Perceived language proficiency and pain assessment by registered and student nurses in native

English-speaking and EAL children aged 4-7 years

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ABSTRACT

Aims and Objectives To identify the factors that influence decisions made by health professionals when assessing the pain of native English speaking and children whose English is an Additional Language (EAL).

Background Pain assessment in children is often poorly executed following acute injury. Whilst a range of pain assessment tools have been developed, little guidance is provided for assessing pain in EAL.

Design Factorial survey design.

Methods Twenty Minor Injuries Unit (MIU) nurses and twenty children's nursing students participated in an electronic survey to make judgments on 12 scenarios describing a child attending a MIU following an incident, accompanied by a parent. Respondents had to decide the most important form of pain assessment, and whether they would ask a parent or an interpreter to assess the pain of the child. An open-ended question asked about the difficulties found in making a judgment.

Results Observation of the child's behaviour was the most common pain assessment reported. The Visual Analogue Scale was significantly associated with children with proficient English. Respondents were significantly more likely to involve parents in the assessment if they could speak English well compared to parents with poor English skills. Moreover, nursing students were significantly more likely than registered nurses to call for support from an interpreter. Thematic analysis identified three themes related to difficulties with pain assessment: contrasting approaches, differing perceptions of pain, and overcoming challenges.

Conclusions The reduced ability to communicate between child, parent and healthcare

professional highlights the need to identify forms of assessment based on individual cases.

Relevance to clinical practice The number of children with EAL has seen a marked rise over

the last decade. In situations where communication ability is reduced, assessment of pain should

tailored to meet the needs of the child. This may require timely access to interpreter services.

Keywords: Pain assessment, Pain management, Communication, English as Additional

Language, Children and young people

What does this paper contribute to the wider global clinical community?

- Pain assessment for EAL children may not be optimal, particularly when it is the first

  encounter between the child/parents and health care professionals. Existing services

  such as self-report pain instruments and interpreter services may need further

  modification in order to be suitable for children with EAL.

- In clinical situations when children and parents speak English poorly, experienced nurses

  would rely on interaction with the parent to express the pain experience of their children,

  but children's nursing students are more likely to call for an interpreter.

- Qualitative findings highlight the importance of nonverbal pain assessment using formal

  instruments such as FLACC, behavioural assessment and distractions such as play

  therapy to measure acute pain in young children and children with limited English ability.

Perceived language proficiency and pain assessment by registered and student nurses in native English-speaking and EAL children aged 4-7 years

Poor pain assessment following acute injury in children has been documented in previous studies (Kellogg *et al*. 2012, Scott *et al.* 2013). Validated tools for the assessment and management of pain in children (RCN 2009) assume that children will experience and express pain in a similar manner (von Baeyer *et al.* 2009, Powell *et al.* 2010). To select an appropriate assessment tool, assessment of pain among infants and children requires consideration of the child's age, developmental level and cognitive development, as well as communication skills (von Baeyer & Spagrud 2007). Language proficiency can influence the quantification of pain measurement during the assessment. Indeed children living in families who migrated to England from around the world and for whom English is not the first language may have limited vocabulary knowledge though the level of language proficiency is highly variable across children (Cattani *et al.* 2014). Cattani *et al.* (2014) evidenced the wide variability of bilingual preschool children and quantified the amount of exposure to English between 5% and 98%; they recommended that at 60% of language exposure to English, bilingual children can be assessed like monolingual children. Further, the diverse cultural background and values related to the familial role of the injured child or the behaviour toward a minor accident may affect the pain measurement. In English-speaking countries, pain assessment is more challenging with young children from distant ethnic cultural background and values or with limited English language skills who may have communication difficulties, with consequences for the accuracy of the pain assessment (Azize *et al.* 2011, Craig *et al.* 2006).

In addition to communication barriers involving children, other factors are important in assessing pain. The behaviour of the child, such as facial expressions, is found to be a major determinant of pain, which helps health professionals to judge children's pain especially in the nonverbal population (Voepel-Lewis *et al.* 2010, Herr *et al.* 2006). The chronological age of the child is usually linked to the maturity of the developmental stage. Older children experience and express their pain differently to young children because of the maturity of their cognitive ability (Drendel *et al.* 2011).

One way of examining decision-making in the assessment of pain in children is the factorial survey, an experimental design for investigating decision making using "true- to life" vignettes, increasingly becoming a central feature of social science research (Taylor 2006). Factorial surveys have been used to examine human judgment through responses to written descriptions of scenarios such as fictive descriptions or vignettes (Shlay *et al.* 2005). They are a valid and reliable method to gain a nurse's judgments (Baughman *et al.* 2012, 2013, Ludwick *et al.* 2004, Rattray *et al*. 2011, for a useful review of the method see Evans *et al.* 2015).

The primary focus of studies involving adults and children has been improving the accuracy of the report of pain. One aspect of pain assessment not explored is the impact of experience and education on the health care professional assessing pain of children from diverse cultural backgrounds. Hence, we sought to compare decisions made by two groups of respondents with different experience: final year pre-registration children's nursing students and nurses working in a primary care minor injuries unit, regarding the assessment and management of pain in children. The primary care minor injury units are settings in the UK that treat sprains, broken bones, wound infections, burns and scalds, injuries to the head, eye, back, shoulder and chest.

The study aim was to identify the dimensions that influence how Minor Injuries Unit (MIU) nurses and final year pre-registration children's nursing students make decisions about the assessment of monolingual and English as an additional language (EAL) children following a minor injury and to understand the difficulties that nurses face while assessing pain. Four research questions guided the study:

1.   What actions would nurses working in a Minor Injuries Unit (MIU) and final year pre-registration children's nursing students take to assess pain for children with different language abilities?

2.   Does the language of the parents affect decisions made about the assessment of the child?

3.   What difficulties do MIU nurses and pre-registration children's nursing students identify in assessing pain for EAL children?

4.   Are there differences in the judgments about pain assessment made by MIU nurses and pre-registration children's nursing students?

METHOD

Factorial survey design was used to examine judgments made about pain assessment in children in hypothetical case scenarios. Factorial surveys designs are often used to answer research questions associated with clinical judgments (Ludwick *et al.* 2004; Rattray *et al.* 2011). The advantage of using this research design is the freedom to develop a large number of vignettes with multiple independent variables that mimic real-world case scenarios. Further, in each vignette the multiple independent variables (dimensions) contain a set of two or more characteristics which are randomly assigned in a vignette to a respondent (see Hennessy 1993 and Rattray *et al.* 2011, for further detail). The factorial survey method requires written text in order to randomise the variables in each vignette.

The process to develop the factorial survey is depicted at Figure 1. The process requires that key variables are operationalised and identified, then these variables (dimensions) are used to produce random vignettes and finally the number of vignettes created is used to identify a sample size. Given that the factorial survey uses the vignette as the unit of analysis, the number of vignettes that each respondent rates is based on the number of characteristics to be included. Efforts were made, however, to strike a balance between the complexity of the scenarios and the number of vignettes to be rated by each respondent.

