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AlReshidi, Nahar, Long, Tony and Darvill, Angela

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A systematic review of the impact of educational programmes on factors that affect nurses' post-operative pain management for children

Abstract

Despite extensive research in the international arena into pain and its management, there is, as yet, little research on the topic of pain in children in Saudi Arabia and in the Gulf countries generally. A systematic review was conducted to explore the impact of education programmes on factors affecting paediatric nurses' postoperative pain management practice. This was done in order to advise the creation of an educational programme for nurses in Saudi Arabia. Knowledge about pain, attitudes towards pain, beliefs about children's pain, perceptions of children's reports of pain, self-efficacy with regard to pain management, and perceptions of barriers to optimal practice were all considered to be relevant factors.

The review was restricted to randomised controlled trials and quasi-experimental designs, excluding studies focussed on chronic pain or populations other than solely children. Studies published in English between 2000 and 2016 were identified using CINAHL, MEDLINE, Ovid SP, The Cochrane Library, ProQuest, and Google Scholar databases. Of 499 published studies identified by the search, 14 met the inclusion criteria and were included in the review. The method developed by Hawker et al was used to appraise the studies.

There was evidence of educational programmes exerting a positive impact on enhancing paediatric nurses' knowledge of pain and modifying their attitudes towards it, but only limited evidence was available about the impact nurses' beliefs and perceptions of children's reports of pain, nurses' self-efficacy, or perceptions of barriers to optimal practice. None of the studies was conducted in Saudi Arabia. Studies were needed to address additional aspects of preparedness for effective postoperative pain management. Details of educational programmes used as experimental intervention must be included in reports.

INTRODUCTION

Despite decades of research in the area of pain management, improvement in pharmacological treatment, and enormous technological advances, many studies have concluded that patients generally do not receive adequate pain management [1-5], that this is the case specifically for paediatric patients [6-8], and specifically in the post-operative period [9-10].

Pain is a complex phenomenon and it requires doctors and nurses who are in direct contact with patients to collaborate and implement therapeutic treatment strategies [11]. However, nurses, who are the most numerous members of the health team, who should advocate patients' rights, who have the most prolonged time with patients, who are often the first to know when patients are experiencing pain, and who frequently include pain as a diagnosis in the care plan [6,11], were found to be ineffective in post-operative pain management [11-13]. That is, children's nurses tend to assess children with developmentally non-appropriate pain scales [14], and fail to document pain assessment frequently enough and consistently in the nursing notes [15,16]. When prescriptions are ordered "as needed" they usually under-medicate children by administering low doses of analgesic compared with what the physician ordered [7,8,17]. Furthermore, nurses prefer untested traditional pain relief methods over pharmacological treatment to treat children's pain [18]. Miscommunication between family, physician and nurses regarding pain is common [19,20]. The outcome is that children continue to suffer moderate to severe post-operative pain.

In 2012, 38,441 operations were undertaken on children in Saudi hospitals [21]. Although post-operative pain management has been researched extensively, it does not receive the same attention from paediatric nurses in Saudi Arabia. Practices are not based on sound evidence, but there is a willingness to improve. Nurses have expressed their inability to provide patients and their parents with educational sessions and effective pain management because they are always too busy with new patients, and pain management is not emphasised in their education [22]. This review was conducted prior to the construction of an educational programme for paediatric nurses in Saudi Arabia. The distance between hospitals makes it difficult to gather nurses together in a physical space for ongoing education, so an interactive education package for remote self-completion and with integral feedback was necessary.

METHODS

Asystematic review was conducted to achieve the purpose of this study. Systematic reviews identify, evaluate and summarise the results of all related individual studies in a predefined area in order to reach to sound conclusion regarding the phenomenon under study using a meticulous, scientific process [24-26]. This systematic review adhered to University of York Centre for Reviews and Dissemination (CRD) guidelines [27]. Careful evaluation of rigour and the level of evidence of each study is carried out before synthesising the results of the review. To do this, researchers have

to adhere to meticulous, scientific, chronological steps to increase the rigour of the review, which must itself be reported in the review to minimise bias [29,30].

