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Nurses' knowledge of the principles of acute pain assessment in critically ill adult patients who are able to self-report

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ABSTRACT

Introduction: Nurses play a critical role in managing and alleviating acute pain among critically ill adult patients (CIAP). The purpose of this study was to determine nurses' level of knowledge about principles of acute pain assessment in CIAP.
Methods: A descriptive cross-sectional study design and questionnaire survey were employed to collect data from 170 nurses caring for CIAP at Uganda's national hospital.
Results: The mean knowledge score of nurses was 71% indicating adequate knowledge levels. However, a large proportion of nurses was not knowledgeable about aspects related to pre-emptive analgesia when performing procedures for CIAP such as; airway suctioning (45.3%); invasive line placement (46.5%); and spontaneous breathing trials (63.5%). A large number of nurses did not know or believe that a patient can rate their pain accurately (43.5%). Nurses' knowledge about pain assessment principles was significantly associated with their understanding of the need to assess for pain and pre-emptive analgesia for physical procedures such as; patient repositioning (OR = 0.103, CI = 0.031–0.345); drain removal (OR = 0.088, CI = 0.025–0.314); and invasive line placement (OR = 0.039, CI = 0.011–0.140).
Conclusion: The nurses had adequate general knowledge about the principles of acute pain assessment in CIAP. However, some knowledge gaps exist about key concepts in pain assessment and these can curtail the efforts to ensure quality pain assessment and management in CIAP. The findings entrench the need for focused professional training and continuing professional education about best practices for pain assessment and management in CIAP.

1. Introduction and background

Alleviating patients' suffering is a core ethical and legal obligation for all health care professionals (Brennan, Carr, & Cousins, 2007). However, discomfort due to moderate or severe levels of acute pain remains prevalent and affects between 40% and 77% of adult patients in critical care settings (Gelinas, 2007; Li & Puntillo, 2006). Available evidence shows that critically ill adult patients (CIAP) suffer from pain during rest and routine care (Barr et al., 2013). The degree of suffering due to pain in CIAP is a challenge to the concerted efforts devoted to the advancement of knowledge and technology, development of valid and reliable pain assessment tools and practice guidelines (Polomano, Rathmell, Krenzischek, & Dunwoody, 2008a). Therefore, the extent of global failure in pain control is disproportionate to the level of scientific advancement with the greatest discrepancy existing in the developing nations (Brennan et al., 2007).

Lack of adequate pain management is a common phenomenon among CIAP. Studies conducted overtime have shown that procedures commonly performed on CIAP such as repositioning, suctioning of the artificial airway, removal of drains, wound dressings, and insertion of invasive lines, are associated with intense pain (Gelinas, 2007; Puntillo et al., 2004, 2014; Vazquez et al., 2013). Indeed, CIAP suffer unrelieved severe procedural pain regardless of the type of disease affecting them or their level of consciousness (Vazquez et al., 2013). And the presence of inadequately controlled pain before a procedure increases the likelihood of procedure related pain (Puntillo et al., 2014).

The psychological, physiological, social and economic effects that stem from unrelieved pain not only affect the CIAP, but also

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their families (Brennan et al., 2007; Dunwoody, Krenzischek, Pasero, Rathmell, & Polomano, 2008). Hence, the call for all aspects of health care systems especially in developing countries to illuminate the need to prioritize pain control. Realization of better pain relief is feasible even in resource limited settings, if health care providers and health care systems consistently apply proven strategies that address knowledge, cultural, attitudinal and practice gaps (Brennan et al., 2007). In situations of limited resources, it has been reported that strategies such as availability of guidelines and algorithms enhance informed decision making during pain assessment and management (Shannon & Bucknall, 2003; Twycross, 2013).

In an effort to ensure improved level of physical and psychological comfort among CIAP, the American College of Critical Care Medicine through its guidelines, recommends approaches such as assessment and monitoring of pain in CIAP using reliable and valid tools, use of both pharmacological and non-pharmacological approaches, and the practice of pre-emptive analgesia for known painful procedures (Barr et al., 2013). To achieve adequate procedural pain control, clinicians are required to assess for pain before the procedure, during, and after the procedures (Barr et al., 2013). In addition, clinicians are expected to elicit patient's input during pain assessment and management, because patients provide the most accurate rating of their experience given the subjective nature of pain (Dunwoody et al., 2008; Erstad et al., 2009). In the critical care settings, where it may not always be possible to have patients' input due communication barriers (altered neurological state and cognition), the clinicians are expected to presume presence of pain based on their knowledge of pain and associated factors (Erstad et al., 2009).