INSERT FIGURE 1 HERE

Following construction, the survey was reviewed by the research team for internal consistency of the dimensions of the vignettes and then piloted with academics and students who matched the study inclusion criteria to identify its length and how closely the vignettes resembled real life situations. Following the piloting, it was decided to limit the randomisation of some dimensions (see Figure 1).

Respondents

Forty nurses and pre-registration children's nursing students who were native English speakers participated in the study. The senior nurse manager of the MIU gave permission to approach registered nurses working in the unit area. Twenty nurses (18 females) working in a Minor Injuries Unit took part and were included in the study (17 registered nurses and 3 nurse practitioners). The MIU nurses were eligible if they had experience of working in a Minor Injuries Unit or in an Emergency Department for at least two years, and if the work in which they were involved required that they assess children on at least a weekly basis. The twenty pre-registration children's nursing students (19 females) were final year students, who had recently completed the theoretical component of their final undergraduate modules. Assessment of pain

was a recurring feature of the theoretical learning and a key skill developed through clinical placements. The study was reviewed by the local NHS Research Ethics Committee and the University Human Ethics Committee.

Vignettes and attributes

A vignette contained eight dimensions with between 2-4 characteristics and was generated with a combination of fixed text with eight gaps that were filled by text representing a characteristic from the dimensions (see Appendix A). The gaps were not visible to the respondents. Appendix B depicts the dimensions of the vignettes and the possible variation of characteristics within the same vignette. The judgments to be made for each vignette are at Figure 2.

INSERT FIGURE 2 HERE

The vignettes were generated through combining the characteristics of dimension randomly to include an equal probability of independent dimensions that are orthogonal to each other (Dülmer 2007). Sample size was calculated for the anticipated multiple regression with an effective size of .15, with α= .05, power (1 – β error probability) at = .95 in an analysis with 24 predictor variables, the study would need a sample size of n = 238. Sample size refers to complete vignettes and not respondents. Each respondent was given 12 vignettes, and therefore with 40 respondents (equal to 480 vignettes) the sample size was largely over that required for a fully powered analysis.

Responses were anonymous. Data from the electronic survey were transported, recoded into SPSS statistical package, checked and verified.

Procedure

The researcher arranged the time with the MIU assistant manager and pre-registration children's nursing programme lead to approach respondents to carry out the study. Participation was voluntary, any withdrawal or refusal from the participation was not known to their employer or to the programme lead for the pre-registration children's nursing students and did not have any subsequent adverse impact. The individual data collection for respondents took place at the MIU and on the University campus, respectively, and was undertaken using an electronic survey using MediaLab v2010.3 (Jarvis 2011). The researcher was on hand to assist with the IT if needed.

Written informed consent was obtained before the beginning of the study. Respondents completed a brief biographical questionnaire (work experience, age, gender, type of professional) that was presented on the computer screen. Then, a set of 12 written vignettes of case scenarios were displayed about an instance of a child attending a minor injury unit following an incident, accompanied by a parent. After the presentation of a case scenario respondents were asked to make a judgment by typing the responses to two multi-choice questions and one open-ended question (see examples of vignettes presented in Appendix A, and the questions in Figure 2). For clarity of analysis, responses to these questions are identified as Judgments A, B and C respectively; these correspond to research questions 1-3 respectively. The questions were presented below the text of the vignette. After completion of the first case scenario, respondents moved at their own pace. The survey lasted about thirty minutes and respondents were thanked for their participation and debriefed before they left the room.

Data analysis

Factorial survey analysis. Factorial survey usually analyses the effect of individual vignette dimensions on the decisions made by the respondents and allows calculation of the

impact of each dimension on the vignette decision. We ran multinomial logistic regression with dummy coding as a statistical tool to analyse the categorical polytomous variables. Further, a chi- square test was used prior to the regression to determine the first order interaction effect of the variables. As identified previously, the unit of analysis is the vignette judgment rather than the respondent (Rossi & Knock 1982); however, the multinomial logistic regression procedure was achieved through complex sample logistic regression to avoid the same respondents being included in the modelling several times. The analysis plan was created by assigning a sample made of 40 cases, corresponding to the respondents rather than the 478 observations.

Open ended question analysis. Responses to the open-ended question (Judgment C) were analysed using thematic analysis, a process comprising five phases as outlined in Braun and Clarke (2006) by two coders. Coders first went through a familiarisation stage by reading and immersing in the free text responses then generated initial codes from the responses. These codes subsequently were collated in three main themes which were encompassing the relevant data to each theme. We then checked that the themes 'mapped' to the extracted codes and themes to finally proceed in the labelling of the themes and their sub-themes.

RESULTS

The age of the majority of MIU nurses was older than 35 years of age (85%) with 70% of them that had worked at the MIU for over 5 years. All pre-registration children's nursing students were younger than 35 years of age. Two of the responses provided by the pre-registration children's nursing students were inconsistent, indicating that they had not read the vignette correctly and removed, leaving a final sample for analysis of 478 vignettes.

To test relationships between the judgment of MIU nurses and pre-registration children's nursing students and the vignette dimensions on the response choices around the assessment of

pain of the child, we performed a test of corrected model effect through Wald chi-square

analyses first on the MIU nurses and pre-registration children's nursing students then separately

for the vignette dimensions. These preliminary analyses served as a preparatory base to select the

significant dimensions to be subsequently entered in the regression model for Judgment A and B.

In order to show how the regression models were built, results are presented across the scenarios

related to Judgment A and Judgment B.

Judgment A. Most important actions when assessing the pain of the child

Table 1 shows the outcome of the Wald chi-square test analyses for the vignette

dimensions on Judgment A. There were significant differences for *Language ability of the child*

and *Injury mechanism* dimensions. Therefore, these two significant dimensions were entered as

independent variables in the subsequent multinomial analysis of the regression.

INSERT TABLE 1 HERE

The procedure of the multinomial logistic regression was achieved through complex

sample logistic regression to prepare the statistical software with a preparation analysis. A plan

was created by a given weight of 1 and assigned the sample for 40 cases corresponding to the

respondents instead of 478 observations. The multinomial complex sample logistic regression

was submitted with the MIU nurses and pre-registration children's nursing students and the two

vignette attributes that were significant in the preliminary Wald chi-square test analyses (Child's

language and Injury mechanism) as independent variables. Finally, prior to submitting the

regression model, the response *Observe behaviour* (the most neutral item and frequent type of

pain assessment by respondents) was selected as the reference category for comparisons with

other category responses. Pseudo R^2 values were moderately high (Cox and Snell $R^2 = 0.091$;

Nagelkerke $R^2 = 0.107$) and this model explained between 9% and 11% of the variance. The

Pseudo R^2 value is used to determine the variability of the dependent variable to the model, for example a model with a good fit should have a value of 0.1 (10%) or above in at least one of the two values.

