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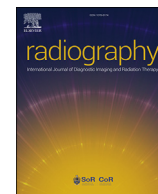
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# Communication during children's X-ray procedures and children's experiences of the procedure: A scoping review

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## ABSTRACT

**Introduction:** Communication is a central part of radiological procedures and influences children's experiences. Previous research concentrates on communication and experiences during complex radiological procedures such as magnetic resonance imaging (MRI). Less is known about the communication that occurs with children undergoing procedures, such as non-urgent X-ray procedures, or the impact communication has on a child's experience.

**Objectives:** This scoping review examined evidence relating to the communication which occurs between children, parents and radiographers during children's X-ray procedures and how children experience undergoing X-ray procedures.

**Key findings:** The comprehensive search identified eight papers. Evidence shows that radiographers dominate communication during X-ray procedures, with their communication in many cases being instructional, closed and limiting the opportunities for children to be involved. Evidence indicates that radiographers have a role in facilitating children in actively engaging in communication during their procedure. The papers that sought children's first-hand experiences highlight children's mainly positive experiences of having an X-ray, and the importance of informing children about their X-ray before and during the procedure.

**Conclusions:** The scarcity of literature highlights a need for research exploring communication during children's radiological procedures and children's first-hand experiences of undergoing these procedures. Findings highlight a need for an approach that recognises the importance of dyadic (radiographer and child), and triadic (radiographer, parent and child) communication opportunities during an X-ray procedure.

**Implications for practice:** This review highlights a need for an inclusive and participatory approach to communication that recognises children's voice and agency in X-ray procedures.

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## Introduction

There is increasing evidence relating to children's communication during, and experiences of, different health care procedures.<sup>1–3</sup> Multiple factors can contribute to children's experiences of a procedure, including how parents and health professionals communicate with or to a child before and during their procedure,<sup>4</sup> and how children's choices are listened to and considered.<sup>5,6</sup> According to the United Nations Convention on the Rights of the Child (UNCRC),<sup>7</sup> every child has the right to be heard on all matters

concerning them, and this includes in healthcare settings and situations. Whilst the importance of children's voices and involvement is rapidly gathering attention within healthcare,<sup>8–10</sup> less is known about the verbal and non-verbal communication that occurs during a child's X-ray procedure or children's first-hand experiences of such procedures.

Communication within paediatric healthcare settings is often triadic, between a child, their parent and a health professional and can be influenced by multiple individual and contextual factors,<sup>11</sup> including but not limited to a child's age and cognitive and language development.<sup>12</sup> This is especially so in Radiography settings whereby radiographers tend to have less time to communicate with their patients, than other health professionals do.<sup>13</sup> Despite there being a greater consensus that children have a right to participate in matters that affect them,<sup>14</sup> evidence shows that children

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continue to find it difficult to communicate verbally in health care procedures, by joining in health care interactions, for example, or by having their views heard.<sup>2,15</sup> Children's verbal communications can sometimes go unacknowledged by their parents and health professionals present for the procedure<sup>8</sup> and this can impact on children's overall experiences.<sup>2</sup>

Poor communication before or during a procedure can leave children feeling frustrated and fearful and result in negative experiences<sup>16</sup> which have both short-term and long-term consequences. This can include instances of immobilisation or restraint,<sup>17,18</sup> non-cooperation during procedures resulting in incomplete or repeat procedures,<sup>19</sup> missed appointments<sup>20</sup> and psychological distress.<sup>21</sup> It is important to consider factors that contribute to a child's experience of an X-ray procedure to improve practice, to protect their rights, and reduce the negative impact on future procedures and the short and long term consequences on their physical and mental health.<sup>22</sup>

Review method

A scoping review was conducted to explore what is known about the communication which happens during children's X-ray procedures and how children experience undergoing the procedure. A scoping review approach is advocated where the purpose is to review and examine the extent, range, and nature of a field of research and to identify gaps in existing literature.<sup>23,24</sup> The following five stages of Arksey and O'Malley's framework guided this review and will form the structure of the paper; identifying a research aim/question, identify relevant studies, make study selection, charting the data and collating, summarising, and reporting the findings.<sup>23</sup> The conduct and reporting of this study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).<sup>25</sup> There is no published copy of the review protocol. Ethics approval was not required for this scoping review.