The concept of pre-emptive analgesia requires utilizing analgesic techniques in a timely manner before a painful stimulus and maintaining the effects during and after the procedure through active management (Polomano et al., 2008a). However, it has been reported that clinicians inconsistently apply the recommended practice guidelines and provide analgesia too early or do not administer analgesia during the procedure when the CIAP experiences the worst pain level (Vazquez et al., 2013). The inconsistencies and variations in practices related to pain assessment and management show that the related key principles are undermined (Erstad et al., 2009).

Reports of very limited post-procedural pain assessment and inadequate documentation even when patients can verbalize pain are also common in literature (Gelinas, Fortier, Viens, Fillion, & Puntillo, 2004). It has been reported that CIAP with medical diagnosis and those undergoing airway suctioning are less likely to receive analgesics during the procedures (Puntillo et al., 2002). This shows that practice guidelines may not guarantee better practices especially when they are not specific to the nurses' local practice settings (Shannon & Bucknall, 2003). Duignan and Dunn (2008, 2009) identified several contextual factors categorized as healthcare-related, clinician-related and patient-related, which preclude nurses' ability to adequately assess pain and contribute to pain control among CIAP. The factors include lack of time to assess and control pain, urgent nature of patients' physical needs, limited nurses' knowledge and low priority given to pain management by the health care system (Duignan & Dunn, 2008, 2009). The patient factors include the fear of the effects of analgesics such as tolerance and addiction, fear of redirecting clinicians' attention from the disease to pain, the belief that a good patient must tolerate pain, and use of alcohol and drugs which affect patients' communication and the quality of assessment. All these factors contribute to under assessment of pain, doctors' reluctance to prescribe analgesics, and unfavorable nurses' attitudes, beliefs and misconceptions about pain and its management (Duignan & Dunn, 2009).

Nurses play a pivotal role in managing patients' pain and the associated distress which affects the comfort of CIAP. The nurses' roles in pain management such as assessment, implementation of evidence-based management strategies, monitoring patients' response, documentation and educating of the patients and their families are key to successful pain control (Dunwoody et al., 2008; Shannon & Bucknall, 2003;Twycross, 2013). Quality pain assessment by nurses is a major attribute of effective pain management in CIAP because physicians' prescription and selection of other pain control strategies are reliant on findings from nurses' on-going holistic pain assessment (Erstad et al., 2009). Although knowledge may not necessarily translate to expected performance (Cope, Cuttbertson, & Stoddart, 2000) or correlate with nurses' practices in the critical care settings (Buckley & Andrews, 2011), quality assessment requires nurses to be knowledgeable about pain, its consequences, and the key principles embedded in the current best evidence (Polomano, Dunwoody, Krenzischek, & Rathmell, 2008b; Vallerand, Musto, & Polomano, 2011).

The multidisciplinary approach used to achieve adequate pain control in CIAP requires nurses to make informed decisions, collaborate with the health care team and advocate for patients (Shannon & Bucknall, 2003). Nurses cannot function effectively in the multidisciplinary health care team unless they are knowledgeable (Glynn & Ahern, 2000). Nurses' theoretical knowledge influences their ability to meet practice expectations (Khomeiran, Yekta, Kiger, & Ahmadi, 2006). Available studies show that a large number (50%) of nurses working in critical care settings such as emergency departments lack knowledge on key aspects related to pain assessment (Moceri & Drevdahl, 2014). In Uganda, no studies have been done to evaluate the nurses' knowledge regarding pain assessment or the curricula used to train nurses in regard to content related to pain assessment and management. Additionally, reports shows that in Uganda nurses' engagement in lifelong learning activities such as attending continuing educational activities is limited and curtailed by factors such as workload, lack of computer skills and access to resources (Muliira, Etyang, Muliira, & Kizza, 2012). Therefore in resource limited settings, nurses struggle to keep abreast with knowledge updates and only a few highly motivated and persistent individuals manage to gain or access the new knowledge (Khomeiran et al., 2006). Given the prevailing situation, an inquiry into the knowledge nurses have regarding acute pain assessment and management is justified especially in resource limited settings like Uganda.

1.1. Purpose of the study

The study was designed to explore the knowledge of nurses regarding the principles of pain assessment in CIAP. In this study, knowledge is defined as the facts and insights nurses have about recommended pain assessment practices among CIAP.

