



Postoperative Pain Assessment in Pediatric Patients

A Literature Review

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<p>ABSTRACT</p> <p>The aim of this literature review was to explore the methods and tools used in postoperative pediatric pain assessment. The purpose of this literature review was to conduct a comprehensive description of pain assessment in pediatric patients in surgical settings.</p> <p>The literature review is based on 22 scientific research articles. The data was systematically collected using OVID/CINAHL and Science Direct. Additionally, manual search through library journal collections and e-journals was conducted in order to find relevant research literature. A critical appraisal was conducted in order to ensure the suitability of the studies to this literature review, and to ensure their quality. Literature was analysed and collected using inductive content analysis.</p> <p>The findings of this literature review showed that postoperative pain in pediatric patients can be assessed by nurses through patients' self-report, use of behavioural/observational scales and physiological indicators. In addition to these methods used by nurses, there are tools and methods of pain assessment that are developed for parents. The main factors influencing pain assessment in this specific patient population were found to be the medical diagnosis, child characteristics and nurse characteristics.</p> <p>One of the most important findings of this literature review was that no single pain assessment method or tool should be used alone; rather, a comprehensive and multifaceted approach in pain assessment is emphasized. Another finding was that parents may have a negative influence on the pain assessment of their children due to their poor knowledge and misconceptions. Lastly, the knowledge deficits and unprofessional attitudes toward a child's pain should be confronted among nurses.</p> <p>Not all of the pain assessment tools used in pediatric postoperative settings have strong empirical evidence to support their use. Further research on these tools is needed.</p>			
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<p>Tämän kirjallisuuskatsauksen pyrkimyksenä oli tutkia eri menetelmiä ja välineitä, joita käytetään postoperatiivisen kivun arvioinnissa lapsipotilailla. Tarkoituksena oli muodostaa kokonaisvaltainen kuvaus lapsipotilaiden kivunarvioinnista kirurgisessa ympäristössä.</p> <p>Kirjallisuuskatsauksen pohjana on 22 tieteellistä tutkimusartikkelia. Aineisto kerättiin systemaattisesti käyttäen OVID/CINAHL ja Science Direct tietokantoja. Tämän lisäksi tiedonhaku tehtiin kirjaston aineistokannoista ja elektronisista aineistoista manuaalisesti. Kriittinen arviointi toteutettiin aineiston soveltuvuuden varmistamiseksi, ja sen laadun takaamiseksi. Aineisto analysoitiin ja tulokset koottiin käyttäen induktiivista sisällön analyysiä.</p> <p>Tulokset osoittavat, että sairaanhoitajat voivat arvioida postoperatiivista lapsipotilaan kipua potilaan oman ilmaisun, kipukäyttäytymisen arviointimittareiden ja fysiologisten ilmaisimien kautta. Näiden hoitajien käyttämien menetelmien ja välineiden lisäksi vanhemmille on kehitetty omia kivunarviointikeinoja ja -välineitä. Lääketieteellinen diagnoosi, lapsen erityispiirteet sekä hoitajan erityispiirteet ovat tutkimustulosten mukaan suurimpia yksittäisiä tekijöitä, jotka vaikuttavat kivunarviointiin lapsipotilailla tässä nimenomaisessa potilasryhmässä.</p> <p>Yksi tärkeimmistä tutkimustuloksista oli se, ettei mitään yksittäistä kivunarviointimenetelmää tai -mittaria tulisi käyttää sellaisenaan. Sen sijaan kivunarvioinnissa painotetaan kokonaisvaltaista ja monipuolista lähestymistapaa. Toinen merkittävä löydös oli se, että vanhemmilla voi olla negatiivinen vaikutus lapsen kivunarviointiin johtuen vanhempien kipuun liittyvistä väärinkäsityksistä ja heikosta tiedontasosta. Lopulta, sairaanhoitajien tulisi kohdata vaillinaiset tietämyksensä ja epäammatilliset asenteensa lapsipotilaan kivunhoidossa.</p> <p>Kaikilla kivunarviointimittareilla ei ole vahvaa empiriseen tutkimukseen perustuvaa näyttöä niiden luotettavuudesta. Syvempää tutkimusta näiden mittareiden luotettavuudesta tarvitaan.</p>			
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1 INTRODUCTION

Pain is a personal, subjective experience. We cannot see pain in others but we can observe how a person responds to the experience of pain. (Solodiuk & Curley 2003.)

Illness, injury and medical procedures are common causes of pain in children. Pain can be associated with anxiety, fear, stress, or distress. (Reaney 2007: 180.) Despite this, several studies have shown that children's pain remains poorly managed (Kankkunen 2003).

The pediatric experience of pain involves the interaction of physiological, psychological, behavioural, developmental and situational factors. According to Kankkunen et al. (2004), *“accumulating knowledge of the physiologic mechanisms underlying the sensation of pain in children provides a basis for pain management consistent with each child's developmental stage, earlier pain experiences, and family. (p 133)”*

Surgical procedure by its very nature causes pain. Especially for children, the stress caused by an unfamiliar environment and awakening to changes in physical functioning can add to this sensation. Depending on their age, gender, previous pain experiences, and coping skills, two children undergoing the same surgery may react to pain in an entirely different manner. (Gold et al. 2006.)

The subjectivity and multidimensional nature of pain requires healthcare professionals to approach pain assessment using a combination of a child's verbal report in conjunction with behavioural observation and physiological measures. Recognizing, treating, and reassessing are essential components of pain assessment. To provide effective pain management in children, healthcare professionals should use age and developmentally appropriate pain assessment tools. (Reaney 2007: 180.)

The aim of this literature review is to explore the methods and tools used in postoperative pediatric pain assessment. The purpose of this literature review is to conduct a comprehensive description of pain assessment in pediatric patients in surgical settings.

2 PAIN ASSESSMENT IN PEDIATRIC PATIENTS

This chapter discusses the importance of pain assessment in pediatric patients, and the current status of pain assessment in general.

In Finland, three quarters of surgical procedures are conducted on a day surgery basis among children under seven years old (STAKEStieto 2000). Research has showed that children can experience severe pain even after minor surgical procedures (Kokki & Ahonen 1997). Despite the body of evidence that demonstrates the significance of pain assessment in the pain management process, nursing practice has not embraced these findings and formal pain assessment tools are underutilized by most nurses (Boughton et al. 1998; Jacob & Puntillo 1999.)

Additionally, mistreatment of painful conditions has been shown to cause unnecessary pain in children with minor illnesses and injury (Drendel et al. 2006). There is evidence that pain can cause significant negative lifelong physiological and psychological consequences that interfere with patient health and recovery. Furthermore, effective pain relief can decrease morbidity and mortality, thus improving patient health and well being. (Anand & Carr 1989; Anand et al. 1997; Anand & Plotsky 1995; Breijvik 1996.)

2.1 Pain

The pain model, developed by Descartes in the 17th century, which focused entirely on tissue damage (nociception), held well until the 20th century. In the mid 1960s, the concept of pain became more comprehensive. Due to the increasing awareness of the relationship between the mind and the body regarding pain perception, a new theory for pain was proposed (Gold et al. 2006). A Canadian professor, Melzack, together with Wall created this Gate-Control Theory (GCT). This theory emphasizes on the complex interplay between the central nervous system (CNS) and the peripheral nervous system (PNS). According to Melzack and Wall, only certain pain-messages are permitted to pass through to the brain. Put differently the nerve-gates are able to determine the degree to which an individual receives a pain sensation. (Gold et al. 2006.)

This theory is connected to the principle that various CNS activities can play a meaningful role in sensory perception. Particular activities such as attention, emotion,

and memories concerning previous experience with the event are factors that influence the new sensation. Since this revolutionary discovery on pain physiology, many groups have proposed integrated definitions of pain perception. (Gold et al. 2006.)

Smeltzer and Bare (2004) define the sensory experience of pain being dependant on the interaction between the nervous system and the environment. The peripheral nervous system and the CNS are involved in the processing of noxious stimuli, and in the resulting perception. Factors influencing the pain response are many: past experiences of pain, anxiety, culture, age, gender and expectations about pain relief. (Smeltzer & Bare 2004.)

The International Association for the Study of Pain (IASP) defines pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.” Pain is the most common reason for seeking health care. It occurs with many disorders, diagnostic tests, and treatments. Though pain is not a disease, rather a symptom, it disables and distresses more people than any single disease. (Smeltzer & Bare 2004.)

Related to nursing, pain management is considered such an important part of care that the American Pain Society coined the phrase: “Pain: The fifth vital sign” (Campbell 1995). This statement suggests that the assessment of pain among health care professionals should be as automatic as taking patient’s blood pressure and pulse.

Pain is multidimensional in its nature (Reaney 2007). A broad definition of pain is: “Whatever the person says it is, existing whenever the experiencing person says it does” (McCaffery & Beebe 1989). This definition explains well the highly subjective nature of pain. Therefore the validation of the existing pain is mainly based on the patient’s report that exists.

Pain can be categorized according to its location, duration, and aetiology. The three generally recognized categories are acute pain, chronic (non-malignant) pain, and cancer-related pain. (Smeltzer & Bare. 2004.)