INSERT TABLE 2 HERE

There were no significant predictions of the independent variables on the response *Assess active and passive movement* over *Observe behaviour* in assessing children's pain (Table 2, top). Respondents were more likely to choose *VAS* as a tool in assessing their pain over using *Observe behaviour* in children who speak English well, than children who speak English poorly, $B = 0.744$, $p = 0.016$; $OR = 2.105$, 95% CI [1.16, 3.82]. For the severe injury mechanism presented in the scenario, respondents were more likely to assess their pain using *Record vital signs* over *Observe behaviour* as a pain assessment scale than other types of injury mechanism, $B = 2.790$, $p = 0.008$; $OR = 16.284$; 95% CI [2.14, 123.80].

Judgment B. Impact of the parent's language on assessment of the child

The Wald chi-square test performed on the vignette dimensions, showed three highly significant dimensions: the *Language ability of the child*; the *Language ability of the accompanying parent,* the *Parent that brought the child to the MIU,* and *the Country of origin* of the family (Table 1, left).

The same preparation plan for Judgment B through multinomial regression described earlier was followed for the *Language ability of the child* and the *Language ability of the accompanying parent*. The dimension *Country of origin*[1] was removed from the analysis.

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[1] On the regression analysis, we encountered an issue with the data. The repeated levels of the fixed dimensions of some vignettes within and across respondents cause a reduction of the variability of the dimensions of the vignettes (indeed the vignettes of native English speaking children represented around 25% of the total vignettes). To solve the issue, this dimension was removed from the analysis as it was not essential to the original aims.

Finally, prior to submitting the regression model, the neutral response *Yes* was selected as reference category (Table 2, bottom). The Pseudo R^2 values indicated high fit of the model (Cox and Snell = 0.434; Nagelkerke = 0.501– equivalent to an explained Pseudo R^2 between 43% and 50% of goodness of fit).

For children who speak English well, respondents were more likely not to involve their parent in the clinical pain assessment than for children who speak English poorly, *B* = 1.207 *p* = .009; *OR* = 3.342, 95% CI [1.37, 8.13]. Similarly, for parents who were native English speakers and those who speak English well as a second language, respondents were less likely to respond *No* than for those parents who speak English poorly as a second language, *B* = -0.996, *p* = 0.004; *OR* = 0.369, 95% CI [0.19, 0.71]; and *B* = -1.454 *p* = 0.001; *OR* = 0.234, 95% CI [0.11, 0.52] respectively. In either case, given the negative sign of the beta, respondents were more likely to ask the parent with good mastery of English to assess the pain of the child than the parent with poor level of English skills.

Perhaps unsurprisingly, if the parents were native English speaking, respondents were less likely to involve an interpreter in the children's clinical judgment than for those parents who speak English poorly (*B* = - 5.299, *p* < 0.001; *OR* = 0.005, 95% CI [0.00, 0.06]). Similarly for those parents who spoke English well but as a second language, the respondents were less likely to involve an interpreter than for parents who speak English poorly (*B* = - 3.937, *p* < 0.001, *OR* = 0.020, 95% CI [0.01, 0.06]).

In summary, the good language skill of the parents was a strong predictor of nurse's decisions to involve them in assessing their child's pain while for parents who speak English poorly, respondents were more likely to involve the interpreter in the clinical judgment over involving them without interpreter.

Judgment C. Factors influencing pain assessment

In the question *Does anything make it difficult to assess this child's pain?,* if the response was positive (as was the case for 85% of respondents), respondents were further asked to provide their perspectives on the factors that might influence assessment of a child's pain in general, and EAL children in particular. In the data excerpts the notation CNSt16, Vig12 is used to denote pre-registration Children's Nursing Student 16, in response to Vignette 12. Due to the randomisation process, the vignette numbers cannot be compared across the respondents; they are included here as part of the audit trail to demonstrate that the data excerpts are drawn from different vignettes and different respondents.

Thematic analysis revealed three themes and ten sub-themes related to difficulties with pain assessment**:**

Theme 1 Contrasting Approaches: sub-themes (i) impact of developmental stage, (ii) use of an interpreter and (iii) interpretation of the child's activity.

Theme 2 Differing Perceptions of Pain: sub-themes (i) influence of ethnic cultural values, (ii) family relationships, (iii) child and parent interpretation of pain, and (iv) impact on the child.

Theme 3 Overcoming Challenges: sub-themes (i) observing family dynamics, (ii) additional approaches to pain assessment, and (iii) use of distraction therapy.

Thematic analysis was used to analyse all lexical items, sentences, and paragraphs to extract themes regarding difficulties that respondents face when assessing pain.

Theme 1. Contrasting approaches

The different ways in which details of the scenarios were interpreted and acted on were grouped under three sub-themes: impact of developmental stage, use of an interpreter and interpretation of the child's activity. A child's cognitive development is one of the factors that can affect a

child's understanding of what is happening around them in relation to reporting their pain and

using pain scoring tools. However, this is not a clear-cut relationship, as illustrated by these

contrasting excerpts both related to pain assessment in a four year old: *... may not understand the*

pain scoring system and just guess a number or give a score of what they were then when the

injury first occurred rather than the pain at the time of asking (MIU8, Vig5)

..... can have limited language skills but this child should be able to indicate pain on our faces

*scale or we can assess using Wong Baker/ FLACC (*MIU20, Vig5)

There were contrasting views about the value of an interpreter, particularly related to the

timeliness of pain management if an interpreter was contacted:

Hopefully the interpreter would be useful so that the nurse will be able to assess the child fully

*and ensure that the child's pain is observed and treated appropriately (*CNSt20, Vig4)

Time for interpretation service to respond will delay effective pain management (MIU1, Vig4)

The behaviour of a normal activity such as playing with toys was seen as an indicator that the

child was not in pain:

No difficulties [the child is] *playing with toys and speaks English so they can tell you if they are*

in pain (CNSt4, Vig8)

If she is playing happily, it is likely that she has no significant pain (MIU13, Vig1)

 However, participants also cautioned against taking the children's response at face value:

I have found there is a difference between children's coping skills and pain threshold (MIU11,

Vig3)

Children do not always conform to expected standards and can have significant injuries while

not appearing distressed (MIU13, Vig1)

These excerpts reveal a picture of complexity underpinning pain assessment in both English and EAL children.

Theme 2. Differing perceptions of pain

Respondents indicated that language and communication were not the only factors to take into account when assessing pain in children with EAL. Factors such as cultural values and religion were also perceived to influence perceptions of pain, highlighting differences between child or parent and the health care professional but also between child and parent with particular concerns that the child might '*not want to show pain or communicate emotion in front of his father* (MIU9, Vig8) or '*wanting to be brave in for father*' (MIU12, Vig7). However, there was also a clear sense that language difficulties should prompt the nurses to consider whether behaviour might mask, rather than indicate, the level of pain the child is experiencing:

 Because of the language barrier there may also be cultural factors that affect his behaviour that may give us the impression that he is in less pain than he actually is. (MIU4, Vig6)

For children with EAL the individuality of pain expression and language barriers was emphasised, with the child's expression seen as more accurate than the parent's:

The "gold standard" of pain assessment is to assess pain from the child's point of view as they are the only one feeling the pain (CNSt6, Vig3).