Research question

The two-part research question, which underpins this review is, *'what verbal and non-verbal communication which occurs between children, parents and radiographers during children's X-ray procedures? and how do children experience undergoing X-ray procedures?'*

**Table 1**  
Search terms utilised in this scoping review based on Population, Concept and Context (PCC).

PCC	Terms
Population	Child* OR P?diatric OR Infant* OR Boy* OR Girl* OR Adolescen* OR Youth* OR Teen* OR "Young adult" OR "Young Person" OR Juvenile OR Mother* OR Father* OR Carer* OR Caregiver* OR Caretaker* OR Parent* OR Child-Parent OR Parent-Child OR Mother-Child OR Child-Mother OR Father-Child OR Child-Father OR Child OR Child-Radio* OR Patient-Radio* OR Physician-Patient OR Patient-Physician OR Family OR Families
Concept	Communicat* OR "Non Verbal Communicat*" OR "Verbal Communicat*" OR Interact* OR Involvement* OR Co?operation OR Role* OR Behaviour OR Behavior OR relation* OR Experienc* OR "Patient Experienc*" OR Participat* OR Opinion* OR View OR Attitude* OR Percept* OR Belie* OR Feel* OR Know* OR Thought* OR Discomfort OR Cop* OR Anxi* OR Fear* OR Understand* OR Apprehen* OR Wish* OR Agency OR Autonomy OR Decision* OR Expect* OR Request* OR Competence OR Decision* OR Assent* OR Dissent* OR Voice* OR Consent*
Context	X?ray OR Radiograph* OR Radiolog* OR "Plain Imag*" OR "Diagnostic Imag*" OR "Medical Imag*" OR Scan OR Procedure*

Identifying relevant studies: search terms and inclusion criteria

The search terms were structured according to the Population, Concept, Context (PCC) model<sup>26</sup>; the 'population' was children aged 3–17 years, the 'concept' under investigation was experience and communication and the 'context' included different terms for an 'X-ray' procedure (see Table 1). Keywords identified by the authors were used to search electronic databases (CINAHL, PubMed, PsychInfo, Cochrane Library and Web of Science), as well as the hand searching of reference lists and key journals. Where available, thesaurus or MeSH terms were utilised. The search strategy used Boolean Operators and truncation to allow for different spellings.

Inclusion and exclusion criteria were set for this review (see Table 2), to ensure only relevant literature was included. This review includes published literature about X-ray procedures only. Papers were eligible for inclusion if they were peer-reviewed papers published in English between 1999 and 2022. As the aim of this review was to explore verbal and non-verbal communication that occurs between children (aged 3–17 years), parents and radiographers during a child's X-ray procedure and children's experiences of undergoing an X-ray procedure, papers were excluded if they *only* included data collected from health professionals or parents, or where it was not possible to separate out data from children. Papers were also excluded if it was not possible to separate data collected during X-ray procedures from other procedures.

Making study selection

A total of 2212 papers were located (Fig. 1). Titles and the abstracts were screened against inclusion and exclusion criteria (Table 2) (HS). Deletion of duplicates resulted in 570 papers being removed and removal of non-relevant papers resulted in 1499 papers being excluded. Full texts of the remaining 143 papers were obtained, as these appeared to represent a 'best fit' with the research question,<sup>23</sup> 135 papers were excluded. Discussions about which papers should be included or excluded were made during regular meetings with the co-authors, following the inclusion and exclusion criteria. Any disagreements were discussed between the authors, until consensus was reached. The main reason for exclusion was because the paper was not focussed specifically on X-ray procedures or included only the first-hand experiences of parents or health professionals, and not children. A total of eight papers

**Table 2**  
Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Primary research	Papers that included children with disabilities who were unable to verbally communicate
Published 1999–2020	The full text of the article was unavailable.
Published in English	Case studies, reviews, guidelines, poster, abstracts, commentaries and editorials
All empirical studies that include qualitative, quantitative or mixed-methods	
Sample including or restricted to children 3–17 years	
Papers reporting children's or children and their parents' communication or experiences of plain X-ray procedures	

