Qualitative study: patients’ and parents’ views on brain tumour MRIs

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ABSTRACT
Background MRI is essential to the clinical management of children and young people with brain tumours. Advances in technology have made images more complicated to interpret, yet more easily available digitally. It is common practice to show these to patients and families, but how they emotionally respond to, understand and value, seeing brain tumour MRIs has not been formally studied.

Methods Qualitative semi-structured interviews were undertaken with 14 families (8 patients, 15 parents) purposively sampled from paediatric patients (0 to 18 years) attending a large UK children’s hospital for treatment or monitoring of a brain tumour. Transcripts were analysed thematically using the Framework Method.

Results Four themes were identified: Receiving results (waiting for results, getting results back, preferences to see images), Emotional responses to MRIs, Understanding of images (what they can show, what they cannot show, confusion) and Value of MRIs (aesthetics, aiding understanding, contextualised knowledge/emotional benefits, enhanced control, enhanced working relationships, no value). All families found value in seeing MRIs, including reassurance, hope, improved understanding and enhanced feeling of control over the condition. However emotional responses varied enormously.

Conclusions Clinical teams should always explain MRIs after ‘framing’ the information. This should minimise participant confusion around meaning, periodically evident even after many years. Patient and parent preferences for being shown MRIs varied, and often changed over time, therefore clinicians should identify, record and update these preferences. Time between scanning and receiving the result was stressful causing ‘scanxiety’, but most prioritised accuracy over speed of receiving results.

INTRODUCTION
Medical imaging such as MRI is a vital part of the detection, diagnosis and clinical management of brain tumours.1 Each MRI scan of the patient produces hundreds and often thousands of images (MRIs), and doctors want to show patients these to improve communication.2

Showing patients their medical images aids understanding3–5, ‘brings home’ the reality of their condition1–6 and makes them feel more involved in their healthcare1; though may produce a strong emotional impact - positive or negative4–5.9 Given the choice, many, but not all, patients want to view their medical images.4–10 There is a paucity of paediatric patients’ (under 18 years) views,4 despite their feeling particularly vulnerable after diagnosis.11 This study aimed first, to gain perspectives from young patients, and their parents, about the value and emotional impact from viewing brain tumour MRIs. Second, to explore what families understand from viewing MRIs, especially concerning the inherent uncertainty of the results.

METHODS
Participant selection and recruitment
Patients with brain tumours, and their parents, were recruited from the Neuro-oncology Clinic at Birmingham Children’s Hospital which treats around 50 new brain tumours in children and young people under 16 years annually. Paediatric oncologists approached eligible families, giving an overview, information sheet/s and gaining permission to pass on the parent’s contact details. After gaining written consent, NT conducted interviews in the participants’ preferred venue from May 2017 to March 2018. Purposive maximum variation sampling was used to provide the ‘broadest practicable range of participants’,12 (p.564) in
demographic variables such as age, gender, ethnicity, diagnosis and socioeconomic status (using postcode as a proxy). Patients were eligible if they had a brain tumour, were at least 3 months from diagnosis, not deemed by their clinician to be going through an acutely challenging period and either: on active treatment (up to 3 months following completion), or undergoing MRI surveillance of residual tumour. Thus this study does not include patients with low-grade tumours treated with complete surgical excision. Participants needed to be able to see the prompt (online supplementary figure), and respond verbally to questions. Patients with severe learning difficulties, and those under 8 years, were excluded due to anticipated communication difficulties, though their parents were eligible.

**Data collection**
Interview questions (online supplementary file) were informed by clinical experiences of the paediatric oncologists caring for the patients, literature review and the Research Advisory Group (RAG) (parents of current and former patients), then piloted with the target population. Questions covered initial responses to, usefulness of and what could be shown from MRIs.

Patients (accompanied by parent) were met twice. First, a session where they drew, played or talked with NT to become more comfortable around her. Second, a semi-structured interview, where a prompt (online supplementary figure) of another patient’s anonymised brain tumour MRI provided a focus, prompted memories and made it less intimidating. Interviews were audi-taped and transcribed verbatim (except one where notes were taken), with each question directed to patient, then parent. Fieldnotes were taken immediately afterwards.