Yes [there would be difficulty] *if the parent tries to tell us of the child's pain instead of asking the child direct.* (MIU19, Vig2).

The potential impact of misunderstanding for the child with EAL was reported by a number of respondents, highlighting perceptions of distress and concern for the child's emotional well-being using phrases such as '[the child] *may feel intimidated'* (CNSt11, Vig10) and '*being frightened' (*MIU12, Vig10).

Theme 3. Overcoming challenges

Whilst the open question asked respondents to identify any specific difficulties with pain assessment related to the individual scenario, many respondents articulated solutions related to family language barriers. These are presented under three sub-themes: observing family dynamics, additional approaches to pain assessment, use of distraction therapy. The challenges in assessing pain as part of a 'new' consultation, with a child and family that the nurses had not met before, were emphasised. If the child was brought to the hospital by the father, the respondents wanted to understand the closeness of the relationship between the accompanying parent and the child, for example, '*ensure father is primary care giver or knows the child well* (CNSt18, Vig9). Verbal and non-verbal communication between child and parent was an important indicator:

I would be looking for the interaction between him and the person who brought him to MIU. It [pain assessment] *would be more difficult if the child was with a person they were not comfortable with* (MIU3, Vig1).

The effect of language barriers on the level of children and parents understanding of what is happening, in particular their understanding of how to use the pain scales, was emphasised:

'*difficult to use if it cannot be explained clearly to both child and parent* (MIU4, Vig4).

However, it was deemed also important for the respondents to ascertain both the child and the parent's understanding of the process, regardless of language ability:

I would not rely on obtaining information from just the parent or just the child (it is easy to fall into this trap when child has a better knowledge of English) (MIU11, Vig3)

Some respondents particularly focused on the child's understanding and provided some clinical solutions using additional forms of assessment to overcome this barrier for example:

vital signs could be recorded which could indicate pain through increased heart rate (CNSt 1, Vig10)

The assessment of the injury is also an important part of the pain assessment (MIU1, Vig4)

If the vignette depicted the child as crying or upset, respondents suggested the use of distractions, such as play therapy, in order to build a rapport, whilst also assessing the child's movement (MIU3, Vig12, and CNSt14, Vig4). The overall picture across the themes is of the need to individualise pain assessment for each child and family, taking into account a complex range of factors.

Differences between the judgments made by MIU nurses and pre-registration children's nursing students

Overall there were differences across scenarios between MIU nurses and pre-registration children's nursing students in judgment A and judgment B. The students were more likely to identify difficulties with assessing pain for scenarios in which the child had EAL.

For judgment A, crosstab chi-square Pearson analysis performed on the MIU nurses and pre-registration children's nursing students revealed a significant difference between the two groups when assessing the pain in the child, (χ^2 (df 3, $N = 478$) $= 8.543$, $p = 0.036$). Notably, there was high overall accordance on the choice of *Observe behaviour* response, but the proportion of the two groups differed with 63% for MIU nurses and 71% for pre-registration children's nursing students. However, MIU nurses identified that they would '*Observe behaviour*' more confidently than students (i.e. with fewer difficulties identified in the open question), even if the child's language was poor.

The crosstab chi-square Pearson analysis performed on the MIU nurses and pre-registration children's nursing students revealed again a significant difference between the MIU

nurses and pre-registration children's nursing students in the frequency of judgment B, χ^2 (df 2,

$N = 478) = 32.829$, $p < 0.001$. Just over half of the responses from the scenarios (regardless of

the group) would ask the parent to participate in the clinical judgment (56% for pre-registration

children's nursing students and 53% for MIU nurses, respectively). However, a double

dissociation was evident, the pre-registration children's nursing students said that they would

also seek the additional help of an interpreter (32%) whilst on the contrary the MIU nurses did

not feel the need of the interpreter presence preferring to deal with the assessment independently

(31%).

DISCUSSION

Minor injury unit nurses and nursing students made three judgments through a factorial

survey, to determine the influence of factors on the assessment of pain in simulated minor injury

scenarios involving primary school aged children. Both MIU nurses and pre-registration

children's nursing students identified the observation of the child the most suitable method of

pain assessment for EAL children and the VAS for fluent English speakers. Pre-registration

children's nursing students compared to MIU nurses preferred the presence of an interpreter in

the assessment. The free text responses (judgment C) demonstrated that MIU nurses based their

judgment more on clinical practice experience whilst the decisions of pre-registration children's

nursing students seemed to be derived from their theoretical knowledge.

Our respondents assessed the pain of the children basing their judgments on the ease of

linguistic interactions. *Observe the child's behaviour* was identified most frequently as suitable

to assess pain among those children who speak English as an additional language. This is line

with guidance from the American Academy of Pediatrics (AAP 2001) that behavioural

assessment should be carefully examined when communication is difficult between patients and

health professionals. Similarly, Herr *et al.* (2011) provided guidelines for clinicians to use with

patients who have difficulties in self-reporting their pain (the older adult with advanced dementia,

infant and preverbal toddler, critically ill/unconscious patient, person with intellectual disability

and patient at the end of life). Our findings indicate that this list of nonverbal patient populations

should be extended to include children with limited English proficiency whose primary language

is other than English. Reliance on behavioural assessment should be used with caution

particularly in situations when children are under stress, as they may not demonstrate expected

behavior (AAP 2001). This was evident in our qualitative findings. Further, in the clinical

setting, language expectations may create a communication barrier, which can lead to stress,

anxiety and confusion for patients (Wissow & Kimel 2002).

For decisions based on case scenarios with children who speak English well, respondents

chose more frequently a *Visual Analogue Scale* (VAS) that requires good receptive and

productive verbal skills to assess children's pain. In the International Association for the Study

of Pain guide, produced to guide pain management in low-resource settings, Powell *et al.* (2010)

highlighted first the need to assess patient's comprehension and expression of pain and then to

rate their pain accurately and communicate the pain effectively. This fits well with the

conceptual framework of the socio-linguistic communication of pain (Hadjistavropoulos & Craig

2002, 2004, Craig 2009), which places emphasis on enabling the patients to encode (express)

their pain and health professionals to decode (assess). However, recent guidance from the

Association of Paediatric Anaesthetists (APA 2012) emphasises the need to use a composite

measure (e.g. behavioural assessment and self-report) when assessing a child's pain, regardless

of the child's age. The optimal assessment of pain in children is the subject of much debate,

particularly in relation to self-report (Twycross *et al.* 2015).