2.2 Pain Assessment

Pain assessment is the first, essential part of pain management (Solodiuk & Curley 2003). The highly subjective nature of pain provides a challenge for every clinician in assessing and managing pain (Reaney 2007). The factors to consider in a proper and complete pain assessment are the intensity, timing, location, quality and personal meaning of pain (Jorgensen 1995).

Pain assessment should be based on observing the patients' overall appearance carefully including the posture and behaviour. Because of the subjective nature of pain, a better way of assessing pain is asking the patient to describe in his/her own words the specifics of the pain. (Reaney 2007.) According to Smeltzer and Bare (2004), a nurse must have good rapport with the patient in pain in order to perform good pain assessment and management.

People respond differently to the experience of pain. The nonverbal and verbal expressions of pain cannot be interpreted as consistent or reliable indicators of the quality or degree of the pain experienced. (Smeltzer & Bare 2004.) Different meanings may be associated with the same existing behaviour among patients.

The physical responses to pain such as tachycardia, hypertension, tachypnea, pallor, diaphoresis, mydriasis, hyper vigilance and increased muscle tone are related to the stimulation of the autonomous nervous system. However, using physiologic signs to indicate pain is unreliable, for they could be caused by a number of other reasons. (Smeltzer & Bare 2004.)

Measuring pain can be achieved through physiological, behavioural and psychological means. Nevertheless, there is no comprehensive tool that combines all of these variables. Therefore, many different tools can be used in the pain assessment process. (Merkel & Malviya 2000.) One of the aims of this literature review is to explore tools and methods used in pediatric pain assessment.

2.3 Pain Assessment in Pediatric Nursing

Pediatrics is defined as the branch of medicine that deals with the development and care of infants and children and the treatment of their diseases (the American Heritage Medical Dictionary 2007). The word is derived from the Greek *pais, paidos*, child + *iatreia*, cure (Harper 2001).

The assessment of pain in a pediatric patient presents a true challenge for clinicians. As pain perception is a highly subjective experience, the acceptance of the patient's report is the cornerstone to pain management. However, some children, unlike most adults, may not be able to conceptualize or articulate either the intensity or the quality of their pain. (Gold et al. 2006.) This is the main reason why pain assessment in pediatric patients requires specific involvement. When a child is sick, he/she might go through regression, and experience the hospital as a threatening and unsafe environment. Negative feelings have a pain-enhancing affect. (Salanterä et al. 2006.)

A child's pain does not influence only the child, but also the family (Gold et al. 2006). The involvement of the parents in the pain assessment and management process is important. Families can be a source of support for children in postoperative pain. The child's pain also increases stress in the family members. Nevertheless, more attention should be paid on parents' needs and on their counseling about children's pain in clinical pediatric nursing. (Kankkunen et al. 2004.)

Numerous international pain-measurement tools have been developed in order to ease the assessment of pediatric pain, most of which measure the intensity of pain. Regardless of the quantity of pain-measurement tools, their use is inconcise, and the pain assessment is often carried out unsystematically. (Pölkki 2008; Salanterä 1999.)

In brief, it is essential during the pain assessment of a child that the nurse knows the child's developmental level, and is able to recognize and treat pain accordingly. This awareness is vital when it comes to looking for the appropriate pain measurement tool and applicable medicine form for each individual pediatric patient. (Salanterä et al. 2006.)

2.4 Postoperative Pain

Post-operative pain has been reported to appear in up to 80% of patients despite pain medication. Pain appearance after surgery stems from many factors such as surgery-site, the size of the wound, the surgery technique, different anesthesia-related factors, personal pain sensibility and former experiences, preoperative pain alleviation, environment, and the preoperative patient education. (Salanterä et al. 2006.)

Post operative pain is also unique because of restrictions presented in communication with the patient, due to use of ventilators and altered levels of consciousness. The type of pain itself can be varied in nature as well postoperatively, because of differences in surgeries and surgical technique. Postoperative pain can thus be presented as being sharp and localized to the site of incision, and/or it can be dull and throbbing from visceral damage. Other factors, such as the type of anesthetic agent used during the surgery, can also have an impact on postoperative pain. (Kneedler & Dodge 1994.)

3 AIM AND PURPOSE OF THE LITERATURE REVIEW AND RESEARCH QUESTIONS

3.1 Aim and Purpose

The aim of this literature review is to explore the methods and tools used in postoperative pediatric pain assessment. The purpose of this literature review is to conduct a comprehensive description of pain assessment in pediatric patients in surgical settings.

3.2 Research Questions

The study questions to be answered by this literature review are:

What are the tools and methods used in postoperative pediatric pain assessment from the nursing point of view?

What are the different factors that influence pain assessment in pediatric nursing?

4 METHODOLOGY

4.1 Literature Review as a Methodology

In this study, a systematic review of literature was used as a methodology. A review of literature means an organized, critical collection and evaluation of important published literature that supports a study. The major purpose of a literature review is to form an extensive, systematic, and critical review of the most important published scholarly literature on a particular topic. (LoBiondo-Wood & Haber 2006.)

4.2 Database Search

The databases which have been used in our literature searchers are Science Direct, OVID, and CINAHL. The keywords used are Pain Assessment, Nursing and Pediatric. We decided to exclude the British spelling of the word pediatric because the number of results in the initial database search was excessive. In turn, the American version resulted in more precise sources. The total number of sources we have procured through the databases is 8. (Refer to Table 1)

The literature search conducted through OVID/CINAHL was started on November 19th, 2007, by using the keywords Pain Assessment and Nursing and Pediatric. The search was limited to articles with full text available. 100 hits were found, of which 6 articles were used in the literature review.

Science Direct was used for finding more relevant literature on November 19th, 2007. The keywords Pain Assessment and Children and Nursing were also used in this search. 24 hits were found, of which 2 articles were used in the literature review.

One research article, by Lehtikoinen (2007), which was found from the library in the beginning of the literature search, was a great resource for finding additional relevant articles from its reference list. The rest of the articles were found through manual search in e-journals and Terveystieteiden kirjasto. The total number of resources found through manual search was 14. The total number of research articles used in this literature review was 22.

4.3 Inclusion Criteria

The inclusion criteria for our literature review were set as follows:

1. The articles are based on empirical evidence.
2. The research is published in English or Finnish.
3. The research articles are related to our subject matter.
4. The presented research reflects the current clinical practice in nursing.
5. The research article is either qualitative, quantitative or a systematic review.

4.4 Analysis

In this literature review the main findings of the review of scientific research articles were analyzed using an inductive content analysis. Content analysis is a research technique, which can be used for objective, systematic and quantitative description of documentary evidence. (Lo-Biondo-Wood & Haber 2006.)

First, the articles were independently read by both authors of this final project. Both of the authors then rated the articles with stars referring to their applicability for this particular research. Five stars were given to articles that seemed most applicable, and articles that did not answer the study questions were excluded from the study.

Common patterns and themes were found through the tentative analysis of the content. In the initial coding, the authors divided the data into two main categories: to the different tools used for pain assessment and the factors that influence pain assessment.

According to this arrangement, we sorted, aggregated and synthesized the data further. After more articles through the databases and through the articles' reference lists were found based on these two categories, the data was again assigned to smaller units of themes that arose through the database search and through contents of the data.

At this point, the common themes for the main findings were recognized. Tools and methods of pain assessment were divided into four main sections: assessment of pain through self-report, assessment of pain by observing patient behaviour, pain assessment through physiologic changes and the parental role in pain assessment. The factors influencing pain assessment was considered to be the fifth theme of the main findings.

Furthermore, a research article table was created to highlight the main findings of each of the selected articles. This was done to reveal the applicability of each of the articles for this literature review. (APPENDIX 1) Finally, critical appraisal checklists by Greenhalgh and Donald (2000) were utilized to analyze the reliability and validity of these articles. (APPENDIX 2) 22 articles were included in the literature review after the critical appraisal. 2 articles were excluded, because they failed to fill the criteria set for acceptance.

4.5 Reliability and Validity

Reliability of data is connected to consistency, accuracy, precision, stability, equivalence and homogeneity. A reliable item or instrument is required to be consistent. Validity of content refers to the universality of content. It also evaluates whether the items of content are representative of the content domain that is looked for. A valid item or instrument measures something that it is supposed to measure. (Lo-Biondo-Wood & Haber 2006.)

Throughout the literature gathering process, it was imperative that we only selected research articles based upon empirical studies. To ensure compliance with these criteria, we used professional, scientific databases and peer reviewed scientific journals. Among the data bases employed were OVID, CINAHL and Science Direct. The electronic resources available at Terveystieteiden kirjasto (Library of Health Sciences, Helsinki), were also extensively used. Manual searching through nursing journals also helped to procure reliable sources for our literature review.