2. Methods

2.1. Study participants and setting

A descriptive cross-sectional design was used to collect data from nurses working in units which take care of CIAP at Mulago Hospital (MH). MH is Uganda's national referral and teaching hospital with a capacity of 1500 beds. The hospital employs an estimated total of 2057 health care professionals and the majority (42%) of these are nurses. The participants for this study were nurses working on clinical units which take care of CIAP and these were; the burns unit, intensive care unit (ICU), post-operative care unit, high dependency unit, neurology unit and emergency unit. The patients are admitted on the above units as emergency cases

or as referrals from other hospitals located in other parts of the country. The units were purposively selected basing on the nature of the health status of the patients admitted on the units and the type of care provided. In this study, CIAP are the patients with a life- threatening condition due injury or illness and require strict continuous monitoring and/or supportive care to prevent death or disability. Given the limited space in the intensive care unit at MH, CIAP are also admitted on the selected units. These patients may be transferred to the ICU once a vacant bed is available or when they need mechanical ventilation. The selected units have designated areas where such patients are admitted. Each of the units has an average of 20 beds for such patients and a total of 200 nurses are deployed on these units. Purposive sampling technique was used to collect data from eligible participants. The nurses who were recruited to participate in the study had to be; an officially employed personnel by the hospital; working on one of the selected units for at least 6 months; registered as a nurse by the Uganda Nurses and Midwives Council; and involved in direct patient care. The nurses with the following characteristics were excluded from the study; nurses pursuing internship training which is a requirement for professional licensure; nurses who had spent less than 6 months on the unit and managers or coordinators of nursing services (not directly involved in patient care).

2.2. Data collection instrument

The data were collected using a pre-tested structured questionnaire that was developed in Canada to measure nurses' assessment and management of pain for CIAP (Rose et al., 2011). The questionnaire was in English language and English is the official language in Uganda. The original survey has 6 sections with focus on assessment practices, and knowledge related to pain assessment for CIAP who are able and unable to self-report pain, perceived relevance of behavioral indicators, enablers and barriers for effective pain assessment, pain beliefs and education section. The authors requested for the tool and permission to use and make some modifications to the questionnaire. This was granted by the original authors (Rose et al., 2011). The modified version of the tool used in the study has 4 sections seeking information on the nurses' demographic characteristics, practices and barriers for effective pain assessment, knowledge and education. The findings on practices have been published (Kizza & Muliira, 2015). This report focuses on the findings about nurses' knowledge and education related to pain assessment for CIAP who are able to self-report pain. The knowledge and education section of the questionnaire is comprised of 16 and 9 items, respectively. The knowledge items elicit information about nurses' insight on the principles of pain assessment such as; patient's input to their pain assessment; use of a valid assessment tool; importance of documentation of pain assessment; and the principle of pre-emptive pain assessment (Barr et al., 2013).

The questionnaire was slightly modified to ensure relevancy to the Ugandan setting. The modifications included changing the responses of the close ended items from a Likert style to dichotomous format ("yes" and "no"). The items focusing on patients who are unable to self-report pain were removed because this study focused on CIAP who can self-report pain. The participants responded to the items in the instrument with "yes" and "no" answers. The modified questionnaire was pre-tested among 10 nurses working on units which admit CIAP at a private hospital located Kampala (Uganda) to ensure clarity and logical sequencing of the items.

The internal consistency reliability and content validity of the modified tool were established. The Cronbach's alpha of the modified tool was 0.71. The value reflects acceptable internal consistency, and the data collected was adequately reliable (Nieswiadomy, 2012). The item content validity index (I-CVI) and scale–level content validity (S-CVI) was 0.90. The level of knowledge was established by assigning one point to each correct answer (16 items) to generate a total score (maximum possible total knowledge score = 16). The participants' raw total scores were converted to percentages and scores of less than 70% were considered as low knowledge while scores of 70% and above were considered to be knowledgeable.

2.3. Data collection procedures

The study was reviewed and approved by the Research and Ethics committees of Makerere University School of Health Sciences and Mulago Hospital in Uganda. Meetings were held with managers of the respective hospital units to explain the study purpose and procedures. After obtaining permission from the unit managers, the investigators approached eligible nurses, who were available at work during day, evening and night shifts in the period of May to June, 2012. The nurses who were willing to participate in the study received thorough explanation of the study purpose and procedures, before completing the consent form.