Notwithstanding the high accordance on the observation of the patient, the choice of the MIU nurses to *Observe behaviour* appeared more confident (i.e. identified less difficulties - judgment C) than the pre-registration children's nursing students, even if the language of the child was poor. The MIU nurses emphasised the understanding of the tool even if it is by the parents and they were more confident about the parent's interpretation of their child's condition. The qualitative data also highlighted that MIU nurses were more likely to identify practical difficulties with assessing pain than pre-registration children's nursing students, possibly because of their clinical experience. For example, they identified vital signs monitoring as a priority action for all children who had suffered from severe injury and they addressed the effect of language barriers on taking the history of the injury and illness from the EAL children. In their decisions, MIU nurses focused on the individual differences in children's experience of pain, such as pain threshold, coping, skills, and cultural differences whilst the differences between children in terms of pain experiences were rarely mentioned by the pre-registration children's nursing students. This difference supports findings of previous studies identifying incongruence between theoretical knowledge and pain management practice (Twycross 2007, Twycross & Collins 2013); however, our qualitative findings also highlight some knowledge inadequacies.

Respondents were very clear that they were less likely to involve children's parents when parents could not speak English well. Therefore, the limited language proficiency was again the common barrier that was perceived to influence communication between children, parents, and health professionals. For EAL children who speak English poorly, respondents were more likely to involve their parents if they could speak English well. Otherwise, they tended not to include them and to seek help of an interpreter, because parents could become a barrier to the process of pain assessment as they were seen not able to give an accurate history about their children's

condition. The role of parents in pain assessment has been explored in previous studies. Parental over-exaggeration of their child's pain was also reported as a perception of nurses working in an acute hospital in England (Twycross & Collins 2013). However, parents also need appropriate information, and teaching in the use of pain assessment tools for effective involvement in their child's pain assessment, (Rony *et al.* 2010, Voepel-Lewis *et al.* 2005) a situation less likely to be feasible in the acute injury scenarios depicted in our vignettes.

The subjectivity of pain was identified by the pre-registration children's nursing students who, it could be argued, have up to date knowledge and MIU nurses focused more on the importance of the interaction of the parent in the pain experience of their children. Pre-registration children's nursing students were more concerned about assessing pain among those who were not able to verbalise pain than MIU nurses, so that they clearly preferred to call for an interpreter rather than using the family translation with poor master of English competence. Meyer *et al.* (2010) explained the limited use of a family interpreter in clinical settings identifying availability and the emotional interaction between patients and family, which enables provision of specific information that the interpreter could not provide. There is also a risk that the use of interpreters adds an extra layer to language transmission, increasing the opportunities for misunderstanding (Endacott *et al.* 2010).

Finally, through the responses to the open direct question, respondents were asked to describe the difficulties they faced during assessment of pain among this group of children. The age of the child was primarily identified in terms of understanding the medical process and knowing how to use the pain assessment tool, most of which need linguistic and cognitive competences to describe pain, regardless of whether the child is native English speaker or an EAL child. Whilst VAS has been identified as suitable for children aged 3 and over (Cohen *et al.*

2008), and hence was included as an option in our study, the capability to distinguish between

the severities of pain begins when children reach the age of eight years old (Goodenough *et al.*

1999). This is reflected in our findings with FLACC and Wong Baker were identified by

respondents as tools that could be used with younger children with limited English ability. This

is in accordance with Manworren and Hynan (2003) who pointed out that FLACC is one of the

preverbal scales to measure pain in young children. However, our findings also highlight the

importance of nonverbal pain assessment using behavioural assessment and distractions such as

play therapy to measure acute pain in young children and children with limited English ability.

We noted that the linguistic barriers when reacting to pain might affect verbal expression

of the injury. Indeed children from EAL background provide less elaborate language in their

narratives compared to native speakers (Gorman *et al.* 2011, Han *et al.* 1998, Parke, 2001) and

also when talking about pain (Azize *et al.* 2011, 2014). For example, Azize *et al.* (2014) found

that EAL children tended to focus their stories either on using limited vocabulary (albeit very

animated) or providing extended narratives which were storying their experiences of pain to a far

greater extent than monolingual children.

Limitations

One limitation of the study was in the similarities of the vignettes, which might have

seemed tedious to the respondents and therefore resulted in signs of fatigue. However, a detailed

review of the qualitative responses indicated that all respondents were actively engaging until the

end of the survey. Further, the factorial survey method has been criticised for the lack of

independence, with the same respondents being included in the modelling several times (Taylor

2006); we corrected for this by instructing SPSS to treat the 40 respondents as individual cases

(see data analysis section). The advantage of the random combinations of the levels in the

dimensions, thereby creating multiple incidences of case scenarios, was a limitation to constructions of the real life situations. For example, if all dimensions were fully randomised, an unrealistic case scenario could read as an English native child with poor mastery of English and a parent who spoke English well as first language. Therefore, during the planning stage, we fixed the combinations of levels of three dimensions to prevent the constructions of these unrealistic case scenarios. A further limitation lies in one of the pain scoring instruments included in Judgment A; the VAS used in the MIU in which the registered nurse respondents worked used a 1-10 score, rather than the usual 100 mm scale (with no numbers). This was reflected in our vignettes to make the scenarios as realistic as possible.

Clinical implications

Our study findings highlight potential health risks that disadvantage the pain assessment of EAL children. This study highlighted that interpreters or translators are perceived to adequately convey the level and severity of pain in some situations; in some clinical units the use of telephone interpretation is an adopted policy. When the purpose of the interpretation is to assess pain among EAL children this is unlikely to meet the patient's or the clinician's need given that the finding of this work revealed that the observation of the child's behavior is the most common approach given by the respondents.

Pain is a subjective feeling and the self-report of pain has to be offered as primary method of observation to all children regardless of the language background. Investments should be placed toward self-report tools available to children from all language abilities. Some of the physiological signs during the assessment such as a playing child may not indicate a real of lack of pain in children but may reflect cultural practices and norms in reaction to pain following a

minor injury. Self-report tools should be further tailored to take into account the cultural sensitivity to pain before assessing pain among those with different background.

Future research will aim to moving from the assessment of pain in simulated minor injury scenarios to hospitalised EAL children to investigate the complex interaction in clinical care between children, their parents and health professionals. Much of the evidence for use of interpreters is based in non-paediatric settings; intervention studies could focus on different forms of interpretation and interventions designed to improve the communication between parents, children and health professionals. Our findings indicate that the use of communication interventions, including modified self-report pain instruments, for the first meeting of the child, parents and health professionals might be a fruitful area to pursue.