The literature review is extensive, with over 20 original research articles. All the articles included in the review were of research conducted in hospital settings. In general, sample groups consisted of children, parents and nurses in surgical settings. All of the selected articles are presented in a separate chart, which includes the purpose of the study, study sample, study method and analysis, and the main results. (APPENDIX 1)

Critical appraisal checklists aim to focus on the key determinants of validity. We used the Critical Appraisal Checklist developed by Greenhalgh and Donald (2000) in order to evaluate the suitability of the studies to this particular literature review, and to assess their quality. (APPENDIX 2)

It was agreed between both authors, prior to checking the articles against the checklists, that we would approve a study that filled at least 2/3 of the criteria set in the critical review checklist. The articles were then systematically appraised using the checklist mentioned above, which ensured the validity of these articles for inclusion in our literature review. (APPENDIX 3)

5 FINDINGS

5.1 Assessment of Pain by Self-Report

Pain being a subjective and complex in its nature, the intensity of pain is then primarily assessed through self-report in both adults and children (Merkel & Malviya 2000). A child's ability to express or report pain is dependant on his/her physical and psychological developmental stage. One should never underestimate a child's report of pain, though a child may not be able to specify his/her feelings and pain experience. (Salanterä et al 2006.)

Cultural factors play their role in the pain expression and its admissibility. In some cultures, boys are told to hide and put up with pain more than girls. (Kankkunen et al. 2004; Finnström & Soderhamn 2006.) According to Guinsburg et al. (2000), sex might also influence pain expression; girl neonates have been studied to express pain through face gestures more than boys.

It is challenging to assess pain through self-report with small children due to their lack of ability to communicate verbally. The vocabulary of these small children under school-age is rather curt. In addition, a small child may not have experienced a lot of pain, and therefore might find it difficult to express pain with fitting terms. (Salanterä et al. 2006.)

A small child thinks about pain mainly as a physical experience. He/she does not necessarily shape the cause and effect but rather explains pain with his/her imaginary visions, and might not understand that pain is alleviated with medications. Small children do not usually know how to use numeral pain scales or simple line scales. The

scales may be too abstract for them. This is why in the assessment of pain in smaller children different face-scales have become generally used. The only problem that seems to appear with these face-scales is that small children tend to mix up pain and feelings, such as fear, anger or irritation. In any case, when a child reports pain, it should be taken seriously, and the cause of pain should be determined. (Salanterä et al. 2006.)

7-12-year old children are not developmentally grown-ups, and as a result they need different support in pain assessment than adults. School-age children use willingly numeral scales. School-age children can also express pain verbally with good adjectives. (Salanterä et al. 2006.)

A well known self-report scale is the Visual Analogue Scale (VAS), which is good for children over the age of 7. VAS is a 10 cm long horizontal line, with one end representing no pain at all, and the other end the worst possible pain. (Kalso 2002.) There has been a lot of research done on this scale. The reliability of this scale, nonetheless, varies between children. (Kankkunen et al. 2004; Kelly et al. 2002; Luffy & Grove 2003; Shields et al. 2005.) (Refer to Figure 1.)

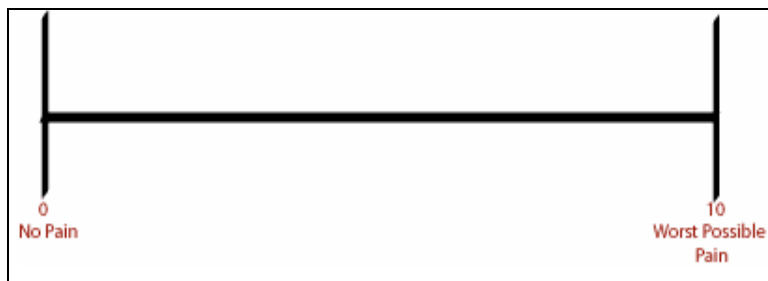


FIGURE 1. Visual Analogue Scale (VAS)

Source: Duodecim terveyskirjasto 2007.

Coloured Analogue Scale (CAS) is based on colour variation. This scale is used for the assessment of headache, postoperative pain and pain in emergency clinics. The criteria of mild, moderate and strong pain have been determined through a research that has been done on this scale. The CAS has a long triangular shape (14.5 cm in length) and a clear plastic slider that moves vertically on the scale. The scale ranges from a 1 cm width at the bottom to a 3 cm width at the top, and the colour ranges from white to a light pink to a deep red. (Chambers et al. 2005.)

Numerous face-scales are also commonly used to obtain self-reports from pediatric patients. These scales are based on the series of facial expressions describing pain. Children are asked to point out the face that best characterizes how much pain they are experiencing. Some of the scales begin with a smiling face describing “no pain”, and some with a neutral face representing the painless state. (Chambers et al. 2005.) Chambers with his co-workers (2005) have done research on the influence of this difference on the reported pain intensity. Based on their study it can be stated that the highest ratings on the intensity of pain are provided with the smiling “no pain” faces scale. (Refer to Figure 2.)

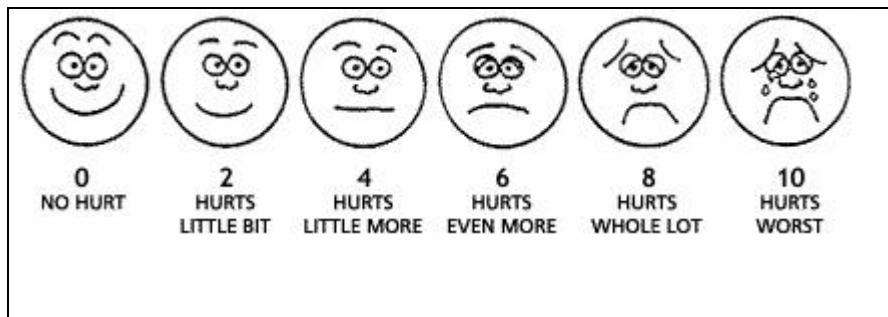


FIGURE 2. Wong-Baker Faces Rating Scale

Source: Hospital of Saint Raphael 2007.

The most researched faces scales are the Faces Pain Scale (FPS), the Faces-Pain Scale-Revised (FPS-R), the Wong-Baker Faces Scale and the Oucher Scale. The FPS has been discovered to be reliable in measuring pain in children aged 5-16. (Bulloch & Tenenbein 2002.) The revised version has been researched even with children aged 3-6, and the research results have showed that half of the 6-year-old participants had difficulties with using this scale (Stanford et al. 2006). The advantages of both the FPS scale and the FPS-R scale are that they are easy and effortless to use. In addition these two scales do not require a lot of time for guidance. (Stinson et al. 2006.)

Wong-Baker Faces Pain Scale consists of six hand-drawn faces, ranging from smiling to a crying face. These faces typify pain intensity on levels 0-5. The reliability of this scale has been weakened by the observation that smaller children tend to choose a face from the extreme end of the measure scale. That’s why this scale is appropriate for over

3-year-old children. The merit of this scale is that it is easy to use. (Chambers et al. 2005; Stinson et al. 2006.)

The Oucher Scale is a combination of six photographs and a 10 cm long numeral meter (Stinson et al. 2006.) This scale has been later modified into two culturally sensitive versions: for Asian (Yeh 2005) and African-American (Luffy & Grove 2003) children.

With the Poker Chip Tool (PCT) a child can report his/her pain with red, plastic chips. One chip describes little pain and four chips the worst possible pain. (Romsing et al. 1998.) The PCT-meter is really popular among children due to its easy use. This pain assessment meter can be used with 3-year-old children. The PCT-tool is recommended for postoperative use in hospitals. (Stinson et al. 2006.)

Verbal and numerical Scales such as the Verbal Rating Scale and the Numeral Rating Scale can be utilized with school-age children. They are designed to evaluate pain on scale 0-4. (Kalso 2002.) School-age children are adequate for using these types of pain assessment tools, because they are able to describe their pain and they know the numbers (Salanterä et al. 2006).

5.2 Observational Pain Assessment

Although self-report has been heralded as the “gold standard” regarding pediatric pain assessment, this may be overstated, given the complex nature of pain. According to von Baeyer and Spagrud (2006), there are several reasons for which observational measures of pain assessment are indicated. Cognitive factors, which include the age of the patient, distress level of the patient, and reliability concerns about self-report, are strong antecedents for the use of observational pain assessment measures. Internal and external physical restrictions due to medical equipment, ventilators, bandages, tapes etc. and paralysis, also contribute to the need of observational pain assessment measures.

The use of observational pain scales can help in identifying pain behaviours, thus assisting clinical decision making in these types of pediatric patient groups. However, the context of the patient’s behaviour should be considered when using these scales as well, as they can be misleading. (Merkel and Malviya 2000.)

The phenomenon of nurses' denial of patient pain may also play an important role in skewing observational assessments of pain. Denying a patient's pain can have adverse effects on his/her expression of pain. The result of this can be elevation of pain expression in order to be believed, to receive pain medication, or to avoid an unwanted procedure. An older child may do the opposite though, hiding their pain in order to be considered a "good patient" and to avoid negative response. (von Baeyer and Spagrud 2006.)

In an extensive systematic review of observational measures of pain for children and adolescents, von Baeyer and Spagrud (2003) found that the FLACC and CHEOPS pain scales have the highest level of evidence to support their usage.

The FLACC, which stands for Face, Legs, Activity, Cry and Consol ability, was created to assist nurses in identifying, evaluating, and documenting pain in children who have difficulties in expressing their pain (Willis et al. 2003). It consists of the five categories listed in its name, with each being ranked on a scale, with 0 being non existent and 2 being the highest level. The composite of the rankings is compiled for a score varying between 0-10, with 10 being the highest possible pain score. (Refer to Figure 3)

Categories	Scoring		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant frown, quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or being talked to; distractible	Difficult to console or comfort

Note: Each of the five categories Face (F), Legs (L), Activity (A), Cry (C), and Consolability (C) is scored from 0-2, which results in a total score between 0 and 10.