The study questionnaire with an identifying number was administered to participants to complete and return to the investigator who was waiting on the unit. The participants were asked to complete the questionnaire during their break time to limit disruption of patient care. The returned questionnaires were immediately checked for completeness, omissions and clarifications were sought from participants where necessary before they left. All the 200 nurses working on units designated for CIAP were eligible to participate in the study, but 15% (30) did not participate because of annual leave ($n = 15$), failure to return the questionnaire ($n = 6$) and declining to participate ($n = 9$).

2.4. Data analysis

Univariate and bivariate analysis was performed using SPSS for windows version 14.0. Descriptive statistics were used to describe the sample, nurses' knowledge of the principles of acute pain assessment and related education. Pearson's Chi-square test was used to examine the factors associated with nurses' knowledge. The factors considered were nurses' demographic characteristics and education received. Binary logistic regression analysis was performed to determine predictors of knowledge. For all analyses the level of significance was set at $p \leqslant 0.05$.

3. Results

3.1. Description of the sample

A total of 170 of the 200 eligible nurses (85% response rate) participated and returned the completed questionnaires. The characteristics of the 170 participants are described in Table 1. The nurses were working in the emergency department (23.5%), burns unit (4.1%), ICU (8.8%), post-operative care unit (54.7%), high dependency unit (5.9%) and neurology unit (2.9%). The sample mean age, professional and clinical experience in years were 39.7, 9.75 and 4.36, respectively. The majority of nurses (55.9%) were in the age range of 20–40 years, female (95.9%) and had associate degree level of professional education (95.9%).

3.2. Nurses' knowledge related to key acute pain assessment principles

The majority of nurses (58.2%) were knowledgeable about acute pain assessment principles (scores of $\geqslant$70%). The sample's mean knowledge level ($M = 71.81$, SD = 18.79) shows that the

Table 1
Characteristics of the Participants.

Characteristic	Response	Frequency ($N = 170$)	%
Age in years ($M = 39.7$, SD = 8.18)	20–30	28	16.5
	31–40	67	39.4
	41–50	61	35.9
	⩾51	14	8.2
Gender	Male	7	4.1
	Female	163	95.9
Highest level of professional education attained	Associate Degree	163	95.9
	Baccalaureate	7	4.1
Years of professional experience ($M = 9.75$, SD = 4.20)	<2	6	3.5
	2–5	24	14.1
	6–10	44	25.9
	>10	96	56.5
Years of clinical experience (M = 4.36, SD = 4.09)	<2	79	46.5
	2–5	38	22.4
	6–10	20	11.8
	>10	33	19.4
Employment status	Full	166	97.6
	Part-time	4	2.4

participants had good knowledge about acute pain assessment principles. The only demographic factor that was significantly associated with knowledge was the level of qualification. The nurses with baccalaureate level education (100%) had good knowledge and slightly more than half (56.4%) of nurses with associate degree level education had good knowledge ($\chi^2 = 5.291$; $p = 0.021$).

The results presented in Table 2, indicate that the majority of nurses knew that it is important to assess for pain among; post-operative (98.8%), burns (95.7%), trauma (94.7%), and medical (92.4%), and in patients with Glasgow Coma Scale of less than 8 (75.9%) as well as those on sedatives (66.5%). The majority of nurses also knew that it is important to use standardized pain assessment tools (74.7%) and to frequently assess and document pain assessment findings (83.5%). A considerable proportion of nurses did not know that CIAP provide the most accurate rating of their pain (43.5%). Among the nurses who reported that another person provides the most accurate rating of the patient's pain, the majority stated the other person as the nurse (82.4%), physicians (12.2%) and relatives (5.4%). Significantly more nurses with good knowledge levels also perceived the importance of assessing for pain in patients with; medical problems ($p = 0.037$); Glasgow coma scale score of less than 8 ($p = 0.001$); trauma ($p = 0.000$); burns ($p = 0.001$); end of life conditions ($p = 0.003$); and on sedative treatment ($p = 0.000$).

3.3. Nurses knowledge about pain assessment during procedures

The results summarized in Table 3 show that a sizable number of nurses were not knowledgeable about the necessity of assessing for the need of analgesia before, during and after performing common pain inducing procedures like drain removal (34.7%), repositioning (37.6%), artificial airway suctioning (45.3%), invasive line placement (46.5%), spontaneous breathing trials (63.5%), during end-of – life (32.5%) and for sedated patients (35.5%). The majority of nurses perceived their knowledge to be inadequate (73.5%) and only 26.5% rated their knowledge as adequate. Significantly more nurses with good knowledge levels also perceived the importance of assessing for pain and the need for analgesia before, during and after performance of procedures such as repositioning ($p < 0.0005$); endo–tracheal suctioning ($p < 0.0005$), drain removal ($p < 0.0005$), placement of invasive lines ($p < 0.0005$) and spontaneous breathing trials ($p < 0.0005$).