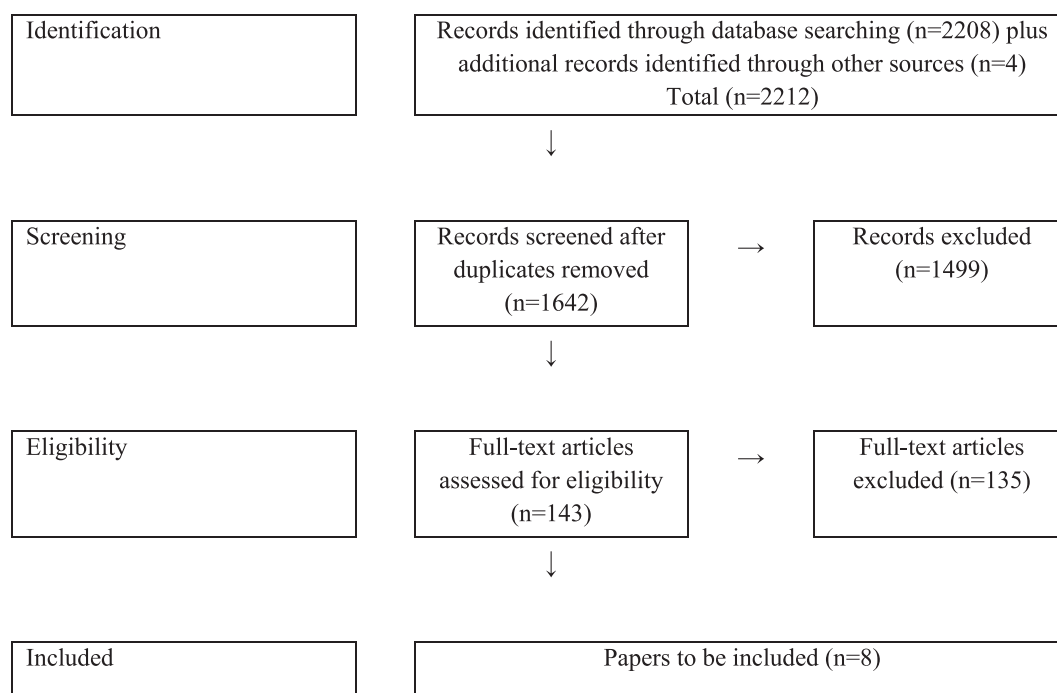


Figure 1. PRISMA flow diagram for scoping review process.

from five studies were suitable for inclusion and were reviewed by all authors (HS, LB, BC, CW).

As a scoping review aims to map the extent and nature of the literature that exists,<sup>27</sup> an assessment of the quality of included and discarded papers is not required.<sup>23,28</sup> No formal quality appraisal of the included papers was performed.

#### Charting and collating the data

Eight papers were included; these represent data collected in five studies. Data extraction or charting was conducted and mapped onto a form structured to capture details of the empirical study, for example, author, study location, number of participants and age of children, aim(s) of the study, study methodology, methods and analysis and key findings/outcomes. One author (HS) conducted the charting of the data of each included paper, and all authors (HS, LB, BC, CW) reviewed and checked the charting of data. In line with Arksey and O'Malley's<sup>23</sup> guidance, a 'descriptive analytical method' was used to summarise information and thematic analysis, resembling qualitative data analytical techniques, was used to analyse the content of the papers included in the review.

Arksey and O'Malley<sup>23</sup> highlight the need, as part of the analysis, to provide a numerical summary describing the characteristics of the included studies. As such, three papers<sup>29–31</sup> report participants drawn from one study but report different aspects of the study so have been considered separately. The eight papers were published between 2002 and 2015. Five out of the eight papers reported research from Sweden,<sup>29–33</sup> two papers from the UK<sup>34,35</sup> and one from the Republic of Ireland.<sup>36</sup> Qualitative, quantitative and mixed methods were used to collect data. Methods used were interviews with drawing methods,<sup>34</sup> questionnaires,<sup>32,36</sup> direct observations,<sup>35</sup> self-reports,<sup>32,33</sup> video recordings,<sup>31</sup> and video observations with interviews.<sup>29</sup> Various methods of analysis were used, qualitative content analysis,<sup>29</sup> descriptive statistics,<sup>30,32,33</sup> deductive analysis of the verbal interaction between the radiographer, child and parent using the Roter Interaction Analysis System (RIAS),<sup>31</sup> and

coding as part of thematic analysis.<sup>34–36</sup> Table 3 presents a summary of the included findings.