FIGURE 3. Face, Legs, Activity, Cry and Consol ability-scale (FLACC).

Source: Merkel et al. 1997.

Manworren and Hynan (2003) investigated the clinical validation of the FLACC pain scale in pre-verbal patients in a study which revealed that the tool is useful in

supplementing a caregiver's clinical judgement through the standardization of pain behaviours. Furthermore, it was shown to be multidimensional in nature, being applicable in surgical, oncological and traumatic settings, as well as for other painful conditions. The results validate the nurses' decision making the selection of pain medications, rather than a FLACC-score-based guide in choice of medication.

A further study which compares the FLACC with the "gold standard" of a child's self-report was conducted by Willis et al. (2003). Thirty children, between the age of 3 and 7 years, were investigated postoperatively for any relationships between the FACES self-report scale, and the FLACC behavioural observation scale. Significant and positive correlation was established between the scores of the respective scales in the total sample population. However, in the under-5-year-old subset, the scores did not correlate well. This could attribute to the cognitive ability of the group in understanding the FACES scale. (Willis et al. 2003.)

In addition to serving general pediatric populations, the FLACC has been revised to suit the needs of pediatric patients with cognitive impairments. The revision allows for the input of specific pain behaviours that are unique to a certain patient, as identified by their parents. An observational study conducted by Malviya et al. (2006), involving a population size of 52, verifies the reliability of the FLACC-revised-scale for use with children who have cognitive impairments.

The Children's Hospital of Eastern Ontario Pain Scale, or CHEOPS, was originally developed in conjunction with experienced post-anaesthesia nurses (McGrath et al. 1985). The scale measures postoperative pain through the observation of six behavioural categories: cry, face, verbal, torso, touch, and legs. The scoring system for each category is irregular, ranging from 0-3, 1-2, 1-3, depending on the reliability of each category. A composite score ranging from 4 (no pain) to 13 (worst pain) is given.

In a cross validation study by Suraseranivongse et al. (2001) of several pain scales, CHEOPS was found to be in the highest agreement with the decision to treat pain on both the ward and in the post-anaesthesia care unit. In terms of practical use, the study revealed that CHEOPS and FLACC were very similar to each other, with CHEOPS taking only 14 seconds longer to use. One weakness found in CHEOPS scores concerned longer term use, several hours after the surgical procedure. These scores then

did not correlate well with the scores provided through self-report. This problem was also revealed in a study conducted by von Baeyer and Spagrud (2006).

5.3 Physiologic Measures of Pain

The physiologic meters of pain are the cardiovascular and respiratory indicators, which include increased heart rate, increased respiratory rate, increased blood pressure and decreased oxygen saturation level. These indicators provide information about response to noxious stimuli, which can be caused by pain. (Merkel & Malviya 2000.) However, assessment of physiologic meters as the only indicator of a child's pain might be misleading, because for example cry and fear might influence the parameters. (Lehikoinen 2007; von Baeyer & Spagrud 2006). Therefore, physiologic meters must be used in conjunction with some other pain assessment tools always when it is possible. (Merkel & Malviya 2000).

According to Coffman et al. (1997), nurses tend to use more physiologic parameters as indicators of pain in children rather than behavioural parameters or family input. In the ICU environment cardiovascular and respiratory measurements are readily available on monitor screens, which make the physiologic assessment easy for nurses (Coffman et al. 1997).

The instruments, which are based on physiologic changes, have mainly been developed for hospital use, and they are the most appropriate for use with premature babies, neonates, and children in ICUs (Lehikoinen 2007; von Baeyer & Spagrud 2006). One of these instruments has been developed in Finland by Maunuksela. (Lehikoinen, 2007) The Maunuksela Pain Scale has been developed to assess pain intensity by assessing breathing, circulation, expression, behaviour and response to treatment. (Nikanne & Kokki 1999.)

The CRIES-tool (Crying Requires increased oxygen administration-Increased vital signs-Expression-Sleeplessness) is appropriate for pain assessment in infants after an operation. This tool is used by observing a child's pulse, blood pressure, need for extra oxygen, pain expression and sleep. The PAT (Pain Assessment Tool) is quite similar to the CRIES-tool. However, it focuses also on the colour of the child's skin, the position of the child, and the cry. The PAT tool has been studied to be valid and reliable tool for assessing infants' pain in the ICU. (Spence et al. 2005.)

5.4 Parental Role in Pain Assessment

Parents are in a unique position in the assessment of a child's pain postoperatively at home. Also in hospitals parents may act as advocates of the child when pain is poorly managed. However, parents can also have negative influences in the management of a child's pain. Therefore, good communication between the parents and the nurses should be emphasized more in pediatric hospital settings in order to prevent obstacles to the effective management of pain. (Simons & Roberson 2002; Kankkunen et al. 2003.)

The need for a post-operative pain measurement scale for the use by children's parents has been shown to be necessary (Finley et al. 1996). In this study, parents displayed a lack of knowledge and misconceptions about the nature of their children's pain. For example, 42% of the parents in the study sample felt that medication should be used only as a last resort, and 50% worried about addiction to pain medications such as opioids. One recommendation as a result of this research was the development of protocols for assessing pain in children by parents.

Chambers et al. (1996) set out to confront the previously stated problem by developing a new pain measurement tool, the Postoperative Pain Measure for Parents. The development and initial validation of the tool was the focus of their study in 1996. It was developed by using listed behaviours which parents stated expressed their child's pain, which were then correlated to actual self-ratings of the children in question. The behaviours in question that were revealed to have a weak correlation with the child's self-report were then dropped from the measurement tool. A total of 15 items were included in the tool, down from the start of 29 behavioural items. In practice, the tool was found to have excellent sensitivity and specificity (>80%) for use with children. Although this is only a preliminary study, it provides strong evidence for the use of the Postoperative Pain Measure for Parents. (The name for the tool was later changed to Parent's Postoperative Pain Measure, PPPM)

Additional evidence into the construct validity of the PPPM was conducted by Finley et al. (2003) in two separate studies. The first study was designed to validate whether the PPPM was able to discriminate between pain and anxiety in children undergoing ambulatory surgery. This was important as anxiety can skew the reliability of scores given by a pain measurement scale. The study revealed that the PPPM was indeed able

to measure the construct of pain accurately, without interference from anxiety which often results from surgical procedures. The second study focused on the impact of analgesic intervention on scores that were given by the PPPM. It showed that the pain scores decreased following analgesia, which was also consistent with the self reports of pain that were given. This implies that the PPPM behavioural cues are sensitive to changes resulting from pain relief.

5.5 Factors Influencing Pain Assessment in Pediatric Patients

One of the reasons why postoperative pain has been untreated in children is the difficulty in assessing pain due to the lack in verbal and cognitive skills in this patient group to self-report the nature of pain (Stevens 1998). Effective pain management is therefore very dependent on the ability of care providers to observe and assess the presence and intensity of pain in a reliable way (Malviya et al. 2005). Lack of knowledge about pain in children among nurses can be an obstacle for proper assessment of pain in this special patient group (Simons & Roberson 2002). The main factors influencing a nurse's assessment of pain in pediatrics are medical diagnosis, nurse characteristics and child characteristics (Abu-Saad and Hamers 1997; Hamers et al. 1994).

Nurses' attitudes towards pain in children also contribute to affect the assessment of pain. A study conducted in Finland showed that such attributes as nurses' age, education, experience, and place of work and field of expertise do not significantly affect the common attitude toward pain management, but rather the characteristics of the nurse. (Salanterä 1999.) Nurses' attitudes toward pain in children have an impact on the expression of pain by children, and hence the actual assessment and management of pain (von Baeyer & Spagrud 2006).

Using a proper pain assessment tool for each pediatric case is important in terms of the proper outcome of pain assessment. Young nurses in Finland have been studied to be more aware of the pain instruments than older nurses. (Salanterä et al. 1999.) Nurses with more education in the use of pain assessment tools have been studied to have a more positive attitude towards the use of pain assessment tools (Young et al. 2006).

According to Salanterä (1999), nurses cannot completely rely on the different tools when assessing pain. The reason behind this is that tools tend to measure only one

aspect of the pain (e.g. intensity). In turn, nurses should use as many forms of assessment as possible in order to form a comprehensive conception of the child's pain.

Coffman et al. (1997) conducted a study which aimed to find out how nurses assess pain in critically ill children. The results of this study revealed that the average number of different pain indicators selected by nurses concerning surgical patients and younger children were significantly higher compared to other pediatric patient groups. This study also indicated that nurses with more experience, education and personal experience were able to select more factors indicating pain in pediatric patients. Nurses that had personal experience with pain, either in themselves or a family member, are found to be able to assess pain more comprehensively than nurses without personal experiences.

In pediatric postoperative settings good communication between nurses and parents is a key factor in assessing and managing pain appropriately. Nurses' poor communication with parents and nurses' knowledge deficits create obstacles to effective pain management. Even though nurses might be good at providing parents with information about a child's pain preoperatively, they often are lacking in evaluating the parents understanding postoperatively. (Simons & Roberson 2002.)