3.4. Nurses' Continuing Education Status about Pain

The results summarized in Table 4 show that majority of nurses had attended a continuing education activity about pain (68.8%), but very few had ever read any pain assessment and management guidelines (10.6%) or received education on practice guidelines for pain assessment and management among CIAP (21.2%). The average number of topics covered by the nurses was 2.91(±2.77). The least covered topics were pain assessment methods (27.1%), physiology of pain (25.3%) and non-pharmacological management strategies (31.2%). There was no significant association between the different aspects of continuing education and knowledge about acute pain assessment principles ($p > 0.05$).

Table 2
Nurses' knowledge of key pain assessment principles.

Item	Response	$N = 170$ frequency (%)	Nurses with poor knowledge $N = 71$ Frequency (%)	Nurses with good knowledge $N = 99$ Frequency (%)	Chi-Square (χ^2) p-value
Patient rate their pain most accurately	Yes	96(56.5)	36(50.7)	60(60.6)	$\chi^2 = 1.649$
	No	74(43.5)	35(49.3)	39(39.4)	$p = 0.199$
Important to assess pain in post-operative patients	Yes	168(98.8)	69(97.2)	99(100)	$\chi^2 = 2.822$
	No	02(1.2)	2(2.8)	0(0)	$p = 0.094$
Important to assess pain for medical patients	Yes	157(92.4)	62(87.3)	95(96)	$\chi^2 = 4.366$
	No	13(7.6)	9(12.7)	4(4)	$p = 0.037^{*}$
Important to assess for pain among patients with *Glasgow Coma Scale* > 8	Yes	129(75.9)	45(63.4)	84(84.8)	$\chi^2 = 10.413$
	No	41(24.1)	26(36.6)	15(15.2)	$p = 0.001^{**}$
Important to assess for pain among trauma patients	Yes	161(94.7)	62(87.3)	99(100)	$\chi^2 = 13.251$
	No	09(5.3)	9(12.7)	0(00)	$p = .000^{**}$
Important to assess for pain among burns patients	Yes	162(95.7)	63(88.7)	99(100)	$\chi^2 = 11.706$
	No	08(4.7)	8(11.3)	0(0)	$p = 0.001^{**}$
Important to assess for pain for patients at end-of-life	Yes	115(67.6)	39(54.9)	76(76.8)	$\chi^2 = 9.01$
	No	55(32.4)	32(45.1)	23(23.2)	$p = 0.003^{*}$
Important to assess for pain among patients receiving sedatives	Yes	113(66.5)	30(42.3)	83(83.8)	$\chi^2 = 32.082$
	No	57(35.5)	41(57.7)	16(16.2)	$p = 0.000^{**}$
Important to assess for pain using a tool	Yes	127(74.7)	47(66.2)	80(80.8)	$\chi^2 = 4.671$
	No	43(25.3)	24(33.8)	19(19.2)	$p = 0.031^{*}$
Important to assess and document pain	Yes	142(83.5)	56(78.9)	86(86.9)	$\chi^2 = 1.921$
	No	28(16.5)	15(21.1)	13(13.1)	$p = 0.166$

* p-Value ≤ 0.05.
** p-Value ≤ 0.001.

Table 3
Nurses' knowledge on other pain assessment principles.

Item	Response	Frequency/ (%) $N = 170$	Nurses with poor knowledge $N = 71$ Frequency (%)	Nurses with good knowledge $N = 99$ Frequency (%)	Chi-Square (χ^2) p-value
Important to assess for the need of pre-emptive analgesia for repositioning the patient	Yes	106(62.4)	20(28.2)	86(86.9)	$\chi^2 = 60.692$
	No	64(37.6)	51(71.8)	13(13.1)	$p = 0.000^{**}$
Important to assess for the need of pre-emptive analgesia for endo-tracheal suctioning	Yes	93(54.7)	17(23.9)	76(76.8)	$\chi^2 = 46.562$
	No	77(45.3)	54(76.1)	23(23.2)	$p = 0.000^{**}$
Important to assess for the need of pre-emptive analgesia for wound care	Yes	142(83.5)	47(66.2)	95(96)	$\chi^2 = 26.621$
	No	28(16.5)	24(33.8)	4(4)	$p = 0.000^{**}$
Important to assess for the need of pre-emptive analgesia for drain removal	Yes	111(65.3)	22(31)	89(89.9)	$\chi^2 = 63.327$
	No	59(34.7)	49(69)	10(10.1)	$p = 0.000^{**}$
Important to assess for the need of pre-emptive analgesia for invasive line placement	Yes	91(53.5)	11(15.5)	80(80.8)	$\chi^2 = 70.909$
	No	79(46.5)	60(84.5)	19(19.2)	$p = 0.000^{**}$
Important to assess for the need for pre-emptive analgesia for spontaneous breathing trials	Yes	62(36.5)	9(12.7)	53(53.5)	$\chi^2 = 29.793$
	No	108(63.5)	62(87.3)	46(46.5)	$p = 0.000^{**}$

