

Respiratory Assessment in Child and Adolescent Residential Treatment Settings: Reducing Restraint-Associated Risks

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TOPIC: *Crisis situations of youth in treatment settings may require restraints. Restraints should only be used in situations where there is imminent danger to the child and when there is no alternative. They are meant to maintain the child's safety, but there is risk for respiratory compromise.*

PURPOSE: *Nursing care of children in restraints must include respiratory assessment and, when indicated, immediate intervention to prevent disastrous outcomes.*

SOURCES: *Review using PubMed and established texts confirms that clinical skills and knowledge is essential to child and adolescent psychiatric nursing.*

CONCLUSIONS: *Clinical assessment and awareness of risks in physical restraints is essential for the safety and well-being of the child.*

Search terms: *Adolescent, child, pediatrics, restraint, restraint death*

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Introduction

Management of crisis situations that include assaultive or self-harming behaviors of children and adolescents in residential treatment settings sometimes includes the use of physical restraints (Allen et al., 2003; Berrios & Jacobowitz, 1998; Dorfman & Kastner, 2004; Sourander, Ellila, Valimaki, & Piha, 2002). Physical restraint use is a high-risk intervention that may cause sudden death that is preventable. The most effective means of reducing risks associated with restraints is prevention of their use.

There are several effective de-escalation and crisis intervention strategies designed to prevent the use of physical restraints. Many agencies and institutions follow the protocols and recommendations of successful training programs that offer specific techniques regarding the management of crisis situations. To extensively review and summarize the available literature addressing nonphysical de-escalation and crisis intervention strategies is beyond the scope of this article.

Physical restraint use is meant to be a last resort in situations where there is imminent risk of harm to the patient, staff, or others (Bower, McCullough, & Timmons, 2003). In the mid-1990s, there was strong belief that restraint was often being used inappropriately as a behavioral intervention rather than a safety measure (Allen, 2000; Fish & Culshaw, 2005; Goren & Curtis, 1996). At that time inpatient nurses were made aware of the dangers of restraint. Staff members working now in the child and adolescent psychiatric setting may not be fully aware of the life-threatening risks of restraint use (Mohr, Mahon, & Noone, 1998; Mohr & Mohr, 2000).

There is no safe restraint method and rather than serving as an intervention in the management of assaultive and self-harming behaviors, it is instead a

poor outcome. Few studies have been conducted to determine the nature and cause of restraint-related fatalities in children. A study conducted by Nunno and colleagues found 45 child or adolescent fatalities related to the use of physical or mechanic restraints between 1993 and 2000. The cause of death in 25 of those cases was asphyxia (Nunno, Holden, & Tollar, 2006).

One of the greatest risks of physical restraints is respiratory compromise. When a physical restraint cannot be avoided, clinical nursing assessment of clients in restraints is essential to maintain the safety and ultimate physical as well as psychological well-being of the child. By using critical-thinking skills and both broad assessment of the client with focus assessment on respiratory status once a restraint has been initiated, nurses can decrease the risk of tragic outcomes (Berrios & Jacobowitz, 1998; Considine, 2005; Mohr, Petti, & Mohr, 2003; Sourander et al., 2002).

Psychosocial Development

Preventing the use of physical restraints as part of the crisis intervention strategy for child and adolescent clients requires a strong general knowledge base of psychosocial development. Understanding the normal developmental stages and the characteristics of those stages provides a broader insight around the behaviors that may have preceded the crisis situation as well as the behaviors that the child is displaying while in a physical restraint. This knowledge and understanding also serves as a baseline to compare any deviations of normal age-specific deviations. Children react to situations and perceive interventions such as physical restraints differently based on development stage.

Inpatient staff could benefit from understanding the developmental sequence of children and adolescents' response to limit setting and consequences. Children perceive and respond differently to discipline as they progress through the stages of development. Understanding the differences can help nurses adjust the approach used when interacting with children and

supporting them as they learn rules and expectations. This understanding can help nurses achieve cooperation with children through empathy with how they perceive adult demands.

The 6- to 11-year-old child in a crisis situation needs to feel supported and safe while depending on caregivers to provide structure.

The 3- to 5-year-old child in an escalating crisis situation needs assistance with his or her own control mechanisms (Psychosocial Paediatrics Committee, 2004) rather than taking all control away. Furthermore, many children in these settings may have come from less than ideal life situations and recalled past events are just as frightening as present unpleasant situations. A restraint situation may reinforce past trauma and compromise growth and recovery from those traumas (Alliance to Prevent Adverse Interventions and Seclusion, 2005; Banks, 2002; Howard, 1991; Lansford, Deater-Deckard, Dodge, Bates, & Pettit, 2004; Mohr et al., 1998; Mohr & Anderson, 2002; Psychosocial Paediatrics Committee).