Using the PICOS framework, the review question was set as “What is the impact of an educational programme (I) on children nurses’ knowledge, attitudes, beliefs and perceptions of children’s pain, self-efficacy, and perceptions of barriers to optimal post-operative pain management (O) in children (P) when measured over time (S) compared to the usual practice of no planned intervention (C)?

SEARCH STRATEGY

An extensive interrogation was made of electronic online databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), Database of the National Library of Medicine (MEDLINE) via EBSCO and Ovid SP (Ovid MEDLINE(R) 1946 to present with daily update), The Cochrane Library, ProQuest, and Google Scholar. Keywords were Child (children), Adolescen*, Paediatric (Pediatric), Postoperative (Post-operative, Post surgery, Post-surgical), Pain, Self-efficacy, Attitude (Attitudes), Knowledge, Belief (Beliefs), Perception (Perceptions), Barrier (Barriers), Education, Programme (Program).

A combination of these terms using "AND" or "OR" were made in order to generate a comprehensive search and maximise the number of studies retrieved. The search was conducted first during July and August 2014 and updated during March 2016.

All items had to meet all of the inclusion criteria of being focused on at least one of the variables stated in the review question; prepared in English; reporting the outcome of experimental or quasi-experimental research; and focused on post-operative pain in children. The restriction to items published in English was applied as the official academic and medical language in Saudi Arabia is the English language. In Saudi Arabia, researchers and health care professionals use English as the main language of communication, and scientific medical journals choose English as the main adopted language to publish findings of research conducted in Saudi Arabia.

Items which met any of the exclusion criteria were discarded. Articles published before 2000 were excluded. Rapid, informal review of the evidence base confirmed suggestions made by Twycross in a conference presentation and later published [31] that this was the starting point of increased awareness of the gap in knowledge among nurses about pain management. It was the beginning of the creation of widespread pain standards [32] which has peaked more recently in the creation of related skills frame works in New Zealand [33], UK [34], and internationally [35]. Mixed method studies were excluded if the conduct and outcomes of the experimental element were not clearly differentiated from other aspects of the study. If the focus was found to be on chronic pain following surgery rather than acute post-operative pain, this would result in exclusion.

A number of issues were found when testing the articles against the inclusion criteria. Articles included populations that were broader than the population at issue in this review. The study populations included nurses who were working in surgical units but possibly in both paediatric and adult surgical units. Studies might include more than one setting such as medical units, intensive care unit and an oncology unit. In these studies, nurses who worked in surgical units were included as part of whole nursing populations. After careful deliberation, it was decided to include these studies as the data and results for adult and paediatric nurses were available discretely.

The database search revealed 499 papers. After scanning the articles, 230 duplicated articles were removed. Two hundred and sixty-nine articles were reviewed against the inclusion criteria. This process resulted in the elimination of 244 articles as their content did not match the inclusion criteria. The remaining 25 articles were independently reviewed and evaluated to ensure that they were appropriate to be incorporated in the review. Fifteen papers related specifically to post-operative pain management education programmes addressing at least one of the variables of interest were retained for the review. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was used as the internationally preferred method of reporting (Figure 1). **INSERT Figure 1 here**

METHODOLOGICAL QUALITY OF STUDIES

Of the fifteen studies, two were experimental studies [37,38] and the rest were quasi-experimental studies as they lack of randomisation [15,36,39-49]. Another important issue was the sample size. Only three of the fifteen studies provided a sample size power calculation [38,39,43]. A data extraction sheet was generated for this study for application to the 15 articles (See Table 1).

INSERT Table 1 here

Hawker et al's Assessment Tool was selected for use in this study because it enables researchers to quantify and measure the quality of reviewed reports of a variety of study designs [50]. This entails assessment of nine categories: abstract and title, introduction and aims, methods and data, sampling, data analysis, ethics, bias, findings, generalisability /transferability, implications and usefulness. Hawker et al's tool has been applied successfully to other systematic reviews [51,52]

The assessment is based on a point system for each category, which ranges from 1 to 4, with 1 indicating a very poor score and 4 indicating a good score, thus allowing a maximum score of 36 points. Each included study was awarded total score falling into one of the following categories: very poor (0-10points), poor (11-20 points), fair (21-30 points) and good (31-36 points). Table 2 summarises the level of evidence and the quality of the included studies according to Hawker's et al Assessment Tool. **INSERT Table 2 here**

KNOWLEDGE ABOUT CHILDREN'S PAIN

Thirteen studies tested the impact of an educational programme on nurses' knowledge of pharmacological and non-pharmacological techniques of pain management [15, 36-42,49, 45-48]. On reviewing the quality of these, eleven studies offered good (strong) positive evidence to support the implementation of an educational programme on nurses' knowledge [36-39, 45-49]. Another two studies were found to have a fair level of quality to support the impact of post-operative pain management education on children's knowledge [15, 40].