** p-Value <0.0005.

Table 4
Nurses' continuing education status about pain assessment and management principles.

Variable	Response	Frequency (%) $N = 170$	Nurses with poor knowledge $N = 71$ F (%)	Nurses with good knowledge $N = 99$ F (%)	Chi-square and p-value
Continuing education activity	Yes	117(68.8)	49(69)	68(68.7)	$\chi^2 = 0.002$
about pain	No	53(31.2)	22(31)	31(31.3)	$p = 0.964$
Number of topics covered on pain	<3	89(52.4)	38(53.7)	51(51.5)	$\chi^2 = 0.067$
	⩾3	81(47.6)	33(46.3)	48(48.5)	$p = 0.797$
Read any guidelines	Yes	18(10.6)	8(11.3)	10(10.1)	$\chi^2 = 0.059$
	No	152(89.4)	63(88.7)	89(89.9)	$p = 0.808$
Education on pain guidelines/recommendations	Yes	36(21.2)	18(25.4)	18(18.2)	$\chi^2 = 1.274$
	No	134(78.8)	53(74.6)	81(81.8)	$p = 0.259$
Education on assessment methods	Yes	46(27.1)	18(25.4)	28(28.3)	$\chi^2 = 0.180$
	No	124(72.9)	53(74.6)	71(71.7)	$p = 0.672$
Education on painful conditions and procedures	Yes	99(58.2)	40(56.3)	59(59.6)	$\chi^2 = 0.180$
	No	71(41.8)	31(43.7)	40(40.4)	$p = 0.671$
Education on physiological mechanisms of pain	Yes	43(25.3)	18(25.4)	25(25.3)	$\chi^2 = 0.000$
	No	127(74.7)	53(74.6)	74(74.7)	$p = 0.988$
Education on physiological consequences of unrelieved pain	Yes	67(39.4)	29(40.8)	38(38.4)	$\chi^2 = 0.105$
	No	103(60.6)	42(59.2)	61(61.6)	$p = 0.746$
Education on psychological consequences of unrelieved pain	Yes	78(45.9)	28(39.4)	50(50.5)	$\chi^2 = 2.040$
	No	92(54.1)	43(60.6)	49(49.5)	$p = 0.154$
Education on pharmacological pain management strategies/principles	Yes	73(42.9)	33(46.5)	40(40.4)	$\chi^2 = 0.623$
	No	97(57.1)	38(53.5)	59(59.6)	$p = 0.430$
Education on non-pharmacological management strategies/principles	Yes	53(31.2)	19(26.8)	34(34.3)	$\chi^2 = 1.108$
	No	117(68.8)	52(73.2)	65(65.7)	$p = 0.293$

3.5. Predictors of the nurses' knowledge about the pain assessment principles

Binary logistic regression analysis was used to examine the relationship between nurses' knowledge about pain assessment and the importance attached to need for pre-emptive analgesia for commonly performed painful procedures (Table 5). The logistic coefficient was used to show the expected amount of change in the level of knowledge for each unit change in knowledge about pre-emptive pain assessment. The results show that nurses' knowledge about pain assessment is significantly associated with their perception of the importance of assessing pain and need for pre-emptive analgesia for procedures like patient repositioning (OR = 0.103, CI = 0.031–0.345); drain removal (OR = 0.088, CI = 0.025–0.314); and invasive line placement (OR = 0.039, CI = 0.011–0.140).