The 6- to 11-year-old child in a crisis situation needs to feel supported and safe while depending on caregivers to provide structure. Adult caregivers serve as important role models for coping (Psychosocial Paediatrics Committee, 2004). By supporting the need for structure and consistency, crisis situations can be avoided (Alliance to Prevent Adverse Interventions and Seclusion, 2005; Psychosocial Paediatrics Committee).

Early in adolescence, the child is beginning to gain confidence in inner sameness while quickly growing and developing and at the same time trying to cope

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with major physical changes. Throughout adolescence, young people need support and guidance as they explore their world from this rapidly changing perspective (Psychosocial Paediatrics Committee, 2004). Staff need to be aware that at times the preadolescent demands to be treated as a teen, and other times may respond to situations similar to a younger, latency-aged child.

Teen years are a rapidly changing time for the 12- to 17-year-old child and he or she may be experiencing an intense amount of anxiety and stress around the changes. The biggest fear at this age is the loss of face around peers (Dixon, 2000; Psychosocial Paediatrics Committee, 2004). Presented with choices, the adolescent is likely to be much less flexible as he or she factors in peer reactions with consequences (J. G. Goepp, personal communication, 2006). In the wake of these fears and anxieties from this child's perspective, he or she may react in a way that attempts to maintain integrity (Alliance to Prevent Adverse Interventions and Seclusion, 2005; Banks, 2002; Howard, 1991; Lansford et al., 2004; Psychosocial Paediatrics Committee). Staff should avoid overreaction to teen bravado that is often a maneuver to save face.

Nursing assessment of child in any psychological crisis situation can be greatly enhanced with a concrete understanding of normal psychosocial development. A firm knowledge of these factors can be extremely helpful with de-escalation techniques in order to return the child to a safe, calm, and rational state.

Basic Anatomy and Physiology of the Respiratory System

Once a physical restraint has been initiated, the risk to the child increases to include potential compromise of respiratory function. Accurate nursing assessment depends on a solid understanding of basic normal respiratory function in order to be able to quickly identify deviations and intervene immediately. During respiration, oxygen is inhaled and carbon dioxide is exhaled as a result of metabolism. The fully developed adult

uses the muscles of the chest wall as well as the intercostals and the diaphragm to aid respiration along with thoracic pressure changes that move the air. Normal breathing is driven by increased carbon dioxide (Franklin Institute, 2006).

The airway in a smaller child is more prone to collapse with hyperextension or hyperflexion of the neck because the cartilaginous rings around the trachea are not fully developed (Soud & Rogers, 1998). In addition, the reduction of pressure in the trachea caused by screaming in a small child can result in collapse of the airway (J. G. Goepp, personal communication, 2006).

The sternum and ribs of a child are also more cartilaginous and do not provide stable thoracic structure. The intercostal muscles are not developed and do not aid in respiration. Children depend almost entirely on their diaphragm to breathe. Major organs such as the liver and spleen are not protected by the ribs and they can be easily compressed and displaced, which in turn displaces the diaphragm and compromises breathing (Soud & Rogers, 1998). A seated small child hold, prone-positioned hold, or basket hold in a child at this age can directly interfere with diaphragmatic movement and severely compromise respiratory function.

In the adolescent or adult-sized child, the airway is more stable with developed cartilaginous rings around the trachea. The sternum and ribs have developed to bone, providing more rigid protective thoracic structure while the now developed intercostals are part of the mechanics of breathing (Franklin Institute, 2006). Although the thoracic and airway structure is more stable in the adolescent child, there is also more weight. A prone-positioned hold will still involve the use of chest wall muscles to function against the child's own body weight.

Physical Impact of Restraints

There is no safe restraint. Prone-positioned restraints place the child at risk for positional asphyxia (Belviso, De, Vitale, & Introna, 2003; Chan, Neuman,

Clausen, Eisele, & Vilke, 2004; O'Halloran & Frank, 2000). In the prone position, chest wall movement is always restricted to some degree because the child is breathing against the weight of the upper body. A seated positioned restraint in which chest or abdominal movement is restricted can also severely compromise respiratory function, especially in smaller children (Masters et al., 2002). Supine-positioned restraints place children at risk for aspiration. In addition to the mechanism of the restraint, breathing can also be affected by the central nervous system (CNS) effects of some psychotropic medications putting the child at risk for an acute dystonic reaction (J. G. Goepf, personal communication, 2006; Rodnitzky, 2003; Sanger, 2003). Struggling and heightened anxiety in any position cause an adrenal catecholamine release-effecting heart rate while hyperventilation if present decreases carbon dioxide drive and at least temporarily affects heart rate (Rico, Prieto-Lloret, Gonzalez, & Rigual, 2005). Although it is a rare occurrence, it is important to be aware a sudden blow to the chest wall that can occur during a take down can result in commotio cordis. The blow interferes with repolarization in electrical conduction of the heart and can cause ventricular fibrillation (Geddes & Roeder, 2005; Link et al., 2003; Link, 2003; Maron, Gohman, Kyle, Estes, & Link, 2002). Awareness of clinical risks and the physical impact of restraints focus clinical assessment during crisis situations, thus better ensuring the safety and well-being of the child.