CONCLUSION

Our findings emphasize that pain assessment for children with EAL might not be optimal. Understanding how EAL children express (or encode) pain is essential in order for health professionals to assess pain (decode) accurately. Assessing a child using the observation method was considered the best method of assessment, hence the use of interpreters should be considered at best as an adjunct to other methods of pain assessment. Respondents noted that other factors in addition to the language barrier of the child including his or her maturity skills and the language skills of the parent would prompt the use of an additional method of pain assessment such as FLACC. However, effective intercultural communication between health professionals and patients can be achieved mainly when conversation is comprehensible to both sides.

REFERENCES

American Academy of Pediatrics (2001) The assessment and management of acute pain in infants, children, and adolescents. *Pediatrics* **108**, 793-797.

American Medical Association (2010) *Module 6 Pain Management: Pediatric Pain Management*. AMA, Chicago, USA.

Association of Paediatric Anaesthetists (2012) *Good practice in postoperative and procedural pain* (2nd edn). APA, London, UK,

Azize PM, Endacott R, Cattani A & Humphreys A (2014) Cultural responses to pain in primary school age children: a mixed methods study. *Nursing and Health Sciences* **16**, 186-192.

Azize PM, Humphreys A & Cattani A (2011) The impact of language on the expression and assessment of pain in children. *Intensive and Critical Care Nursing* **27**, 235-243.

Baughman KR, Ludwick R, Merolla D, Palmisano BR, Hazelett S, Allen KR & Sanders M (2013) Disentangling consumer and provider predictors of advance care planning. *American Journal of Hospice and Palliative Medicine* **30**, 717-725.

Baughman KR, Ludwick RE, Merolla DM, Palmisano BR, Hazelett S, Winchell J & Hewit M (2012) Professional judgments about advance care planning with community-dwelling consumers. *Journal of Pain Symptom Management* **43**, 10-19.

Braun V & Clarke V (2006) Using thematic analysis in psychology. *Qualitative Research Psychology* **3**, 77-101.

Cattani A, Abbot-Smith K, Farag R, Krott A, Arreckx F, Dennis I & Floccia, C. (2014) How much exposure to English is necessary for a bilingual toddler to perform like a monolingual peer in language tests? *International Journal of Language and Communication Disorders* **49**, 649-671.

Cohen LL, Lemanek K, Blount RL, Dahlquist LM, Lim CS, Palermo TM, et al (2008).

Evidence-based Assessment of Pediatric Pain. *Journal of Pediatric Psychology* **33**, 939–

955.

Craig KD, Stanford EE, Fairbairn NS & Chambers CT (2006) Emergent pain language

communication competence in infants and children. *Enfance* **58,** 52-71.

Craig KD (2009) The social communication model of pain. *Canadian Psychology* **50**, 22-32.

Drendel AL, Kelly BT & Ali S (2011) Pain assessment for children: overcoming challenges and

optimizing care. *Pediatric Emergency Care* **27**, 773-781.

Dülmer, H (2007) Experimental plans in factorial surveys: Random or quota design?

Sociological Methods & Research, **35,** 382-409.

Endacott R, Benbenishty J & Seha M (2010) Preparing research instruments for use with

different cultures. *Intensive and Critical Care Nursing* **26**, 64–68.

Evans SC, Roberts MC, Keeley JW, Blossom JB, Amaro CM, Garcia AM, Stough CO, Canter

KS, Roble R & Reed GM (2015) Vignette methodologies for studying clinicians' decision-

making: Validity, utility, and application in ICD-11 field studies. *International Journal of*

Clinical and Health Psychology **15**, 160-170.

Gorman B, Fiestas C, Peña E & Clark MR (2011) Creative and stylistic devices employed by

children during a storybook narrative task: A cross-cultural study. *Language, Speech, and*

Hearing Services in Schools **42**, 1-30.

Goodenough B, Thomas W, Champion GD, Perrott D, Taplin JE, von Baeyer CL & Ziegler JB

(1999) Unravelling age effects and sex differences in needle pain: ratings of sensory

intensity and unpleasantness of venipuncture pain by children and their parents. *Pain* **80**,

179–190.

Hadjistavropoulos T & Craig KD (2002) A theoretical framework for understanding self-report

and observational measures of pain: A communications model. *Behaviour Research and*

Therapy **40**, 551-570.

Hadjistavropoulos T & Craig KD (2004) An introduction to pain: Psychological perspectives. In

Pain: Psychological Perspectives (Hadjistavropoulos T and Craig KD 9th eds), Lawrence

Erlbaum Associates, London, UK, pp. 1-13.

Han J, Leichtman M & Wang Q (1998) Autobiographical memory in Korean, Chinese, and

American children. *Developmental Psychology* **34**, 701-13.

Hennessy CH (1993) Modeling case management decision-making in a consolidated long-term

care program. *The Gerontologist* **33,** 333-341.

Herr K, Coyne PJ, Key T, Manworren R, McCaffery M, Merkel S, Pelosi-Kelly J & Wild L

(2006) Pain assessment in the nonverbal patient: position statement with clinical practice

recommendations. *Pain Managment Nursing* **7**, 44-52.

Herr K, Coyne PJ, Key T, Manworren R, McCaffery M, Merkel S, Pelosi-Kelly J & Wild L

(2011) Pain assessment in the patient unable to self-report. *American Society for Pain*

Management Nursing **12**, 230-250.

Jarvis BG (2011) *MediaLab* (Version 2010) [Computer Software]. Empirisoft Corporation, New

York, USA.

Kellogg KM, Fairbank RJ, O'Connor AB, Davis CO & Shah M N (2012) Association of pain

score documentation and analgesic use in a pediatric emergency department. *Pediatric*

emergency care **28**, 1287-1292.

Ludwick R, Wright ME, Zeller RA, Dowding DW, Lauder W & Winchell J (2004) An improved methodology for advancing nursing research factorial surveys. *Advances in Nursing Science* **27,** 224–238.

Manworren R & Hynan L (2003) Clinical validation of FLACC: Preverbal patient pain scale. *Pediatric Nursing Journal* **29**, 140-146.

Meyer B, Pawlack B & Kliche O (2010) Family interpreters in hospitals: Good reasons for bad practice? *mediAzioni* **10,** 297-324. http://mediazioni.sitlec.unibo.it, ISSN 1974-4382.

Parke T (2001) Words and tunes: Bilingual and monolingual children construct a story. *Linguistics and Education* **12**, 409–430.

Powell RA, Downing J, Ddungu H & Mwangi-Powell FN (2010) Pain history and pain assessment. In *Guide to Pain Management in Low-Resource Settings* (Kopf A, Patel NB eds). IASP, Seattle, USA, pp. 67-78.

Rattray JE, Lauder W, Ludwick R, Johnstone C, Zeller R, Winchell J, Myers E & Smith A. (2011) Indicators of acute deterioration in adult patients nursed in acute wards: A factorial survey. *Journal of Clinical Nursing* **20**, 723-732.

Rony RYZ, Fortier MA, Chorney JM, Perret D & Kain ZN (2010) Parental postoperative pain management: Attitudes, assessment, and management. *Pediatrics* **125**, e1372-e1378.