#### Summarising and reporting the findings

Findings of the review are structured thematically and reported in a narrative way, reflecting the two parts of the review question: the verbal and non-verbal communication that occurs during children's X-ray procedures and children's experiences of undergoing X-ray procedures.

##### What communication occurs during a child's X-ray procedure?

##### *Telling me what to do and doing all the talking: Radiographers as the dominant communicators during children's X-ray procedures*

In observations of 32 children aged 3–15 years undergoing X-ray procedures, findings indicated as much as 75% of communication during the procedure is from the radiographer,<sup>31</sup> with children's verbal interactions accounting for as little as 17% of all observed communication.<sup>31</sup> Parents were observed as contributing less than 3.5% of all communication during their child's X-ray procedure,<sup>29</sup> this is supported by evidence which shows that parents are frequently involved by receiving information from radiographers and by 'supporting' their child during the procedure, often just by being present, although the specifics of what constituted 'support' was not examined.

##### *Be still, you just moved: Instructional, closed communication limits children's opportunities to join in*

Most of the communication from radiographers in the 32 X-ray procedures observed<sup>31</sup> was reported by the authors as being task-focused (78%) and was undertaken predominantly to give instructions using closed statements (126 utterances), such as "can you pull your pants over your knee?" These closed, instructional statements evoked little opportunity to invite and consider a child's wishes or feelings<sup>31</sup> and comments such as "you have to sit over here"<sup>31</sup> limited a child's decision making during their procedure.

**Table 3**  
Summary of included papers.

Author/s and study location	Study population, number of participants, age of children eligible for inclusion	Aim(s) of study	Study methodology, methods and analysis	Key findings/ important results
Björkman et al 2012a* Sweden	<b>Children:</b> (n=32). 3–15 years.	To investigate children's experiences undergoing a radiographic examination for a suspected fracture	<b>Methodology:</b> Qualitative. <b>Methods:</b> Procedures were videotaped and then children were interviewed afterwards while watching the videotape. <b>Analysis:</b> Qualitative content analysis was used to analyse the data.	Children reported mixed feelings about their procedure. Two findings categories exemplified this, 'feeling uncomfortable' and 'feeling confident'. Children discussed their feelings about pain, their waiting time, the future after the injury and the confidence they had in their parents and the radiography staff.
Björkman et al 2012b* Sweden	<b>Children:</b> (n=29). 5–15 years.	To investigate pain and distress in children while undergoing a radiographic examination in an acute situation. In particular, how children evaluate the pain and distress experiences in conjunction with a radiographic examination after being physically injured and whether this correlates to the observed pain behaviour	<b>Methodology:</b> Quantitative. <b>Methods:</b> The Coloured Analogue Scale and Facial Affective Scale were used as self-reporting scales to measure children's pain and distress along with the FLACC as an observational tool. <b>Analysis:</b> Descriptive statistics.	Children reported, and were observed, experiencing pain and distress when undergoing the procedure. No significant differences were obtained concerning the pain level reported by the children who were diagnosed as having a fracture or dislocation of bones and those who did not have a fracture.
Björkman et al 2013* Sweden	<b>Children:</b> (n=32). 3–15 years. <b>Other:</b> (n=20). Female radiographers.	To investigate the verbal interaction between a child, radiographer and parent during radiographic examinations.	<b>Methodology:</b> Quantitative. <b>Methods:</b> Verbal interactions were video recorded. <b>Analysis:</b> Roter Interaction Analysis System.	A radiographer dominated 80% of verbal interaction, 17% was by a child and 3% of communication was by a parent. 78% of the radiographers' communication contained 'task focussed categories' (e.g. 'instructions'). 22% of communication was coded as 'other' and included socio-emotional exchanges including social conversation used to distract the child during the procedure. Communication was described as being mostly 'dyadic', with the radiographer communicating and the parent or the child responding with agreement or understanding. Children often responded to instruction from the radiographer. Interaction with parents was limited and was reported as replacing or interfering with the interaction between the radiographer and children.
Björkman et al 2014 Sweden	<b>Children:</b> (n=110). 5–15 years.	To investigate children's anxiety, pain and distress during an acute radiographic procedure to assess whether these factors can be related to the child's perception of care.	<b>Methodology:</b> Mixed-methods. <b>Methods:</b> Self-reports and questionnaires. <b>Analysis:</b> Quantitative data analysed using descriptive statistics and qualitative data analysed using content analysis.	Anxiety, pain and distress were a concern to children, as well as the waiting time for their procedure. Despite the negative feelings associated to the procedure,