Nine studies found a significant impact of an educational programme on nurses' knowledge. Eight of these demonstrated good evidence [37, 41-42, 45-49], and only one study was gauged as displaying fair evidence [40]. For example, a non-randomized pre-test post-test Mexican study aimed to test the impact of a pain education intervention programme on nurses' knowledge and attitudes toward children's pain (n=79). Significant improvement was established ($p < 0.0001$) [44]. Similar results were found across other countries: Columbia [49], Canada [37], USA [41], Jordan [42], China [40, 48], India [45], Taiwan [46], though the findings from one study [40] must be treated with caution due to the employment of a single group design and the inherent risk of confounding variables.

In contrast, four out of twelve studies did not find any significant improvement in nurses' knowledge of pain after the education programme [15,36,38,39]. All of the studies were of good quality except one [15]. Education programmes in all of these studies were planned to increase children's nurses' knowledge of pain assessment and management except one which targeted both adult and children's nurses [38]. The datasets from adult and paediatric nurses were analysed separately in (and therefore the study was eligible for inclusion), the intervention programme was the same for both and perhaps too broad.

The content of educational programmes was inconsistent across the studies. Only the Indian study [45] established a specialized post-operative pain education programme to increase post-operative pain management among children's nurses, while another [40] sought to increase only knowledge about the use of non-pharmacological post-operative pain managements. Other researchers chose to increase children's nurses' knowledge in the area of children's pain in general [38,47]. Other researchers also chose to provide even broader pain management education programmes as they targeted children's and adult nurses in all hospital areas using the same educational programmes [41,42,48]. Ideally, these studies might have been discounted, but the general dearth of evidence required that they be included, and they all met the inclusion criteria. Discrete results were reported for both groups of nurses. In contrast, the Taiwanese study [46] was designed to increase children's and adult surgical ward nurses' knowledge solely regarding the use of relaxation therapy.

Four studies used the same approach, recruiting nurses from different ward settings, and obtained a statistically significant positive result [42, 46-48]. Three studies that found no impact all suffered from high attrition rates which makes interpretation of these negative results difficult [15, 36, 39].

Since the majority of good studies (9 out of 12) reported a statistically significant effect from pain education programmes on nurses' knowledge, and only four did not report a significant impact, then it was concluded tentatively that education programmes have the potential to exert a significant impact on nurses' knowledge of pain assessment and management.

ATTITUDES TOWARDS CHILDREN'S PAIN

Nine out of fifteen studies with good evidence reported the impact of pain assessment and management educational programmes on nurses' attitudes towards pain management for children [37-39, 41,42, 46-49]. Seven of the studies reported a positive impact on nurses' attitudes toward pain management [37,41,42, 46-49]. For example, a US study tested nurses' knowledge and attitudes toward pain management using the Knowledge and Attitudes Survey regarding pain in acute care settings. Attitudes toward pain management were significantly improved ($p=0.0001$) [41]. Lin et al [46] found that before the education programme nurses saw no need for intervention, holding that patients should tolerate post-operative pain without medication, but after implementing the education programme this stance was abandoned.

In eight studies, knowledge and attitude were combined in the same survey [37-39, 41,42, 47-49]. This may suggest an implicit link between knowledge and attitudes toward pain management. As long as the two factors are distinguishable in the instrument and can be analysed separately, this combination in the questionnaire poses no problem. All studies that found significant improvements in knowledge also found a significant improvement on attitudes. For example, the Taiwanese study [46] examined the impact of a pain management education programme on strengthening nurses' knowledge of relaxation therapy as an important pain relief technique. The pain assessment and management education programme improved nurses' knowledge significantly. As a result, the nurses' attitude toward pain management was also increased significantly ($p=0.005$) [43].