Rossi PH & Knock SL (1982) *Measuring Social Judgements: The Factorial Survey Approach* (eds.). Sage, Beverly Hills, USA.

Royal College of Nursing (2009) *The recognition and assessment of acute pain in children. clinical practice guidelines*. London, Royal College of Nursing.

Scott LE, Crilly J, Chaboyer W & Jessup M (2013) Paediatric pain assessment and management in the emergency setting: The impact of a paediatric pain bundle. *International emergency nursing* **21**, 173-179.

Shlay AB, Tran H, Weinraub M & Harmon M (2005) Teasing apart the child care conundrum: A factorial survey analysis of perceptions of child care quality, fair market price and willingness to pay by low-income, African American parents. *Early Childhood Research Quarterly* **20,** 393–416.

Taylor BJ (2006) Factorial surveys: Using vignettes to study professional judgement. *British Journal of Social Work* **36,** 1187-1207.

Twycross A (2007) What is the impact of theoretical knowledge on children's nurses' post-operative pain management practices? An exploratory study. *Nurse Education Today* **27**, 697–707.

Twycross A & Collins S (2013) Nurses' views about the barriers and facilitators to effective management of pediatric pain. *Pain Management Nursing* **14**, e164-e172

Twycross A, Voepel-Lewis T, Vincent C, Franck LS & von Baeyer CL (2015) A Debate on the Proposition that Self-report is the Gold Standard in Assessment of Pediatric Pain Intensity. *The Clinical Journal of Pain* **31**, 707-12.

Voepel-Lewis T, Malviya S & Tait A (2005) Validity of parent ratings as proxy measures of pain in children with cognitive impairment. *Pain Management Nursing* **6**, 168-174.

Voepel-Lewis T, Zanotti J, Dammeyer JA & Merkel S (2010) Reliability and validity of the face, legs, activity, cry, consolability behavioral tool in assessing acute pain in critically ill patients. *American Journal of Critical Care* **19**, 55-61.

von Baeyer CL & Spagrud LJ (2007) Systematic review of observational (behavioral) measures

of pain for children and adolescents aged 3 to 18 years. *Pain* **127,** 140–150.

von Baeyer CL, Forsyth SJ, Stanford EA & Chambers GT (2009) Response biases in preschool

children's ratings of pain in hypothetical situations. *European Journal of Pain* **13,** 209-213.

Wissow LS & Kimel MB-D (2002) Assessing Provider-Patient-Parent Communication in the

Pediatric Emergency Department. *Ambulatory Pediatrics* **2**, 323–329.

Table 1. Corrected model effect through Wald chi-square test of Judgment A and Judgment B on the Dimensions of the Vignettes

Dimensions	Judgment A (n = 478)			Judgment B (n = 478)		
	df	χ^2	p	df	χ^2	p
Age	9	8.057	0.528	6	3.695	0.718
Gender	3	1.809	0.613	2	1.691	0.429
Language of child[i]	3	11.098	0.011	2	35.368	0.001
Country of origin	9	5.545	0.784	6	60.440	0.001
Who brought the child to MIU	3	2.006	0.571	2	8.175	0.017
Injury Mechanism	6	22.760	0.001	4	5.613	0.230
Language of parent	6	5.437	0.489	4	194.203	0.001
Verbal and nonverbal reaction to pain	6	8.794	0.186	4	1.199	0.878

Note[i]: The Language of child factor includes two levels: 1. The merged level of children who are English native speakers and the children who master well the English language, 2. Children who speak English poorly remained unchanged. This was reduced to two categories for simplicity to better represent the ability of the child to speak English. However, the repeated analyses performed on three levels produced same results.

Table 2. Parameter Estimate of Multinomial Logistic Regression of Judgment A (top) and Judgment B (bottom)

Judgment A	Assess movement			VAS			Record vital signs		
	B	SE	OR Exp(B)	B	SE	OR Exp(B)	B	SE	OR Exp(B)
n = 478			(95% CI)			(95% CI)			(95% CI)
Intercept	-1.427	0.527	0.240	-1.301	0.484	0.272	-4.836	1.233	0.008
			(0.08, 0.70)			(0.10, 0.72)			(0.00, 0.10)
Group			0.417						
Children's nursing students	-0.874	0.753	(0.09, 1.91)	-0.384	0.592	0.681	0.662	0.971	1.939
						(0.21, 2.26)			(0.27, 13.84)
MIU nurses									
Language of child									
Speak English well	-0.147	0.459	0.863	0.744	0.295	2.105*	-0.472	0.394	0.624
			(0.34, 2.19)			(1.16, 3.82)			(0.28, 1.39)
Speak English poorly									
Injury mechanism									
Severe	-0.219	0.469	0.803	-0.269	0.339	0.764	2.790	1.003	16.284**
			(0.31, 2.07)			(0.39, 1.52)			(2.14, 123.81)
Moderate	-1.100	0.706	0.333	-0.021	0.235	0.979	1.296	1.277	3.656
			(0.08, 1.39)			(0.61, 1.58)			(0.28, 48.41)
Mild									

Judgment B		
n = 478	No	Yes but with interpreter

	B	SE	OR Exp(B) (95% CI)	B	SE	OR Exp(B) (95% CI)
Intercept	-0.498	0.505	0.608 (0.22, 1.69)	-0.203	0.469	1.226 (0.48, 3.16)
Group						
Children's nursing students	-1.021	0.532	0.360 (0.12, 1.06)	1.021	0.524	2.775 (0.96, 8.01)
MIU nurses						
Language of child						
Speak English well	1.207	0.439	3.342** (1.37, 8.13)	0.012	0.336	1.012 (0.51, 2.00)
Speak English poorly						
Language of parent						
Native English speaker	-0.996	0.324	0.369** (0.19, 0.71)	-5.299	1.224	0.005** (0.00, 0.06)
Speak English well	-1.454	0.396	0.234** (0.11, 0.52)	-3.937	0.561	0.020** (0.01, 0.06)
Speak English poorly						

*$p < 0.05$, **$p < 0.01$

Note: 'Observe the child's behaviour' (top table) and 'Yes' (bottom table) were the reference categories

B Estimated parameter Beta; *SE* Standard Error; *OR* Odd Ratio; *95% CI* 95% Confidence Intervals

Figure captions

Fig 1. Flow chart depicting development of the factorial survey instrument.