Table 3 (continued)

Author/s and study location	Study population, number of participants, age of children eligible for inclusion	Aim(s) of study	Study methodology, methods and analysis	Key findings/ important results
Björkman et al 2016 Sweden	<b>Children:</b> (n=110) 5–15 years. <b>Other:</b> Parents (n=110).	To investigate children's and their parents' perceptions of care during the peri-radiographic process.	<b>Methodology:</b> Quantitative. <b>Methods:</b> questionnaires and self-reports. <b>Analysis:</b> Descriptive statistics.	children were satisfied with the care they received, as it was child-centred and supportive. Children were 'satisfied' with the care they were provided with and both children and their parents perceived the radiographer to be skilled and sensitive throughout X-ray procedure. The radiographer's 'kindness and ability to help the child in a sufficient way' received the highest score and 'available time for the children to ask questions' and 'available time to meet the child's emotional needs' received the lowest scores. Findings demonstrated the importance of recognising the anxieties and fears of the children about the examination process. Children had at least a minimal level of knowledge of X-rays and gained information from friends, family and neighbours, school or television.
Chesson, Good and Hart 2002 United Kingdom	<b>Children:</b> (n=45). 7–14 years.	To determine children's perceptions of X-ray examinations.	<b>Methodology:</b> Qualitative. <b>Methods:</b> Two-part semi-structured interview, one prior to and one following the X-ray. Drawing methods to answer the question of 'what it felt like to have an X-ray'. <b>Analysis:</b> An art therapist and a child psychiatrist reported on the children's drawings. Interview responses were read, categories generated and open-coded.	Methods to help alleviate the child's fear and anxiety when undergoing an X-ray procedure included use of child friendly equipment (e.g., colourful lead protection and posters on the wall), simple explanations of the equipment, offering rewards including verbal praise and showing the child their image after the examination. When time was short and workload was high, it was observed that radiographers were less likely to spend time calming the child and instead focused on completing the procedure. Adolescents discussed pain, boredom, the wait for the procedure and nervousness. Adolescents had positive feelings despite having little knowledge of the procedure. Many adolescents perceived radiographers to be friendly.
Harding and Davis 2015 United Kingdom	<b>Children:</b> (n=79). 3 months–15 years. <b>Other:</b> (n=13). Radiographers.	To observe the interaction between the paediatric patient and the radiographer and to uncover techniques used by the radiographer to help alleviate any fear or stress that the child might have.	<b>Methodology:</b> Quantitative. <b>Methods:</b> A direct observational method was conducted using an observational checklist. <b>Analysis:</b> Descriptive statistics	
O'Shea and Davis 2015 United Kingdom	<b>Adolescents:</b> (n=18). 15–17 years.	To explore middle adolescents' perceptions of X-ray examinations.	<b>Methodology:</b> Qualitative <b>Methods:</b> A self-completion questionnaire. <b>Analysis:</b> Thematic analysis.	



There were fewer instances noted (53 utterances) of open communication than closed, instructional statements. These instances included communication that invited or suggested a response was needed or children and parents were able to express their thoughts, wishes or feelings. Most open utterances were questions from a child to a radiographer, such as “what does this sign/mark mean?”<sup>31</sup> Social conversation or personal remarks were reported to be less frequent than the abovementioned closed statements and open communication. Social conversation and personal remarks were used to seek a child’s reassurance by asking “them if they are doing okay?” or “showing concern or worry”.<sup>31</sup> Evidence from another study which observed 79 children’s X-ray procedures, showed that radiographers were even less likely to spend time supporting a child when time was short and the workload was high.<sup>35</sup>

#### *Inviting me to join in: ‘Good’ communication during a child’s X-ray procedure*

Contrary to the finding that a closed question limits a child’s involvement, some task-focussed communication from radiographers was reported as opening up conversation; an example of this being the common task of communicating multiple patient identifiers, sometimes known as the 3-point-check (name, date of birth and home address), at the start of many X-ray procedures.<sup>35</sup> Whilst this involves closed questions, this communication is reported by the authors as a ‘good’ way to invite children to join in the conversation. These findings are consistent with those from video recorded observations,<sup>31</sup> which show that children actively engage in the communication process if they are invited by radiographers to respond to questions.