The Wald test was used to evaluate the logistic coefficient for each of the predictors and the results, and associated p-value were; repositioning (13.568, $p = 0.000$); drain removal (14.059, $p = 0.000$) and invasive line placement (24.620, $p = 0.000$). The logistic coefficients are different from zero, implying that nurses' understanding of the pain assessment and management related to pain inducing procedures can be used to predict the level of knowledge about pain assessment principles. The Hosmer–Lemeshow test of goodness-of-fit results [χ^2 (8, $n = 170$) = 7.303, $p = 0.504$) shows that the model predicted values were not significantly ($p > 0.05$) different from the observed values. The odds ratios [Exp (B)] associated with the predictors are less than 1 and the logistic coefficients (B) are negative. Therefore, nurses who give more importance to physical sources of pain such as patient repositioning, drain removal and invasive line placement tend to have low level of knowledge about pain assessment.

4. Discussion

The findings of this study show a mean knowledge level score (71%) which represents adequate overall knowledge about pain assessment principles in a sample of nurses caring for CIAP in Uganda. The knowledge level in this sample is very re-assuring considering that majority of the participants (96%) had only associate degree level professional education and had not received any training on pain assessment and management specific to CIAP (79%). The knowledge level observed may also have developed over a long period of professional and clinical experience. The average

Table 5
Predictors of the nurses' level of knowledge about pain assessment principles.

Factor	B	Wald	*p*-Value	Exp (B)	95% CI	
					Lower	Upper
Important to assess for pain and the need pre-emptive analgesia for repositioning	−2.277	13.568	0.000**	0.103	0.031	0.345
Important to assess for pain and the need of pre-emptive analgesia for wound care	−1.442	2.638	0.104	0.236	0.041	1.347
Important to assess for pain and the need for pre-emptive analgesia for drain removal	−2.428	14.059	0.000**	0.088	0.025	0.314
Important to assess for pain and the need for pre-emptive analgesia for invasive line placement	−3.251	24.620	0.000**	0.039	0.011	0.140
Important to assess for pain and the need for pre-emptive analgesia for spontaneous breathing trials	−1.037	2.264	0.132	0.355	0.092	1.369
Important to assess for pain and the need for pre-emptive analgesia for suctioning	0.980	1.885	0.170	0.375	0.093	1.520
Constant	16.99	31.98	0.000			

** *p*-Value <0.01; CI = confidence interval.

professional and clinical experience of the nurses was 9.75 and 4.36 years, respectively. However, no significant associations were established between knowledge and these demographic characteristics of the nurses.

The study was carried out in a national and teaching hospital and this increases the possibility of nurses acquiring knowledge during peer discussions (handover or nursing rounds) and teachings during major ward rounds (Khomeiran et al., 2006). In resource limited settings, such means of acquiring new knowledge are more feasible, but the learning takes place in a haphazard and opportunistic manner. Learning about principles of pain assessment and management in this manner can lead to acquisition of inappropriate and inadequate knowledge. Therefore, there is need for well-structured formal continuing professional education and training programs for nurses focusing on evidence based pain assessment and management for CIAP. This may facilitate changes in practice and lead to improved pain control in CIAP (Polomano et al., 2008b).

Other studies that have explored nurses' knowledge about pain have reported varied findings. Studies of nurses caring for CIAP conducted in parts of the USA and Ireland have reported higher mean scores and therefore higher knowledge levels (Buckley & Andrews, 2011; Erkes, Parker, Carr, & Mayo, 2001; Moceri & Drevdahl, 2014). It should be noted that these studies had a considerable number of nurses with masters' level education compared to our study which had mostly nurses with associate degree level of professional education. Additionally, the studies mentioned above used the Ferrell and McCaffery's Knowledge and attitudes survey regarding pain (KASRP) to measure nurses knowledge (Moceri & Drevdahl, 2014).

Other studies which used the KASRP survey to study nurses practicing in various settings in Jordan, Canada, Taiwan and Turkey reported lower knowledge levels and lack of understanding of basic pain assessment and management principles (Al Qadire & Al Khalaileh, 2014; Bruiner, Carson, & Harrison, 1995; Wang & Tsai, 2010; Yildirim, Cicek, & Uyar, 2008). A study by Moceri and Drevdahl (2014) showed that more than 50% of the emergency department nurses lacked knowledge on basic pain assessment concepts. In our study, a large proportion of nurses (44%) did not know that patients are the most accurate raters of their pain and this indicates a knowledge and attitude deficiency. Similarly, it has been reported by other studies that nurses continue to believe that other people's estimate of patients' pain are the most accurate even when patients can self-report pain (Bernardi, Catania, Lambert, Tridello, & Luzzani, 2007; Yildirim et al., 2008). Such knowledge deficits and attitudes can negatively influence practices because they lead to incongruence between patients' pain scores and those reported by the nurses (Schreiber et al., 2014).