It is important for nurses to become aware of the contextual and cultural factors that influence pain behavior in children. This knowledge is needed to carry out proper pain assessment. (von Baeyer & Spagrud 2006). As McGrath (1994) explains it,

...if a child has an elevated temperature, flushed face, or rapid breathing, one needs to know the context in which the behavior arises before one determines its meaning. If the child has been lying in bed and feeling sick and has a stiff neck, one would draw different conclusions than if the child has just run up five flights of stairs. (p.94)

Documentation is an essential part of pain assessment. Optimal pain assessment observes and quantifies the patient's pain status and experiences, and proper documentation makes this possible for nurses. (Treadwell et al. 2002.) According to Salanterä et al. (1999), the intensity, duration, quality and non-pharmacological care of pain have been poorly documented among Finnish nurses. Only half of the nurses (150/303) documented some general comment about a child experiencing pain. In addition they often failed to report and document pain from an objective perspective.

6 DISCUSSION

The aim of this literature review was to explore the methods and tools used in postoperative pediatric pain assessment. The purpose of this literature review was to conduct a comprehensive description of pain assessment in pediatric patients in surgical settings. Different methods and tools used in pediatric pain assessment in postoperative settings were explored. The various factors influencing pain assessment by nurses working in pediatric populations were also investigated.

6.1 Most Important Findings

Many issues of importance to consider in pediatric nursing concerning pain assessment were found through conducting this literature review. One of the most important issues that arose from this literature review regards the comprehensive approach to assessing pain. No single pain assessment tool or method is perfect for validating pain in children; each has its strengths and weaknesses. Therefore, the optimal approach to postoperative pain assessment in pediatric patients is comprehensive and inclusive of many pain assessment methods. A multifaceted approach minimizes the weaknesses and accentuates the strengths inherent within the pain assessment process.

The parent's role in pain assessment of small children is surprisingly uncharacteristic in light of the common misconception that parents would play a positive role in pain assessment. Parents' negative influence on pain assessment is due to their lack of knowledge and their misconceptions about the nature of their children's pain. This can contribute to poor assessment and management of pain.

Nurses' attitudes and knowledge about pain influence pain assessment in pediatric patients. The knowledge level about the physiology and nature of pain, and the attitudes toward pain in children in nurses is alarming, and calls for development.

This literature review is based on two main research questions. These questions are: What are the tools and methods used in postoperative pediatric pain assessment from the nursing point of view?

What are the different factors that influence pain assessment in pediatric nursing? The answers to these questions are presented in the following sections.

6.1.1 Methods and Tools Used in Pain Assessment

Self-report has been traditionally heralded as the gold-standard for assessing pain because pain is subjective in its nature. However, this literature review revealed that there are disadvantages also in the self-report method regarding pain assessment in pediatric nursing. Tools and methods for the self-report of pain are based on the cognitive skills. That is why the self-report is not an appropriate way of assessing pain in all pediatric populations. For example, small children, who lack the vocal and verbal skills for reporting pain accurately, are not able to judge their pain in abstract manners on self-report scales.

The behavioral pain assessment has been developed to ease and support the assessment of pain in the special pediatric groups, such as neonates, children with cognitive impairments and small children in general. The self-report of pain being difficult or impossible for these patient groups, an easy and reliable behavioral measure is critical. The weakness of the behavioral assessment is that its reliability and validity is rather difficult to judge. The cultural and personal factors of a nurse and a child can have a major influence on the outcome of the pain assessment when pain is assessed through objective observation, and thereby the reliability of this tool is uncertain in all circumstances.

Physiological parameters of pain are easy and simple indicators of pain. Especially in postoperative settings the meters for assessing cardiovascular and respiratory rates are at hand. Although the physiological indicators in pain assessment are essential, the universal reliability of these indicators is questionable. This is due to many factors, other than pain, which can elicit the increased physiologic response, such as increased respiratory rate and cardiologic function. One may argue that it is almost impossible to distinguish these factors from each other, and this leads to the problem of ensuring reliability of this pain assessment method.

Parents play an important role in pain assessment of a pediatric patient. They are responsible for assessing the pain after discharge, and should, therefore, obtain the knowledge and skills of proper pain assessment. Surprisingly, the impact of a parent in postoperative pain assessment is more a negative than a positive one: parents lack knowledge on pain assessment and they have major misconceptions about pain

assessment and treatment and pain in general. This is the reason why parents can not be seen as reliable sources in pain assessment in postoperative settings.

In the light of these findings, it is obvious that no pain assessment method should be used alone to indicate the nature of pain in children. In order to ensure the comprehensive assessment, and, hence, the appropriate management of a child's pain in postoperative settings, the tools and methods should be used in conjunction. The advantages and disadvantages of each method should also become known for the nurses working in pediatric settings.

6.1.2 Factors Influencing Pain Assessment

Comprehensive assessment of pain requires the consideration of many factors that have an influence on the pain assessment process. The medical diagnosis, nurse characteristics and child characteristics are the main issues that have been researched to have an effect on the assessment of pain. Since nurses have no power over the medical diagnosis or the child's characteristics, the emphasis of concern should be laid on the characteristics, attitudes and knowledge of the nurses.

Nurses' attitudes toward pain in children and their knowledge about pain and pain assessment play a crucial role in the assessment of pain. If a nurse does not understand the mechanism of pain and the consequences of untreated pain, it is impossible for them to assess and manage pain properly. The attitudes and knowledge also have an impact on the continuity of care in forms of documentation and management of pain. When it comes to communicating and educating the parents about pain assessment postoperatively, it is the nurse's responsibility to offer her knowledge and skills to ensure the continuity of a child's care after discharge.

Nurses' inadequate knowledge of pain or an attitude problem may have severe consequences regarding patient care. At the moment, nurses do not document pain adequately, the management of pain is inconsistent and the postoperative pain education for parents inappropriate. In short, pain seems to be assessed in an unsystematic manner.

6.2 Limitations

This literature review is limited by the amount of research articles used as data sources to conduct the review. Furthermore, certain relevant research articles may have been omitted due to the cost restraints of obtaining them. In addition, the authors of this review are nursing students with no previous research experience, and amateur mistakes may have been committed due to this.

6.3 Implications for Clinical Practice and Suggestions for Further Development

The findings of this literature review are meaningful and applicable for clinical practice. As discussed above, there are several issues that should be developed in clinical settings concerning this topic. Although some of the findings of this literature review were expected and commonly known for pediatric nurses, there are some unexpected findings which highlight the need for further development in this area. In this chapter, we will discuss the importance of this literature review for clinical settings and come up with some developmental suggestions.

First of all, the findings of this literature review can be used as a simple informative package of pain assessment for nurses and nursing students. The importance of comprehensive and multifaceted approach in pain assessment is emphasized strongly in this literature review. The comprehensive approach of assessing pain should be acknowledged and emphasized more in nursing schools and especially in clinical settings.

Secondly, the role which parents play in pain assessment of children should be recognized by pediatric nurses. Parents may have a negative influence on the pain assessment of their children due to their poor knowledge and misconceptions. This currently occurring problem should be taken care of especially in postoperative pediatric settings among the time of discharge when the responsibility of the pain assessment of a child is removed from nurses to the parents. Functional communication between the nurses and parents should be regenerated in order to avoid poor pain management and its further impact on a child's life.

Thirdly, the knowledge deficits and the unprofessional attitudes toward a child's pain should be confronted among nurses. More education should be provided to nurses about

the physiology of pain, the nature of pain, and the consequences of untreated or mistreated pain in children. The proper knowledge level of nurses and their correct attitude could lead to a more systematic way of assessing pain in pediatric patients. The results of a systematic assessment could optimally appear in forms of accurate documentation of pain, good communication, and selection of the most appropriate tool and proper education of parents.

This literature review offers many starting points for further research. Numerous tools have not been empirically studied enough to ensure their validity for clinical practice. More empirical research is also needed to validate the applicability of some pain assessment tools in specific pediatric clinical settings.

6.4 Conclusions

The main methods of assessing pain in pediatric patients in postoperative settings are as follows: self-report methods, behavioral observation methods, and the physiological methods. In addition to these methods used by nurses, there are tools and methods of pain assessment that are developed for parents. For each of the main approaches, many concrete tools or scales have been developed to ease the assessment of children's pain. There are many factors which influence pain assessment. These factors include the child characteristics, the medical diagnosis, the nurse characteristics and the contextual influences.

To conclude, proper pain assessment practice is the foundation for successful pain management. Nurses can ensure the quality of pain assessment by increasing their awareness in this important area. Consequently the prevalence of untreated pain in pediatric patients, which is a chronic problem worldwide, can be decreased.