**Data analysis**
Transcripts were thematically analysed according to Grounded Theory, with the Framework Method. NT analysed transcripts line-by-line. Coding from early interviews was discussed among the research team – NT (female Sociology research fellow), AP (male professor in Paediatric Oncology/clinician), SG (female professor in Medical Sociology) and SN (female lecturer in Nursing/former palliative nurse) - (investigator triangulation) as well as another clinician (GM), and the RAG to enhance ‘trustworthiness’. NT later compared codes across all participants, and grouped into themes. Participants had opportunity to give feedback on findings.

**FINDINGS**

**Participants**
Thirty-five families agreed to be contacted. Eleven later declined participation. Ten were uncontactable, ineligible or unavailable within the time frame. Fourteen families participated: 15 parents (13 mothers) and 8 patients. Interviewing continued until theoretical saturation: ‘new interviews produced little or no change’ to the codes.

Patients’ mean age was 12 years (range 8 to 15), and participant characteristics are given (table 1). Interviews were held at home (n=9) or hospital (n=5), lasting on average approximately 38 min (range 8 to 80).

**Thematic analysis**
Four themes emerged from the data: Receiving results, Emotional responses to MRIs, Understanding of images and Value of MRIs. Each had a range of sub-themes (figures 1 and 2), and illustrative quotations are provided (table 2). Few differences were found based on ethnicity, parent’s gender, socioeconomic status and being on treatment or surveillance. Results presented are for all participants, though differences between parents and parents discussed.

**Emotional responses to seeing MRIs**
Almost all parents said that they felt confused, worried, distressed, scared, shocked or overwhelmed on first seeing their child’s MRI. Some felt nothing or calmed. None wished that they had not seen MRIs, or been given the choice. Some parents would demand to see them or ‘freak out’ if they could not. While nearly half of the patients did not remember first seeing their MRIs, one found it ‘funny’.

Most of those who initially felt more painful emotions also mentioned feeling calmed, or becoming ‘hardened’ to these over

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**Table 1** Participant characteristics at interview

| Characteristics | Patients (n=8) | Parents (n=15) (14 families) |
|-----------------|---------------|-----------------------------|
| Gender          |               |                             |
| Female          | 4             | Female                      |
| Male            | 4             | Male                        |

| Percentage of deprivation (assessed by multiple indices of deprivation) | Patients (n=8) | Parents (n=15) (14 families) |
|--------------------------------------------------------------------------|---------------|-----------------------------|
| 10% least deprived                                                      | 1             | 10% least deprived          |
| 20% least deprived                                                      | 2             | 20% least deprived          |
| 30% least deprived                                                      | 0             | 30% least deprived          |
| 40% least deprived                                                      | 0             | 40% least deprived          |
| 50% least deprived                                                      | 2             | 50% least deprived          |
| 50% most deprived                                                       | 1             | 50% most deprived           |
| 40% most deprived                                                       | 0             | 40% most deprived           |
| 30% most deprived                                                       | 1             | 30% most deprived           |
| 20% most deprived                                                       | 0             | 20% most deprived           |
| 10% most deprived                                                       | 1             | 10% most deprived           |

| Age (years) | Age of child (years) |
|-------------|----------------------|
| Under 8     | Under 8 (interviewed parent only) |
| 8–12        | 8–12                 |
| 13–15       | 13–15                |

| Ethnicity | Ethnicity of child |
|-----------|--------------------|
| Caucasian | Caucasian          |
| Asian     | Asian              |
| Mixed     | Mixed              |
| Unknown   | Unknown            |

| Diagnosis (patient may have more than 1) | Diagnosis of child (may have more than 1) |
|------------------------------------------|------------------------------------------|
| Glioma                                   | Glioma                                   |
| Astrocytoma                              | Astrocytoma                              |
| NF1                                      | NF1                                      |
| Medulloblastoma                          | Medulloblastoma                          |
| Other                                    | Other                                    |