The importance of using language that children could understand and that was appropriate to their cognition was highlighted by children.<sup>30,35</sup> Communication techniques that children responded well to were observed as involving radiographers adapting their communication to suit the child such as asking, “where is your home?” or using simple phrases to explain the procedure such as “it is just like getting your picture taken”.<sup>35</sup> The categories of communication developed in this study which suggested the radiographer included or directed their communication towards the child,<sup>35</sup> included words like ‘have’ in phrases such as “you *have* to sit over here”, which set a certain negative tone through their directness.<sup>32</sup>

#### *Wanting to know what will happen: Providing information helps prepare children for what will happen during their X-ray procedure*

The communication of procedural information to children regarding their X-ray is prominent amongst the papers reviewed, both in the observation of procedures and in the first-hand accounts from children. Observations showed that some radiographers communicate procedural information via instructions to help children understand the procedure.<sup>35,36</sup> However, this provision of information occurred immediately prior to the procedure taking place<sup>36</sup> which can limit a child’s opportunity to process and understand it. One paper reported that radiographers communicating procedural information lowered children’s anxiety levels because children knew what the procedure entailed.<sup>29</sup> Fourteen of the 16 adolescents interviewed answered ‘yes’ to the question “did the radiographer explain what the X-ray examination involved?”<sup>35</sup> However, only nine of 110 children in another paper, reported being satisfied with the information they received from the radiographer.<sup>32</sup>

A qualitative study with 7–14-year-olds (n = 45), highlighted that despite children reporting that they wanted to know about what will happen during their X-ray procedure, they were often unprepared before they arrived and lacked meaningful information about their procedure.<sup>34</sup> Children reported obtaining pre-

procedural information from informal networks, second-hand from parents or from television.<sup>34</sup>

Children reported having basic knowledge that during X-ray procedures, radiographers “take pictures of your bones”<sup>34</sup> but also reported misconceptions including expecting “a bright light or flash”<sup>34</sup> and anticipating physical contact with the machinery.<sup>34</sup> Some were fearful that the X-ray machine would touch or hurt them<sup>32</sup> or that the machine would “move down on top of them” and “crush” them.<sup>34</sup> They reported feeling “scared”<sup>36</sup> and “worried”<sup>29</sup> and were fearful that they would be “put to sleep” or “might have a needle”.<sup>34</sup> A lack of information, through limited pre-procedural preparation and non-responses to children’s requests for information was said to lead to children undergoing procedures with little understanding of what would happen.<sup>34</sup>

#### *How do children experience the procedure?*

##### *It all went fast and smoothly: Children’s reports of positive experiences during their X-ray procedure*

Five papers noted children’s positive experiences of their X-ray procedure.<sup>29,32–34,36</sup> Children reported being satisfied because of the radiographer and the care they received.<sup>32,34</sup> Children who were interviewed stated that radiographers were skilled and sensitive,<sup>32</sup> capable, kind<sup>33</sup> and friendly.<sup>36</sup> Children (3–15 years) reported in interviews that how a radiographer did their job and communicated with them was important, for example, how they were treated and helped during their procedure conveyed a feeling of confidence.<sup>29</sup> All 35 children (aged 3–15 years) said they were taken good care of and expressed satisfaction in the way they were treated.<sup>29</sup>

Children (n = 110), aged 5–15 years were asked to report their perceptions of their care as scores based on a Likert scale (1 = very dissatisfied to 5 = very satisfied) for various aspects of their procedure, including but not limited to, “the radiographer’s kindness and ability to help in a sufficient way”, “the radiographer’s ability to listen to the child’s needs”, “the radiographer’s ability to explain the examination in an understandable way”, “information during the examination” and “information before the examination”.<sup>33</sup> Only mean scores were reported in the paper, ranging from 3.81 (available time to ask questions) to 4.60 (the radiographer’s kindness and ability to help in a sufficient way), the mean scores represent children being ‘satisfied’ with the care they received when related to the Likert scale used. If or how many children reported lower or higher scores was not reported. A child’s satisfaction was reported as higher when radiographers cared about the child’s wellbeing, not only during the procedure but also “beyond the procedure”.<sup>33</sup>