TABLE 1
DATA SOURCES

PUBLICATIONS	YEARS											
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Journal of Advanced Nursing		X		X			X				X	
Pain	X,X										X	X
Clinical Journal of Pain										X		
The Journal of Acute and Critical Care		X										
The Clinical Journal of Nursing								X				
Kuopio University Publications								X	X			X
Pediatric Emergency Care							X					
Pediatric Anaesthesia										X		
The Journal of Pediatric Nursing				X								
Pediatric Nursing								X,X				
Journal of Obstetric, Gynaecologic and Neonatal Nursing										X		
British Journal of Anaesthesia						X						
International Journal for Quality in Healthcare							X					
TOTAL	= 22 scientific articles											

All of these articles are based on empirical research. 19 of the articles are research studies. Three of them are systematic reviews.

The amount of articles answering question 1: 14

The amount of articles answering question 2: 7

One of the articles answered both of the questions.

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Young, J., Horton, F. and Davidhizar, R. 2006. Nursing Attitudes and Beliefs in Pain Assessment and Management. *Journal of Advanced Nursing*. 53(4), 412-421.

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TITLE, AUTHOR AND JOURNAL	PURPOSE	SAMPLE	DATA COLLECTION AND ANALYSIS	MAIN RESULTS
Abu-Saad, HH and Hamers, JP. 1997 Decision-making and Pediatric Pain: a Review. <i>Journal of Advanced Nursing</i> . 26(5), 946-952.	To present an overview of the literature on the factors influencing decision-making in the nursing care of children in pain.	40 scientific articles were reviewed in this literature review.		The assessment is influenced by many factors. Further research is needed on the influence of nursing diagnosis on decision making, information from parents, nurse's attitudes on pain assessment, the use of pain policies and protocols etc.
Chambers, C., Reid, G., McGrath, P., and Finley, G., 1996. Development and Preliminary Validation of a Postoperative Pain Measure for Parents. <i>Pain</i> . 68(2), 307-313.	The purpose of the study was to develop and validate this measure by examining the relation between patient-report of child behaviors and child-rated pain.	110 children aged 7-12 undergoing day surgery and their parents.	Parents and children completed a pain diary for the two days following surgery. Children rated their pain and emotional distress and parents rated the presence or absence of specific behaviors from a checklist. Correlations were conducted between each of 29 behavioral items. Correlations weaker than 0.30 were dropped. The remaining 15 were subjected to principle axis for factor analysis. A frequency analysis for each of the 29 items. Spearman-RHO and ANOVA were used to analyze the data.	This study provides preliminary evidence for the use of the PPPM as a valid assessment tool with children between the ages of 7-12 years following day surgery. It is internally consistent and strongly related to child-rated pain.
Chambers, C., Hardial, J., Craig, K., Court, C. and Montgomery, C. 2005. Faces Scales for the Measurement of Postoperative Pain Intensity in Children Following Minor Surgery. <i>Clinical Journal of Pain</i> . 21(3), 277-285.	The purpose of the present study was to determine whether scales beginning with a smiling rather than neutral no pain face would produce higher ratings in the assessment of postoperative pain intensity in children and to compare ratings using different faces scales to those reported with an additional independent measure of pain intensity.	Participants were 78 children between the ages of 5 and 13 years undergoing surgery, one of their parents, and their postoperative care nurse.	Following surgery, children were asked to provide a rating of their current pain intensity using a set of five successively administered faces scales and the Colored Analog Scale (CAS). Parents and nurses provided independent ratings using the same measures.	Results showed that parents and nurses rated significantly more pain when using scales with a smiling rather than a neutral no pain face. This pattern was not as clear for the children's ratings, although their highest ratings were provided when using a smiling no pain faces scale.
Coffman, S., Alvarez, Y.,	To describe how nurses assess	24 pediatric ICU nurses who	Data collected using the	Nurses first recognized

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<p>Pyngolil, M., Petit, R., Hall, C. and Smyth, M. 1997. Nursing Assessment and Management of Pain in Critically Ill Children. <i>The Journal of Acute and Critical Care</i>. 26(3), 221-228.</p>	<p>and manage pain in critically ill children.</p>	<p>conducted 112 assessments of 25 critically ill children.</p>	<p>Indicators of Pain in Critically Ill Children Assessment Tool. In addition, there were three open ended questions to be answered by each nurse. Pearson correlations were calculated to derive the data.</p>	<p>cardiovascular and respiratory indicators, then behavioral, followed lastly by neuromuscular responses. More indicators were selected for trauma, surgery and younger patients.</p>
<p>Finley, G., Chambers, C. and McGrath, P. 2003. Construct Validity of the Parents Postoperative Pain Measure. <i>The Clinical Journal of Nursing</i>. 19(5), 329-334.</p>	<p>This research seeks to provide evidence of the construct validity of the PPPM, a 15-item behavioral scale.</p>	<p>Study number 1: 75 children between the ages of 7-12 years undergoing day surgery. Study number 2: 28 children between ages 7-12 undergoing day surgery</p>	<p>Participants were randomly assigned to 1 of 3 time periods per day in which to fill out their diaries to sample child behaviors across different periods throughout the day. These data were then combined for analysis. Children were given instructions on writing the diary. Parent and child forms and questionnaires were collected. ANOVA was used to analyze the data.</p>	<p>Study 1: Scores on the PPPM closely followed the pattern of children's self-reported pain intensity, and not state-related anxiety. Study 2: Scores on the PPPM, like children's self-reported pain intensity ratings, were sensitive to analgesic intervention.</p>
<p>Finley, G., McGrath, P., Forward, P., McNeill, G. and Fitzgerald, P. 1996. Parents Management of Children's Pain Following "Minor" Surgery. <i>Pain</i>. 64(1), 83-87.</p>	<p>The aim of the study is to evaluate the prevalence, severity, and parents management of children's pain following short-stay and day surgery.</p>	<p>189 parents of children 2-12 years of age who had undergone a short stay or a day surgery.</p>	<p>Parents completed a 3-day diary of their child's pain and the methods used to alleviate it. The type of statistical method used was not clearly stated in the article.</p>	<p>There were clear differences in pain reported according to the type of surgery. Even when parents recognize that their children are in pain, most give inadequate doses of medication to control the pain.</p>
<p>Kankkunen, P. 2003. <i>Parent's Perceptions and Alleviation of Children's Postoperative Pain at Home after Day Surgery</i>. Doctoral Dissertation. Kuopio University Publications E. Social Sciences 100. Kuopio: University of Kuopio.</p>	<p>To describe parents' perceptions of the pain in children at the ages 1-6.</p>	<p>201 mothers and 114 fathers whose child had undergone a day surgery in ten Finnish hospitals.</p>	<p>Parents filled in a questionnaire including statements of pain perceptions, VAS scale to assess children's pain and PPPM to measure children's pain behaviors. Frequencies were used to describe the background variables of parents and children's and parents' perceptions of children's pain. Cross tabulation was used for analysis. Chronbachs was used</p>	<p>Differences in parents' perceptions were found by both parents and children's background variables. Parents' perceptions of children's pain were related to children's pain intensity and behaviors after surgery. Special attention should be paid on parents' expectation of boys' higher pain tolerance.</p>

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			as well.	
Kankkunen, P., Pietilä, K. and Vehviläinen-Julkunen, K. 2004. Families' and Children's Postoperative Pain- Literature Review. University of Kuopio.	To describe the findings of a literature review focusing on the viewpoint of family members in children's postoperative pain assessment and management.	11 articles found in two databases (PubMed and Cinahl)	Non-random selection of scientific articles published in 1991-2000. Qualitative deductive content analysis was used to investigate what is known about the topic.	Families are a source of support for children in postoperative pain. More attention should be paid on parents' needs and their counseling about children's pain in clinical pediatric nursing.
Kelly, AM., Powell, CV., and Williams A. 2002. Parent Visual Analogue Scale Ratings of Children's pain reported by child. <i>Paediatric Emergency Care</i> . 18(3), 159-162.	To determine whether parent and child visual analogue scale (VAS) scores for the pain associated with acute conditions in the child agree sufficiently for these methods of measurement to be considered interchangeable in pain and analgesia research.	8-15-year-old children seeking treatment for painful conditions were included in the study. 78 child-parent sets participated, yielding 289 VAS-pain-score comparisons for evaluation.	Both participants were asked to individually rate the child's pain using VAS. Both participants were blinded to their previous rating and the rating of the other participant. The main outcome measure was the correlation of child and parent VAS pain scores by Pearson correlation and bias plot analysis of agreement between tests.	Correlation between parent and child scores was 0.63. There was an increasing tendency for parents to underestimate the child's pain when the child recorded VAS pain scores at the higher end of the scale.
Lehikoinen, N-M. 2007. <i>Parent's Postoperative Pain Measure-mittarin vaikutus 1-6-vuotiaiden päiväkirurgisessa toimenpiteessä olleiden lasten kivunlievitykseen kotona</i> . Masters Thesis. University of Kuopio.	The aim of this study was to evaluate the effects of the tool of Parents' Postoperative Pain Measure on pain assessment in pharmacological and non-pharmacological pain alleviation in children aged from 1 to 6 years treated at home after day surgery.	1-6-year-old children (N=73) and their parents. 3 Finnish University Hospitals included.	Quasi-experimental study design, where children were divided into an intervention and control group at the time of discharge from hospital. Diaries were filled out by parents. The PPPM was used only among the intervention group. Statistical methods were used to analyse the data collected during three days.	The PPPM pain assessment tool did not increase the use of pharmacological methods in children's pain alleviation at home. The PPPM tool increased the use of some non-pharmacological methods significantly in the intervention group (for example comfort).
Malviya, S., Voepel-Lewis, T., Burke, C., Merkel, S. and Tait, A. 2006. The Revised FLACC Observational Pain Tool: Improved Reliability and Validity for Pain Assessment in Children with Cognitive Impairment. <i>Paediatric Anaesthesia</i> . 16(3), 258-265.	This study evaluated the validity and reliability of a revised and individualized FLACC behavioural pain assessment tool in children with CI.	80 observations were recorded in 52 children aged 4-19 years. 21 parents added individualized pain behaviours to the revised FLACC.	Observations were videotaped and later viewed by experienced nurses blinded to analgesic administration. Iterate reliability was supported by excellent interclass correlation coefficients and adequate K-statistics. Construct validity was demonstrated by the decrease in	Findings support the reliability and validity of the FLACC as measure of pain in children with CI.