Fig 2. Judgments A, B and C presented to respondents after the presentation of a vignette

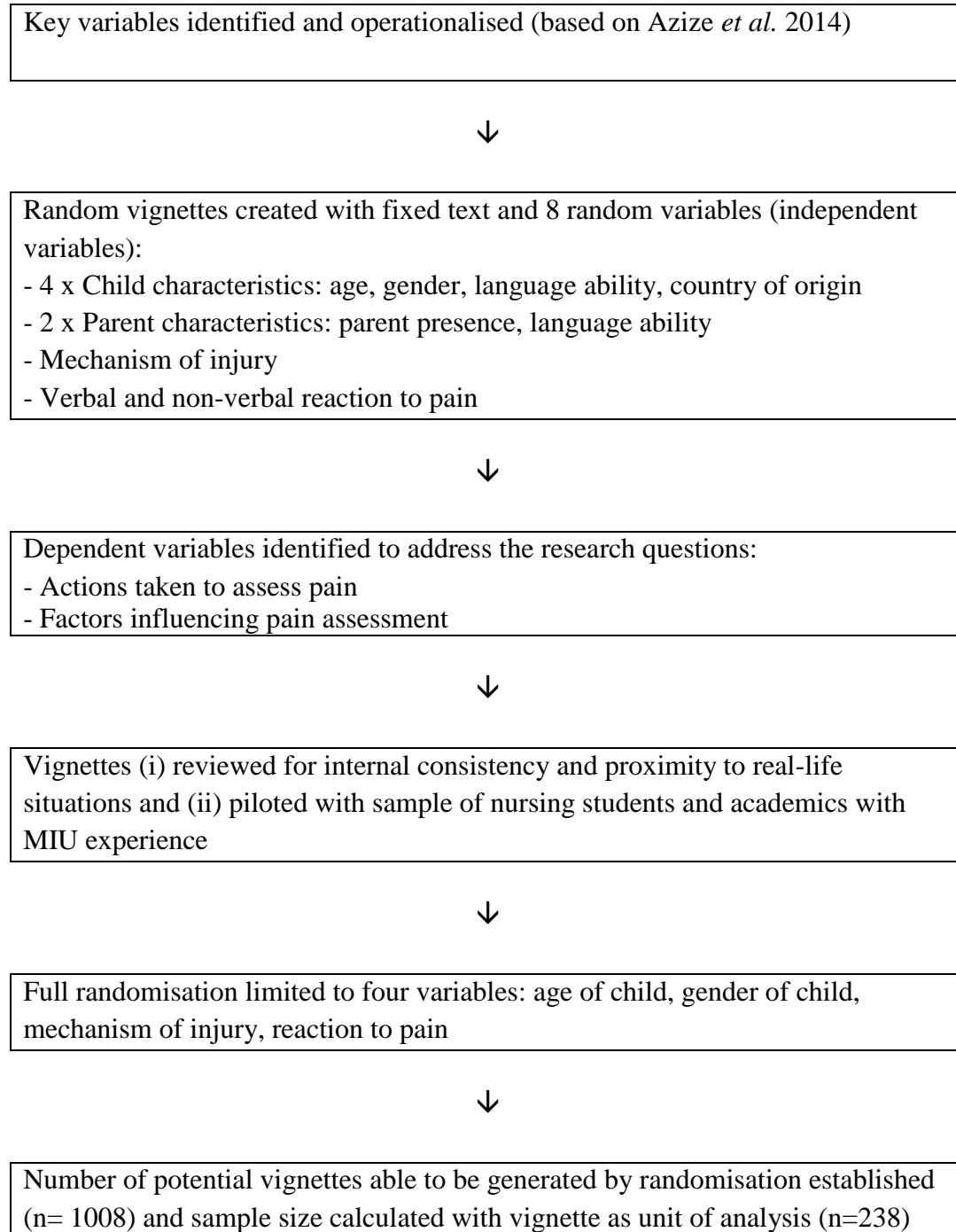(number of vignettes presented per respondent = 12).

Key variables identified and operationalised (based on Azize *et al.* 2014)

↓

Random vignettes created with fixed text and 8 random variables (independent variables):
- 4 x Child characteristics: age, gender, language ability, country of origin
- 2 x Parent characteristics: parent presence, language ability
- Mechanism of injury
- Verbal and non-verbal reaction to pain

↓

Dependent variables identified to address the research questions:
- Actions taken to assess pain
- Factors influencing pain assessment

↓

Vignettes (i) reviewed for internal consistency and proximity to real-life situations and (ii) piloted with sample of nursing students and academics with MIU experience

↓

Full randomisation limited to four variables: age of child, gender of child, mechanism of injury, reaction to pain

↓

Number of potential vignettes able to be generated by randomisation established (n= 1008) and sample size calculated with vignette as unit of analysis (n=238)

Figure 1

Judgment A. Which of the following actions is most important when assessing this child's pain (please tick just one):

1. Observe the child's behaviour
2. Assess active and passive limb movement
3. Use a visual analogue scale (score of 1-10)
4. Record vital signs

Judgment B. Would you ask the parent to help you assess the child's pain?

1. Yes
2. No
3. Yes, but with an interpreter

Judgment C. Does anything make it difficult to assess this child's pain? Please explain.

Figure 2

Appendix A

Examples of vignettes presented to respondents

<u>Example 1</u>

A <6 year-old> <girl> who is from the <Middle East> and <speaks English poorly as a second language> is brought to the MIU by her <father>, who <speaks English poorly>. <The child was playing in the park and was hit in the leg by a football. There are no breaks in the skin and the leg is not swollen>. Following the accident, she was <playing with toys in the waiting room>.

<u>Example 2</u>

A <4 year-old> <boy>, from <the UK who is a native English speaker> is brought to the MIU by his <mother>, who is <a native English speaker as well>. <The child was walking home from school and tripped over resulting in a grazed knee, the graze is oozing slightly but not swollen or restricting limb movement>. Following the accident, he was <crying>.

Note: The brackets shown identified the dimensions but were not visible to respondent.

Appendix B

Levels of coding for each dimension

Dimension (variable)	Value of dimension	Type of coding level	Number of characteristics	Model
Age	4 5 6 7	Continuous	*4	R
Gender	Boy Girl	Categorical	*2	R
Language ability	Native English speaker Speaks English well Speaks English poorly	Categorical	1 *2	M
Country of origin	UK Middle East Eastern Europe Asia	Categorical	4	F
Language abilities of parent	Speaks English as a first language Speaks English well but as a second language Speaks English poorly as a second language	Categorical	3	F
Who brought the child to MIU	Mother Father	Categorical	2	F
Mechanism of injury	Fell from a 3 foot high climbing frame (severe) Tripped over and grazed his knee (moderate) Was hit in the leg by a football (mild)	Categorical	*3	R
Verbal and nonverbal reaction to pain	Sitting quietly Crying Playing with toys in the waiting room	Categorical	*3	R

Note: Number of levels * randomised; Model: R: randomised F: fixed; M: mixed.

A level of a dimension is varied independently in order to be coherent and internally

consistent (e.g. Ludwick *et al.* 2004) and the characteristics for the four dimensions were fully randomised. The characteristics of three dimensions were fixed; these were bounded to the order of the vignette each respondent has to respond. The language of the child dimension was mixed i.e. one characteristic was fixed (native English speaker) and the two remaining characteristics were randomised (speak English well and poorly).