On other hand, the remaining two studies with a good evidence level reported that the impact of pain assessment and management education programmes was not statistically significant [38,39]. The US study tested two instructional designs (text-based reading versus constructivist learning design) in a Web-based continuing education programme on pain management for registered nurses. The results showed no significant improvement in nurses' attitude in either intervention or control groups [38]. However, this educational programme was very broad as it targeted both children's and adult nurses without giving attention to the type of pain and age of patients that were

considered. Furthermore, randomisation was at the individual level and not at the health care facilities level, which increased the chance of contamination between the experimental group and control group. This was one of the first studies that attempted to integrate new teaching methods (a web-based education programme) into everyday nurse continuing education. There is a need to replicate, build and develop on this study as many new educational systems are moving toward the online and web-based educational system.

Since the majority of good studies reported a significant effect of pain education programmes on nurses' attitude toward pain management, and only two did not report a significant impact, it was concluded that education programmes may also exert a positive impact in this factor.

BELIEFS AND PERCEPTIONS OF CHILDREN'S PAIN

Only two studies explored the impact of a pain management education programme on nurses' beliefs and perceptions toward pain management: one with good evidence level [44] and the other with fair evidence level [15]. The first, from the USA, examined feasibility of the Internet-based Relieve Children's Pain protocol to improve nurses' management of children's pain. Using a single-group, pre-test post-test design, nurses were required to complete an Internet-based Pain Beliefs and Practices Questionnaire before and after the intervention. A significant improvement in nurses' beliefs and practices scores was noticed in the post-test compared with the pre-test ($p < 0.0001$).

In contrast, the second study (from Canada) found no significant differences between intervention and control groups in beliefs and perceptions after introducing the educational programme which was designed to improve pain management practices in a children's hospital. The attrition rate was particularly high as only 35% ($n=120$) of the original sample ($n=344$) completed the post-test. This may explain the unexpected result of lack of impact of the educational programme. It remains unclear whether such programmes could be effective, though the current, limited evidence suggests that it is possible.

NURSES' SELF-EFFICACY IN RELATION TO PAIN MANAGEMENT FOR CHILDREN

The extensive literature search did not reveal any studies that examined the impact of a pain management educational programme on children's nurses' self-efficacy.

PERCEIVED BARRIERS TO OPTIMAL POST-OPERATIVE PAIN MANAGEMENT IN CHILDREN

Perceived barriers to optimal post-operative pain management in children was also an important issue that could be influenced by pain assessment and management education, but only one study, with a fair evidence level, reported this variable [47]. Regardless of an education programme, nurses still rated heavy workload, lack of time, and the child's inability to cooperate as the most common barriers to optimal pain management. However, this study did not include a

control group which would have strengthened the evidence. A single study (of only fair quality) does not constitute sufficient evidence and, therefore, further research to address the perceived barriers to optimal post-operative pain management in children is needed.

LIMITATIONS OF THE REVIEW

This review excluded studies written in languages other than English, but no studies in other languages were found when removing this limit during the search. The academic publishing and research language in Saudi Arabia is English so evidence from the Saudi context, and, indeed, that of the Gulf region, was not excluded from the review. Restricting the review to experimental studies necessarily excluded qualitative evidence, but this allowed for more effective comparison between studies. A separate review to assess the qualitative evidence would be advisable. No appraisal tool is without weaknesses, and the use of an overall score for studies has the potential to mask serious design flaws. The Hawker et al tool was used for structure, but additional consideration was given to each individual paper by the researchers to ensure that this was not the case in this review.

CONCLUSION

This review included 15 experimental studies. Of these, 13 had a good level of evidence and two had a fair level of evidence. Eleven of the studies with good evidence found a positive impact of education on nurses' knowledge, while seven of nine studies that addressed attitude toward pain management revealed positive impacts. Of the two studies that explored the impact of pain management education programmes on nurses' beliefs and perceptions toward pain management, the one with good evidence found positive evidence of impact. No study was found that examined the impact of a pain management educational programme on nurses' self-efficacy. Only one study with fair evidence level reported on perceived barriers to optimal post-operative pain management in children. There were no studies addressing all the previous variables together in a single project. This extensive, systematic review revealed considerable gaps in the evidence base regarding the impact of educational programmes on nurses' knowledge, attitudes, beliefs and perceptions of children's pain, nurses' self-efficacy, and perceptions of barriers to optimal post-operative pain management in children.