A study among Taiwanese ICU nurses showed that the majority (93%) knew that CIAP provide the most accurate ratings of their pain experience, besides having low knowledge (Wang & Tsai, 2010) while more than two thirds (67%) of Jordanian nurses also knew the principle (Al Qadire & Al Khalaileh, 2014). Nurses are obliged to take into account patients' report of pain and to facilitate their informed decision making about pain management because this enhances patients' autonomy for better pain relief (Brennan et al., 2007). Therefore, when nurses cite other persons as the most reliable raters of the patients' pain, it implies major disregard of the key tenets for optimal pain assessment and control. This may be one of the reasons why CIAP continue to suffer pain from common procedures (Czarnecki et al., 2011; Siffleet, Young, Nikoletti, & Shaw, 2007).

Practice standards emphasize the role of the nurse in ensuring comfort amidst painful experiences and procedures. The nurse is expected to ensure quality pain assessment, interventions, evaluation and documentation in consideration of the patients' uniqueness related to physical and cognitive state (Czarnecki et al., 2011). Therefore, nurses should be knowledgeable about the required standards in order to appropriately and promptly anticipate, plan and intervene to minimize suffering and promote better patient outcomes (Czarnecki et al., 2011; Polomano et al., 2008b). In the current study, a substantive proportion of nurses did not consider assessing the need for pre-emptive analgesia important for well-known painful procedures. This finding corroborates the documented lack of knowledge on basic concepts of pain assessment among nurses (Schreiber et al., 2014). Such knowledge gaps curtail the efforts to ensure effective pain assessment and management. It has been clearly reported by other studies that nurses selectively administer analgesics an hour before painful procedures among CIAP (Siffleet et al., 2007).

The observed deficits in knowledge may also be attributed to the lack of utilization of guidelines (89%) and lack of education (79%) on practice standards for pain assessment and management as reported by the participants. The nurses also listed pain assessment among the least attended topics during continuing professional education. This assertion is supported by other studies which show that critical care nurses' self-reported practices and awareness of guidelines influence their pain assessment and management practices (Rose et al., 2012).

In our study, the main factor which was associated with nurses' knowledge was their level of professional education. The other demographic factors such as professional and clinical experience, and in-service education on pain were not significantly associated with nurses' knowledge. Similarly, in other studies no associations were observed between nurses' knowledge and their age, gender, level of education and clinical experience (Al Qadire & Al Khalaileh, 2014; Buckley & Andrews, 2011; Moceri & Drevdahl, 2014). On the contrary, some studies have reported significant associations between knowledge scores and level of clinical experience (Fulbrook, Albarran, Baktoft, & Sidebottom, 2012; Yildirim et al., 2008), number of pain related courses attended (Al Qadire & Al Khalaileh, 2014;, Bernardi et al., 2007; Bruiner et al., 1995), and having a bachelor's or postgraduate level education in nursing (Plaisance & Logan, 2006; Yava et al., 2013).

The study findings show that nurses' knowledge level can be predicted by considering their understanding of the concept of pre-emptive analgesia with regard to physical sources of pain such as repositioning of the patient, drain removal and invasive line placement. The unexpected finding of a significant negative association between the variables and nurses' knowledge levels cannot be explained by existing literature.

5. Limitations

The findings of the study should be interpreted in view of its limitations. The data for the study were collected in a single hospital in Uganda using nurses' self-report of knowledge. Therefore the aspects of recall bias and small sample limits the ability to generalize the findings to all nurses working in critical care settings in the country or other resource limited settings. The tool used to generate the findings may be a limitation in terms of its reliability. However, considering the objective of the study and the content captured by the tool, it was suitably used.

6. Conclusion

The sample of nurses included in this study generally had adequate knowledge about pain assessment principles in CIAP. However, there was lack of knowledge about some key concepts such as value for patients' autonomy in pain assessment and pre-emptive analgesia concept. These knowledge gaps may affect their ability to provide quality pain assessment and management in CIAP. There is need for continuous training and other interventions to maintain and enhance nurses' knowledge and ability to provide quality pain assessment and management in CIAP. The training and continuous education focusing on pain is essential for all nurses working in critical care settings regardless of their level of professional education and clinical experience. The training programs are likely to be most effective at enhancing knowledge if they are delivered using innovative methods to address the unique situations in resource limited settings.

Conflict of Interest

The authors declare that they have no conflict of interest.

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