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			FLACC scores following analgesic administration	
Manworren, R. and Hynan, L. 2003. Clinical Validation of FLACC: Preverbal Patient Pain Scale. <i>Pediatric Nursing</i> . 29(2), 140-146.	To test the validity of the Faces, Legs, Activity, Cry and Consol ability (FLACC) pain assessment tool by measuring changes in scores in response to analgesics.	147 children under 3 years of age who were hospitalized in the pediatric intensive care unit, post-anesthesia unit, surgical/trauma unit, hematology/oncology unit, or infant unit.	the FLACC scores were compared to the FACES scores. The mean time for observation was approximately 20 hours postoperatively. Spearman-correlations were used to compare the scale scores. Agreement between the observers' FLACC scores was determined using Kappa statistics. P values of <0.05 were accepted as statistically significant.	The FLACC pain assessment tool is appropriate for preverbal children in pain from surgery, trauma, cancer, or other disease processes.
Salanterä, S., Lauri, S., Salmi, T. and Aantaa, R. 1999. Nursing Activities and Outcomes of Care in the Assessment, Management, and Documentation of Children's Pain. <i>Journal of Pediatric Nursing</i> . 14(6), 408-415.	To explore nurses' assessment and documentation of pain in children.	303 nurses working in the children's wards of university-affiliated hospitals in Finland.	A survey was conducted to 303 nurses through questionnaires. At the same time a retrospective chart of 50 consecutive cases of operation of acute appendicitis was carried out. The charts were analyzed by content analysis. Inter-rater reliability was 97%.	Nurses assess pain mainly by observing the child's behavior and changes in physiology. Pain measurement tools are rarely used, and nurses do not recognize them. The documentation of pain is unsystematic and does not support the continuity of care.
Salanterä, S. 1999. Finnish Nurses Attitudes to Pain in Children. <i>Journal of Advanced Nursing</i> . 29(3), 727-736.	Measures the attitudes of Finnish pediatric nurses to children in pain and the connection between nurses' attitudes, attributes, their own view of their knowledge of their ability to take care of children in pain.	303 nurses working in 5 different university hospitals in Finland.	The measurements were based on a purpose designed instrument consisting of a 41 item Likert-type questionnaire and demographic data. ANOVA and non-parametric Kruskal-Wallis ANOVA were used as statistical methods	The attitudes of these nurses do not hinder effective pain management but there are some misconceptions that need further attention. It also emerged that such attributes as nurses age, education, experience, place of work and field do not have a significant effect on nurses' attitudes.
Simons, J. and Roberson, E. 2002. Poor Communication and Knowledge Deficits: Obstacles to Effective Management of Children's Postoperative Pain.	To explore the perceptions of nurses and parents on the management of postoperative pain in children.	Matched interviews were used between 20 parents and 20 nurses.	The interviews were transcribed and coded to maintain confidentiality. Recursive comparative analysis was applied to the data. Two expert	Nurses' poor communication with parents and nurses' knowledge deficits in relation to children's pain management create obstacles to effective pain

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<i>Journal of Advanced Nursing.</i> 40(1), 78-86.			nurses were also used for further validation.	management.
Spence, K. Gillies, D. Harrison, D. Johnston, L and Nagy, S. 2005. A Reliable Pain Assessment Tool for Clinical Assessment of the Neonatal Intensive Care Unit. <i>Journal of Obstetric, Gynaecologic and Neonatal Nursing.</i> 34(1), 80-86.	The aim of this study was to validate a clinician-friendly pain assessment tool for all groups of critically ill infants cared for in the specific neonatal intensive care units (NICUs) studied.	Participants were 144 preterm and term infants. Infants on a ventilator and those who had undergone surgery were included.	A prospective study was undertaken to test the Pain Assessment Tool (PAT). Interrater reliability of the PAT score was assessed by two nurses who simultaneously determined an infant's PAT score. The PAT was validated against the CRIES score-crying, requires increased oxygen administration, increased vital signs, expression, sleeplessness- and the mother's assessment of her infant's discomfort using the Visual Analogue Scale (VAS).	The PAT score was shown in this study to be a valid, reliable, and clinician-friendly pain assessment measurement tool for all infants nursed in the NICU.
Stanford, EA. Chambers, C. and Craig, K. 2006. The Role of Developmental Factors in Predicting Young Children's Use of a Self-report Scale for Pain. <i>Pain.</i> 124(3), 360-361.	This study examined young children's ability to use the Faces-Pain-Scale-revised toward a common metric in paediatric pain measurement.	112 healthy 3-6 year-olds participated.	Children were assessed for their ability to use a common faces scale to rate pain in hypothetical vignettes depicting pain scenarios common in childhood. Accuracy was determined by considering whether children's judgements of pain severity matched the pain severity depicted in the various vignettes. Children were also administered measures of numerical reasoning, language, and overall cognitive development. To analyse the data a one-way ANOVA was conducted. Hierarchical regression analyses were also used.	5-and 6-year old children were significantly more accurate in their use of the scale. The 4-year olds were in turn more accurate than the 3-year-olds. Only half of the 6-year olds were able to use the scale without difficulties.
Suraseranivongse, U. Kraiprasit, K. Petcharatana, S.	To cross-validate a composite measure of pain scales	167 Thai children aged 1-5,5 years.	Childrens pain behaviour before and after surgery was	All tools had acceptable content validity and excellent inter-rater

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<p>Prakkamodom, S. and Muntarhorn, N. 2001. Cross-validation of a Composite Pain Scale for Preschool Children within 24 Hours of Surgery. (The Board of Management and Trustees of the) <i>British Journal of Anaesthesia</i>. 87, 400-405.</p>	<p>CHEOPS, OPS, TPPPS, and FLACC.</p>		<p>videotaped. Four observers then rated pain behaviour from rearranged videos. The correlations between scales were analysed using the Spearman correlation. The practicality of the scales was analysed with descriptive statistics.</p>	<p>and intra-rater reliabilities.</p>
<p>Treadwell, M. Franck, L. and Vichinsky, E. 2002. Using Quality Improvement Strategies to Enhance Paediatric Pain Assessment. <i>International Journal for Quality in Health Care</i>. 14(1), 39-47.</p>	<p>To enhance pediatric pain assessment through quality improvement approach.</p>	<p>A convenience sample of 36 children and 68 staff at time 1, and 49 children and 82 staff at time 2. Between the two sample times the staff was educated to use pediatric pain assessment tools.</p>	<p>The children and their primary care givers were interviewed using a questionnaire. Multidisciplinary unit staff completed a parallel questionnaire. Chi-square analysis was used in this study.</p>	<p>Improved pain assessment outcomes were reported following staff education. Similarly, patient satisfaction rates increased through quality improvement strategies.</p>
<p>von Baeyer, C. Spagrud, L. 2006. Systematic Review of Observational (Behavioural) Measures of Pain for Children and Adolescents Aged 3 to 18 Years. <i>Pain</i>. 127(1-2), 140-150.</p>	<p>An extensive literature search to identify those observational scales that are recommended as outcome measures in clinical trials.</p>	<p>20 observational pain scales were each evaluated based on its reported psychometric properties and clinical utility.</p>	<p>After all of the selected articles for a given scale were reviewed, the data on its corresponding review sheets were aggregated and recorded on a summary sheet. Each author then independently evaluated each of the measures using the agreed criteria.</p>	<p>Scales were judged to be indicated for use in specific acute contexts rather than for general use. No single observational measure is broadly recommended for pain assessment across all contexts.</p>
<p>Willis, M. Merkel, S. Voepel-Lewis, T. and Malviya, S. 2003. FLACC Behavioural Pain Assessment Scale: A Comparison with the Child's Self-Report. <i>Paediatric Nursing</i>. 29(3), 293-297.</p>	<p>The purpose of this study was to further test the validity of the Faces, Legs, Activity, Cry and Consol ability (FLACC) behavioral pain assessment scale for use with children.</p>	<p>30 children aged 3-7 years who had undergone a variety of surgical procedures were observed and assessed for pain intensity at 20+2 hours after surgery.</p>	<p>FLACC scores were assigned, and a self report of pain using FACES was obtained from the child. Spearman's RHO-correlations were used to compare the FLACC scores to the FACES scores. Kappa statistics were also used.</p>	<p>There were significant and positive correlations between the FLACC and FACES scores for the entire sample and for the scores of children 5-7 years, but not for children under the age 5.</p>
<p>Young, J. Horton, F. and Davidhizar, R. 2006. Nursing Attitudes and Beliefs in Pain Assessment and Management. <i>Journal of Advanced Nursing</i>.</p>	<p>This paper reports a study to determine nurses' attitudes toward pain assessment tools and the relationship of these attitudes to education and</p>	<p>52 nurses on an acute care unit were asked three open-ended questions. The questions were based upon Fishbein's and Ajzen's expectancy- value</p>	<p>Fishbein's and Ajzen's formula for calculating attitude was used.</p>	<p>The amount of education and experience of each nurse and the attitude measure in regard to the use of pain assessment tools were compared. More education</p>

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53(4), 412-421.	experience.	model.		enabled the nurse to have a better attitude to pain assessment tools.
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APPENDIX 2
CRITICAL APPRAISAL CHECKLISTS

CRITICAL APPRAISAL CHECKLIST FOR AN ARTICLE DESCRIBING A SYSTEMATIC REVIEW

By Greenhalgh, T. and Donald, A. 2000.