There are implications for policy and practice since inadequate pain management persists, though significant attempts have been made recently, both in nursing in individual countries and more widely internationally, to address this through a structured, skills-based approach. Education of paediatric nurses (whether general nurses working with children or specifically qualified registered children's nurses) is a vital aspect of improving practice. Often, attendance at a course is possible, but in other situations geographical or logistical challenges imply that remote, self-completed education packages, preferably with an interactive element and with links to Internet-based

resources are essential. Most of the factors sought for in this review were to be found in the evidence base and could be incorporated into this education effort.

There was a scarcity of studies in the Arabic region as only the single Jordanian study was found, and no studies had been conducted in Saudi Arabia. This review was conducted to inform the design of such a study in Saudi Arabia.

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Table 1: Summary of the studies

Study	Design & Instrument	Sample	Intervention: Knowledge, Attitude, Beliefs, Perception, Self-Efficacy, Barriers	Outcomes
Zhang et al 2008. China	Quasi-experiment NKAS	N=196. (Exp=106, ctrl=90) All nurses	6 hours training in use of Changhai Pain Scale K & A	Improved knowledge and attitude (P<0.001)
Ellis et al 2007 Canada	Quasi-experiment	N=366 but 35% response rate at post intervention questionnaire. All children's nurses and physicians	4-hr pain education workshop K, B, & P	No significance differences between groups
Johnston et al 2007 Canada	RCT	N=141 All children's nurses	One-to-one coaching sessions (average 9 for each nurse) K & A	Improved knowledge and attitude (P<0.001)
He et al 2008 China	Quasi-experiment	N=359 All nurses working in surgical units	Booklets and nine lectures K	Improved knowledge of nonpharmacological methods (P<0.001)
He et al 2010 Singapore	Quasi-experiment	N=108 All children's nurses	Educational intervention with questionnaire validated in Finland Ba	Heavy workload/lack of time and child's inability to cooperate were the most commonly reported barriers at pre-test and post-test.
Van Hulle Vincent et al 2010 USA	Quasi-experiment	N=24	Internet-based RCP (Relieve Children's Pain) protocol B	Improved belief (P<0.0001)
Swain 2008 USA	Quasi-experiment	N= 482 All nurses	Small group sessions discussing case scenarios and online self-learning module K & A	Improved knowledge and attitude (P=0.001)
Textor 2003 Columbia	Quasi-experiment	T1 n=65, T2 n=45 T3 n=36 nurses	Traditional education programme K & A	Improved knowledge and attitude (P<0.001)
Dowd 2009 USA	Quasi-experiment	N=53 All children's nurses	Active pain management education programme K & A	No significant differences between groups

Smith 2007 USA	RCT	N=106 All nurses	2-hrs Web-Based Instructional design strategies/constructivist learning design K & A	No significant differences between groups
Paul 2013 India	Quasi-experiment	N=60 Children's nurses working in surgical units	Planned teaching programme K	Improved knowledge (P<0.01)
Abdalrahim et al 2011 Jordan	Quasi-experiment	N=65 All postoperative nurses	Postoperative pain management programme for three months K & A	Improved knowledge and attitude (P<0.05)
Lin et al 2008 Taiwan	Quasi-experiment	N=81 All nurses working in surgical units	15 hrs pain management programme K & A	Improved knowledge (P=0.001) and attitude (P=0.005)
Huth et al 2010 Mexico	Quasi-experiment	N=106	4-hr paediatric Pain Education Program (PPEP) K & A	Improved knowledge and attitude (P<0.0001)
Habich et al 2012 USA	Quasi-experiment	T1 n=27, T2 n=11 T3 n=15 All children nurses	Implementing Pediatric Pain Assessment and Management Guideline K & A	No differences were found between before and after implementation of the guidelines.