Clinical Assessment of Respiratory Function During Physical Restraints

Normal resting vital signs differ among specific age groups (Table 1). During a physical restraint, it is unlikely that the child will have normal vital signs. Vital signs will more likely reflect the high end of normal. Of greater concern is an agitated child with vital signs at or below the low end of the normal range according to age. Children will maintain normal vital signs, even in distress, for a much longer time than

adults will; however, when these reserves are exhausted, declining vital signs indicate pending asystole, respiratory arrest, and vascular collapse.

Any situation in which a nurse may be unable to perform a comprehensive assessment must be avoided through prevention of restraint use, and if a restraint has been initiated, interventions must be implemented toward ending the restraint as soon as possible.

Pulse oximetry is useful in determining the percentage of oxygen in circulating blood through the capillary bed. There are drawbacks to the use of pulse oximetry, however, and clinical signs and symptoms should be the main assessment (Soud et al., 1998). Pulse oximetry is not widely used in the psychiatric setting nor does best practice call for it, but if a pulse oximeter is available, it can serve as an enhancement

Table 1. Age-Specific Normal Vital Signs

Age range (years)	Heart rate (beats per min)	Respiratory rate (breaths per min)	Systolic blood pressure (mmHg)
3-6	80-110	20-30	80-110
6-10	70-100	18-25	80-110
10-12	60-90	15-20	90-120
12-18	60-80	12-16	110-130

(Soud & Rogers, 1998).

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for clinical assessment with careful considerations to the drawbacks. Anemia or severe dehydration, which can easily cause agitation, may result in a false high reading. The reading can also be affected by movement, temperature of extremities, or the presence of nail polish. When using pulse oximetry as an assessment tool, it is important that the heart rate on the machine correlates with the pulse that you obtain by palpation. Furthermore, pulse oximetry does not determine carbon dioxide level.

In a physical restraint situation, it may not be possible to obtain the child's vital signs, so age-specific clinical assessment may be the only measure of indicators of respiratory distress. Any situation in which a nurse may be unable to perform a comprehensive assessment must be avoided through prevention of restraint use, and if a restraint has been initiated, interventions must be implemented toward ending the restraint as soon as possible. Whether or not vital signs can be obtained or a full physical assessment can be performed, immediate general assessment of respiratory status is essential.

Younger children display intercostal retractions with respiratory distress because of underdeveloped intercostal muscles. The diaphragm drops with inspiration and the thorax collapses under increased pleural pressure (Zitelli & Davis, 2002), pulling the intercostals inward. Children may also use accessory muscles when having difficulty breathing. The smaller child uses the sternocleidomastoid muscle, which results in head bobbing with inspiration (Soud et al., 1998). Assessment of any of these signs and symptoms is indication for immediate discontinuation of the restraint.

Adult-sized children also use accessory muscles when experiencing respiratory distress. For these children, those muscles include all of the chest wall muscles and the trapezius muscle with inspiration. Use of accessory muscles during respiration is an obvious sign of increased work of breathing and indication for immediate discontinuation of a restraint for a child of any age.

Gasping respirations and decreasing respiratory rate and effort are a concerning clinical sign for any age group (Soud et al., 1998). Gasping is a classic indication of air hunger.

A late sign for respiratory distress for any child is any alteration in mental status (Soud et al., 1998). This can be seen as sudden changes in struggle if the child is not speaking. A sudden increase in struggle may not be behavioral in origin but rather a desperate attempt to breathe along with the presence of hypoxia (J. G. Goepf, personal communication, 2006). A marked decrease in struggle may not be an indication that the client is settling, but rather a decreased respiratory effort-related decreasing consciousness.

Cyanosis is another very late sign of respiratory distress (Soud et al., 1998); however, it is important to know that cyanosis may not be present in situations such as an extremely low hematocrit (J. G. Goepf, personal communication, 2006). The presence of cyanosis will be most obvious around the mouth and face. A cyanotic child is at imminent risk of death. Cyanosis is almost always preceded by the indicators of respiratory distress that have been explained above.