1. Did the trial address a clearly focused question? Clearly focused? -population -intervention -outcome(s)
2. Were high-quality, relevant studies included? - Robust study design (appropriate to the question)? - Sufficient sample size (power)? - Addressing a relevant question (population/intervention/outcome)?
3. Is it unlikely that important, relevant studies were missed? - Repeatable search strategy? - Comprehensive search strategy, including relevant databases and other, unpublished sources for information?
4. Was the validity of the included studies assessed properly? - Reproducible (explicit) assessment method? - More than one independent assessor?
5. Were the results similar study to study (i.e. were they comparable?)
6. What are the overall results of the review?
7. How precise were the results (e.g. measures of risk, confidence intervals, p-values)?
8. Can the results be applied to my patients? (Compare patient with review population, intervention, outcome)
9. Were sufficient important outcomes (for me) considered?

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CRITICAL APPRAISAL CHECKLISTS

**CRITICAL APPRAISAL CHECKLIST FOR QUALITATIVE OR QUANTITATIVE
RESEARCH ARTICLES**

By Greenhalgh, T. and Donald, A. 2000.

1. Did the study ask how or why something was taking place (qualitative study), or what effect did something have on a studied sample (quantitative study)?
2. Was there a clearly formulated question?
3. Was the method of sampling adequately described?
4. Did the investigators study a representative range of individuals and settings relevant to their question?
5. Were the characteristics of the subjects defined?
6. Has the researcher taken their background and perspective into account in the analysis?
7. Have appropriate data sources been studied? Was literature review conducted?
8. Were the methods used reliable and independently verifiable? Audiotape, videotape? Was more than one method of data collection used?
9. Did the author use systematic methods to reduce their own biases influencing the results? Did more than one researcher perform the analysis? Were explicit methods used to address negative or discrepant results?
10. What are the main findings of the research? Are they coherent?
11. Are the results credible? Are they consistent with the data?
12. Have alternative explanations for the results been explored and discounted?
13. What were the author's conclusions? Were they consistent with the data and results?
14. Were the subjects in the study similar in important respects to our own patients?
15. Is the context similar to our own practice?

APPENDIX 3
CRITICAL APPRAISAL TABLE

REVIEWED RESEARCH LITERATURE	POINTS GIVEN THROUGH CRITICAL APPRAISAL CHECKLIST maximum points 15 or 9
1. Abu-Saad, HH and Hamers, JP. 1997 Decision-making and Pediatric Pain: a Review. <i>Journal of Advanced Nursing</i> . 26(5), 946-952.	This study fills at least 6 of the 9 points of a critical appraisal checklist for a systematic review, and is therefore approved for our literature review.
2. Chambers, C., Reid, G., McGrath, P., and Finley, G., 1996. Development and Preliminary Validation of a Postoperative Pain Measure for Parents. <i>Pain</i> . 68(2), 307-313.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
3. Chambers, C., Hardial, J., Craig, K., Court, C. and Montgomery, C. 2005. Faces Scales for the Measurement of Postoperative Pain Intensity in Children Following Minor Surgery. <i>Clinical Journal of Pain</i> . 21(3), 277.285.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
4. Coffman, S., Alvarez, Y., Pyngolil, M., Petit, R., Hall, C. and Smyth, M. 1997. Nursing Assessment and Management of Pain in Critically Ill Children. <i>The Journal of Acute and Critical Care</i> . 26(3), 221-228.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
5. Finley, G., Chambers, C. and McGrath, P. 2003. Construct Validity of the Parents Postoperative Pain Measure. <i>The Clinical Journal of Nursing</i> . 19(5), 329-334.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
6. Finley, G., McGrath, P., Forward, P., McNeill, G. and Fitzgerald, P. 1996. Parents Management of Children's Pain Following "Minor" Surgery. <i>Pain</i> . 64(1), 83-87.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
7. Kankkunen, P. 2003. <i>Parent's Perceptions and Alleviation of Children's Postoperative Pain at Home after Day Surgery</i> . Doctoral Dissertation. Kuopio University Publications E. Social Sciences 100. Kuopio: University of Kuopio.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
8. Kankkunen, P., Pietilä, K. and Vehviläinen-Julkunen, K. 2004. Families' and Children's Postoperative Pain-Literature Review. University of Kuopio.	This study fills at least 6 of the 9 points of a critical appraisal checklist for a systematic review, and is therefore approved for our literature review.
9. Kelly, AM., Powell, CV., and Williams A. 2002. Parent Visual Analogue Scale Ratings of Children's pain reported by child. <i>Paediatric Emergency Care</i> . 18(3), 159-162.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
10. Lehtikoinen, N-M. 2007. <i>Parent's Postoperative Pain Measure-mittarin vaikutus 1-6-vuotiaiden päiväkirurgisessa toimenpiteessä olleiden lasten kivunlievitykseen kotona</i> . Masters Thesis. University of Kuopio.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
11. Malviya, S., Voepel-Lewis, T., Burke, C., Merkel, S. and Tait, A. 2006. The Revised FLACC Observational Pain Tool: Improved Reliability and Validity for Pain Assessment in Children with Cognitive Impairment.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.

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CRITICAL APPRAISAL TABLE

<i>Paediatric Anaesthesia</i> . 16(3), 258-265.	
12. Manworren, R. and Hynan, L. 2003. Clinical Validation of FLACC: Preverbal Patient Pain Scale. <i>Pediatric Nursing</i> . 29(2), 140-146.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
13. Salanterä, S., Lauri, S., Salmi, T. and Aantaa, R. 1999. Nursing Activities and Outcomes of Care in the Assessment, Management, and Documentation of Children's Pain. <i>Journal of Pediatric Nursing</i> . 14(6), 408-415.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
14. Salanterä, S. 1999. Finnish Nurses Attitudes to Pain in Children. <i>Journal of Advanced Nursing</i> . 29(3), 727-736.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
15. Simons, J. and Roberson, E. 2002. Poor Communication and Knowledge Deficits: Obstacles to Effective Management of Children's Postoperative Pain. <i>Journal of Advanced Nursing</i> . 40(1), 78-86.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
16. Spence, K., Gillies, D., Harrison, D., Johnston, L and Nagy, S. 2005. A Reliable Pain Assessment Tool for Clinical Assessment of the Neonatal Intensive Care Unit. <i>Journal of Obstetric, Gynaecologic and Neonatal Nursing</i> . 34(1), 80-86.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
17. Stanford, EA., Chambers, C. and Craig, K. 2006. The Role of Developmental Factors in Predicting Young Children's Use of a Self-report Scale for Pain. <i>Pain</i> . 124(3), 360-361.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
18. Suraseranivongse, U., Kraiprasit, K., Petcharatana, S., Prakkamodom, S. and Muntarbhorn, N. 2001. Cross-validation of a Composite Pain Scale for Preschool Children within 24 Hours of Surgery. (The Board of Management and Trustees of the) <i>British Journal of Anaesthesia</i> . 87, 400-405.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
19. Treadwell, M., Franck, L. and Vichinsky, E. 2002. Using Quality Improvement Strategies to Enhance Paediatric Pain Assessment. <i>International Journal for Quality in Health Care</i> . 14(1), 39-47.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
20. von Baeyer, C. and Spagrud, L. 2006. Systematic Review of Observational (Behavioural) Measures of Pain for Children and Adolescents Aged 3 to 18 Years. <i>Pain</i> . 127(1-2), 140-150.	This study fills at least 6 of the 9 points of a critical appraisal checklist for a systematic review, and is therefore approved for our literature review.
21. Willis, M., Merkel, S., Voepel-Lewis, T. and Malviya, S. 2003. FLACC Behavioural Pain Assessment Scale: A Comparison with the Child's Self-Report. <i>Paediatric Nursing</i> 29(3), 293-297.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.
22. Young, J., Horton, F. and Davidhizar, R. 2006. Nursing Attitudes and Beliefs in Pain Assessment and Management. <i>Journal of Advanced Nursing</i> . 53(4), 412-421.	This study fills at least 10 of the 15 points of a critical appraisal checklist for a research, and is therefore approved for our literature review.