Parental presence influenced children’s positive experiences. Parents were reported as providing assurance,<sup>31</sup> rewards and distraction.<sup>35</sup> All children (n = 45, aged 7–14 years) in one paper reported favouring parental presence to parental absence<sup>34</sup> as seeing their parents during their procedure helped them as it “distracted from the procedure” and made them “feel safe”.<sup>34</sup> Children spoke positively about their parents saying, “dad made me feel brave”, and “I wanted mum, it helped me feel comfortable”,<sup>34</sup> although *how* their parents made a child feel brave or comfortable was not referred to further.

The support provided by parental presence may be influenced by the child’s age as one study found that whilst children aged 3–6 years and sometimes children 7–11 years preferred parental presence during the procedure, older children (12–15 years) preferred to be without their parent.<sup>24</sup>

##### *Feeling scared and uncomfortable: Children’s reports of negative experiences during their X-ray procedure*

Children reported negative experiences of having to wait a long time before their X-ray.<sup>32</sup> 78% (n = 14) of children reported that

they found the wait in the waiting room boring due to the lack of suitable recreational facilities such as magazines or music to distract them.<sup>36</sup> The children's opinions of the waiting room were mostly negative, stating that they “hated seeing other injured kids”, and that the waiting room was “smelly”, and “stressful”.<sup>36</sup> Children reported wanting to be distracted in the waiting room to prevent them from feeling nervous<sup>35</sup> or from the pain they were experiencing.<sup>32</sup> It was further reported that 9 out of 110 children found the waiting time to be exhausting, although it is not clear who reported this.<sup>32</sup> Long waits for their procedure resulted in some children demonstrating heightened negative emotions; out of 18 children, half reported feeling nervous and 11 reported feeling increased pain whilst they were waiting.<sup>36</sup>

Children described undergoing an X-ray procedure as “frightening and painful”,<sup>32</sup> “uncomfortable”<sup>29</sup> or “threatening”.<sup>33</sup> Many children reported experiencing pain during their X-ray procedure.<sup>29,36</sup> Children provided written comments that highlighted that the pain they felt could result from positioning for the X-ray and could be distressing, one child commented, “it really, really hurts a lot because they angle my foot and squeeze it”.<sup>32</sup> Feelings of distress were reported by many children, with 42% of the 110 children (n = 46) reporting that they experienced distress during their X-ray procedure.<sup>33</sup>

Children commonly reported fears around the unfamiliar and technical environment, equipment and the X-ray procedure.<sup>30,34,35</sup> One child reported that they would tell a friend that their X-ray was “scary” because of “the machine and the noise” and another child stated that they were worried because the “X-ray room was dark” and another child reported feeling “terrified”,<sup>35</sup> older children also reported negative emotions, such as being “nervous” in the X-ray room<sup>36</sup> or “nervous” about the procedure because of past negative experiences having X-ray procedures.<sup>36</sup> This emphasises the importance of children's experiences of their first X-ray procedure.

Some children described negative experiences of being ‘handled’ during their procedures.<sup>32</sup> One paper reported that a radiographer was observed to have “grabbed” a child's arm during the procedure, which “startled” the child and resulted in them becoming “distressed and crying”.<sup>35</sup> Negative experiences were reported by children who had also been overpowered in different ways, such as when the radiographers were perceived to be “quite rough” or “rushed them”.<sup>36</sup>

## Discussion

This scoping review examined what is known about the communication that occurs during children's X-ray procedures and children's experiences of their X-ray procedure. The review included evidence from eight papers reporting findings from five studies and has demonstrated that despite an increased recognition that children have a right to be listened to, involved, and have a say in their care, there is a lack of evidence linked to what this looks like for children undergoing an X-ray procedure. This discussion is structured according to the trajectory of a child having an X-ray procedure, focussing on the importance of preparation before the procedure and communication and support during the procedure.