Accurate clinical assessment for signs and symptoms of respiratory distress depends on the knowledge and understanding of normal baseline vital signs that are age specific as well as age-specific respiratory anatomy and physiology. All types of restraints have the potential to compromise respiratory status and must be avoided if at all possible. Emphasis therefore must be placed on prevention strategies to avoid the use of restraints because of the dangers associated with their use.

Asthma

A child with a history of asthma is at an even greater risk for respiratory distress during a restraint. Asthma exacerbation is the inflammation of the airways resulting in bronchospasm (University of Maryland Medical Center, 2006). Even with seemingly normal respiratory effort, a child experiencing asthma exacerbation is ventilating poorly. Irritants in the air,

stress, and anxiety can trigger an asthma attack (Zitelli & Davis, 2002); thus, an agitated asthmatic client who is located on a floor where there is the presence of dirt, molds, and spores is at immediate risk for acute respiratory distress. The danger of acute asthma exacerbation resulting in respiratory distress is increased by carbon dioxide (University of Maryland Medical Center). Rising carbon dioxide decreases respiratory drive and results in respiratory acidosis.

Clinical assessment of an asthmatic child in a physical restraint includes shortness of breath, wheezing, and complaints of chest tightness (University of Maryland Medical Center, 2006), in addition to general indicators of respiratory distress. Shortness of breath, especially when accompanied by a marked increase in rate initially and followed by a decrease in rate, is greatly concerning. Wheezing often begins suddenly and is usually relieved by the administration of bronchodilators (University of Maryland Medical Center). If the asthmatic child requests a prescribed bronchodilator, the request should never be denied. End the restraint immediately and administer the medication. Rapid onset of a dry or productive cough is another clinical sign and may be the only symptom the child displays (University of Maryland Medical Center).

Asthma exacerbation can quickly turn from a clinical concern to a medical emergency. Accurate assessment and immediate action are essential. Extreme respiratory distress or vomiting, severe or sudden increase in anxiety, or sudden calm and decreased level of consciousness are clinical signs that indicate emergent interventions (University of Maryland Medical Center, 2006). Other examples include profuse diaphoresis and tachycardia in a seemingly settled child, flared nostrils with respirations, and an abnormal breathing pattern in which exhalation is more than twice as long as inspiration (Bickley, 2003; University of Maryland Medical Center).

The asthmatic child is at great risk for severe respiratory compromise during a restraint; therefore, restraints, if necessary, should be used in these children with extreme caution. It is imperative that focused

respiratory assessment includes knowledge of a history of asthma. As with all children in the psychiatric setting, assessment must begin upon admission to include history of trauma, violence, and restraint use as well as identification of triggers and calming strategies.

It is important to consider the child's physical stature when assessing respiratory function and recognize the impact of physical restraints on the obese child.

Obesity

Child and adolescent obesity has reached near epidemic proportions in American children, putting them at risk for many health problems (Kaur, Hyder, & Poston, 2003; Zitelli et al., 2002) and increasing the chance for respiratory as well as cardiovascular compromise during physical restraints (Brodsky, Oldroyd, Winfield, & Kozlowski, 2001; Brodsky, 2002; Egi et al., 2004; Kaur et al., 2003). Compression of extra adipose anteriorly results in increased vascular resistance and decreased blood flow in the prone position. Decreased blood flow decreases the amount of oxygen perfusing vital organs. Furthermore, compression of abdominal adipose tissue displaces abdominal organs, putting pressure on the diaphragm. Organs can be compressed in the obese child in the prone, supine, or seated position. This results in pulmonary compromise along with reduction of pulmonary compliance and chest wall movement, especially in the prone position.

It is important to consider the child's physical stature when assessing respiratory function and recognize the impact of physical restraints on the obese child. These

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children are at an even greater risk for respiratory distress during a restraint. Obese children should be assessed with extreme vigilance and caution when placed in any type of restraint.

Conclusion

Management of crisis situations that include assaultive or self-harming behaviors of children and adolescents in residential treatment settings may require the use of physical restraints. Physical restraints are meant to preserve and maintain the child's safety, but they are not without risk and potential for respiratory compromise. Therefore, nursing care for these children must include comprehensive assessment and individualized interventions to prevent the use of restraints and avoid situations that will place them in life-threatening situations. Clinical nursing assessment of clients in physical restraints is essential to maintain the safety and ultimate physical as well as psychological well-being of the child. Knowledge of the risks and dangers of restraints are the basis for prevention. By using critical-thinking skills and broad assessment of the client with focus assessment on respiratory status, nurses can decrease the risk of poor outcomes by striving to prevent the use of restraints.

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