). One of the most common communication types in health care is the specific transfer of accountability (and care) communication necessary to maintain safe and continuous care when clients are transitioned between different locations and/or care providers change.

#### 5.1.1 Pediatric Transfer of Accountability Communication (See also Resource 6: Transportation and Communication for Safe Transfer of Care):

A transfer of accountability and care in health care can be defined as the transfer of information, responsibility, and authority from one provider to another setting (Weingart et al, 2013). Poor communication can cause more than 80% of the errors that occur in health care (Joint Commission, 2013).

A disruption in the continuity of care during a transfer can lead to multiple errors in client care. Transfers of accountability are susceptible to failure in communication between providers because transitions are often complicated by interruptions, distractions, time constraints and care provider fatigue. Without a universal electronic medical record available across all care institutions, information acquired during transfer communications is often used to make urgent decisions regarding client care. Therefore, the information given during the transfer is essential to patient/client safety.

In the pediatric population, the quality of this communication becomes even more important as the pediatric client cannot give their own medical information or advocate for themselves. If the child is critically ill or transferred between hospitals, the quality of the communication shared is of crucial importance.

#### 5.1.2 PeriAnesthesia Pediatric Transfer of Accountability Communication

The following standardized transfer of accountability template (Illustration Five) is one example of the "script" for all pediatric transfer of accountability communications.

**Illustration Five:** Example of Transfer of Accountability Communication for Pediatric Transfer of Care

**Transfer of Accountability throughout Pediatric PeriAnesthesia Environments**

- Communication/report to begin once the sending nurse indicates that the client is safely on the receiving hospital bed/stretcher and on monitoring equipment
- Transport RN:

Y Patient demographics, name, age, allergies, weight if applicable
Y History of presenting illness/surgery/concern: Brief summary
Y Diagnosis and therapies: Labs (completed and pending), diagnostic and radiographic tests, meds, treatments

- Sending RN/team assessments, meds, diagnostic tests, response to treatment

***Pause for Questions/Clarifications***

- Transport Respiratory Therapist if present

Y Assessment
Y Interventions and responses to treatments
Y Intubation (if applicable): ETT size, tube depth and additional information e.g., difficult intubation, ventilator settings, vital capacity, FEV, etc.

***Pause for Questions/Clarifications***

- Parent (to be lead by Transport RN)

Y "Was the report you heard accurate or did we miss anything?"
Y If no parent available during transfer, RN to give update on parent status and pending arrival

***Pause for Questions/Clarifications***

- Attending MD/Resident/NP

Y Summarize working diagnosis; summarize condition and responses to treatment Review of Plan:
Y Neuro: Pain issues, neuro checks, seizure plan, sedative plan
Y Cardio/Respiratory: Monitoring (if applicable), asthmas pathway plan
Y GI: Diet, fluids
Y Hem/ID: Antibiotics
Y Gen Care: labs, foley catheter, IVs, infusions

***Pause for Questions/Clarifications***

**Adapted from**: Weingart, Herstich, Baker, Garrett, Bird, Billock, Schwartz et al, 2013, p. 43.

For further information regarding Transfers of Accountability, see Resource 6: Transportation and Communication for Safe Transfer of Care.

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