### *Before the procedure*

The evidence highlights that children are often not well informed or prepared before their X-ray procedure and have multiple fears, concerns and misconceptions. This finding reflects literature centered on children's preparation and information needs of other clinical procedures.<sup>2</sup> This review indicates that children's preparation is most meaningful if conducted before arrival in the X-ray department and consolidated through

communication from radiographers during the procedure. This review supports existing evidence which shows that the timing of procedural preparation and information is important,<sup>37,38</sup> with preparation ideally starting early, however, this often leaves parents with the responsibility of knowing what will happen, what to say and how to answer their child's questions. Children's questions can include what the X-ray room will look like, what will happen during the X-ray, if the procedure would hurt, how to stay calm and if their parent can stay with them.<sup>37</sup> This review highlights how radiographers can have an important role in addressing children's unmet information needs and checking understanding with parents and children before<sup>37,4</sup> and during a procedure. By doing this, health professionals are more likely to be able to reduce a child's anxiety, address misconceptions, develop a child's health literacy skills<sup>2</sup> and support them to be involved in their procedures.<sup>4</sup> Earlier liaison with radiography departments and the use of engaging resources are needed to ensure children are prepared and can be meaningfully involved in their procedure.

### *During the procedure*

The review highlighted that communication during a child's X-ray procedure is often dominated by radiographers and this does not always support children to ‘join in’ and share their views and procedural preferences. Although there is literature to support the benefits of ‘One Voice’ rather than multiple voices speaking to and supporting a child during a procedure,<sup>39</sup> an overly dominant voice can limit a child's opportunity to join in the conversation. This reflects findings from other hospital contexts that demonstrates how children can struggle to be involved in choices and decisions when dominant voices overpower or overshadow their contributions.<sup>40</sup> Literature argues for a more child-centred approach to be adopted during health care procedures to reduce the dominant role health professionals often have.<sup>41</sup>

Whilst there are models and frameworks to support radiographers to communicate effectively with patients, such as the ‘AIDET’ framework<sup>42</sup> (acknowledge, introduce, duration, explanation, thank you), these provide guidance of one-way communication from the radiographer to a child. The evidence in this review suggests, that whilst one-way questions as featured in the AIDET framework can be helpful to invite children into communication about their procedure, there should be greater emphasis placed on a two-way communication method to expand the opportunities for children to get involved in sharing their views and making choices and decisions.

This review shows that despite X-ray procedures commonly considered as brief, non-painful or non-invasive procedures,<sup>43</sup> children experience anxiety and fear similar to that reported by children undergoing Magnetic Resonance Imaging (MRI) procedures.<sup>44</sup> This indicates that supporting children to have positive experiences of minor radiological procedures is important, especially as children are likely to experience these minor procedures first or more frequently than more complex procedures,<sup>22</sup> such as Magnetic Resonance Imaging (MRI) procedures.

### *Limitations of the scoping review*

There are several limitations to this work which should be considered when interpreting the findings. The scoping review findings are informed by English-language papers only and therefore evidence in papers written in other languages was excluded. The small number of papers included in this review are based in Western/developed countries, this could impact and limit the transferability of the review findings as children are afforded different rights, responsibilities or permissions, dependant on a



number of factors, including the position they have in their society, that can impact the level of participation they have during healthcare interactions and procedures.<sup>45</sup> In some contexts, dominant adultist perspectives persist and children's views continue to be missing, overlooked or muted.<sup>46</sup> The findings of the review are limited to children who can verbalise their thoughts and feelings and to a radiographer, however children are not a homogenous group and the ways that they choose or are able to communicate differ significantly and are influenced by various factors including their age, cognitive abilities and pre-existing conditions.

## Conclusion

This scoping review has highlighted children can feel unprepared before and scared during their X-ray procedure, and their voices are sometimes overpowered and excluded from communication. An informative and attentive radiographer can positively influence a child's experience of an X-ray procedure. There is a need for more research to explore children's own thoughts, feelings and wishes about undergoing these minor procedures, as well as further research in to how children communicate their feelings with parents and radiographers. Their insights could help shape and change how X-ray procedures are conducted by radiographers and improve the quality of the interactions had before and during the procedure, and the quality of the experience children have of undergoing these procedures.

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None.

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