| Years since diagnosis | Years since child’s diagnosis |
|-----------------------|------------------------------|
| <1 year               | <1 year                      |
| 1–2 years             | 1–2 years                    |
| 2–5 years             | 2–5 years                    |
| 5–10 years            | 5–10 years                   |
| >10 years             | >10 years                    |

| Age at diagnosis | Child’s age at diagnosis |
|------------------|--------------------------|
| <1 year          | <1 year                  |
| 1–2 years        | 1–2 years                |
| 2–5 years        | 2–5 years                |
| 5–10 years       | 5–10 years               |
| >10 years        | >10 years                |

NF1, neurofibromatosis type 1.
time. Longer-term, many felt relief, reassurance and hope for the future from MRIs.

Receiving results
Waiting for results
All but two parents found this a long, difficult time to bear, though both reported that they initially found it hard. Just under half of patients found the wait long, although no patients on the autistic spectrum reported this. When presented with a hypothetical choice of potentially less accurate but faster results, a strong majority of parents chose accuracy over speed. Half the patients were unsure, with nearly half preferring accuracy.

Uncertainty
Every parent mentioned the uncertainty of the condition and the future; almost all mentioned anxiety related to MRIs and the results (‘scanxiety’).²¹ ²²

Coping and strategies
Virtually all participants mentioned using cognitive processes to ‘put up with’, or actions to cope with the difficult times of the condition,²³ (p.460) such as receiving the diagnosis, relapse or facing surgery, and we intend to explore these in a future paper.

Preferences to see MRIs
This varied greatly, ranging from always to never seeing the image. Some wanted to see only ‘significant’ changes, ‘good news’ or ‘bad news’.

Understanding of images
What images can and cannot show
The vast majority of responses regarding what MRIs could show were correct: structures of the brain; anomalies; the size, shape, location and presence (or absence) of the tumour and effects of treatment. Half the patients referred to tumour size, as did all the parents; though often with the implicit understanding that the bigger the tumour, the more life-threatening.

Generally, participants were clear what images could not show: the future; the cause, type and all the effects of the tumour; the patient’s feelings; when the patient was cured or next treatment needed.

Confusion
Most could remember an occasion when they found MRIs confusing. Nearly half expressed doubt that they understood what was being shown; even after viewing for many years. Many commented that MRIs were immediately ‘obvious’, even to people without a medical background. MRIs were often described as ‘black-and-white proof’; something seen in the images was real. Showing MRIs in context (side-by-side with previous MRIs) improved understanding, as did ‘framing’ the information first,²₄ for example, ‘good news’.

Figure 1  Thematic schema 1. Though initial emotional responses to seeing MRIs varied, participants tended to ‘harden’ to more painful feelings over time, and find emotional benefits, and other values, in seeing MRIs. The uncertainty and risk with their condition, especially receiving results, was mitigated for some by the feeling of control, and reassurance provided by the images. Many mentioned strategies to cope.

Figure 2  Thematic schema 2. Generally, participants were clear on what MRI could and could not show. Though a few participants were unclear on whether the MRI could show the cause of the tumour, or ‘everything’, led to confusion.
### Table 2 Illustrative quotations

| Receiving results |  |
|--------------------|---|
| Waiting for results | C: I need the results. But if it means ‘I’ve gotta wait, then you sort of have to.’ P2, p5, 165 |
| Uncertainty and risk | C: I felt worried because there was a lump and worried what it would do when I get older.’ P9, p2, 62 |
| ‘There’s no hundred per cent in anything.’ P5, p5, 151 |
| Accuracy or speed in reporting? | C: Obviously it’s, quite, like daunting, the wait you have to have. ‘Cos’ you wanna, I sort of wanna know, like ‘Is anything different?’ P2, p4, 156 |
| Speed over accuracy | P: Even if they, someone gave ya a phone call. (NT: Mmmm.) Just to say, ‘We’ve had a, quick scan. We think everything’s okay, but, we’re not puttin’ our name against it, until ya come in’. It’s just that, not knowing, (NT: Mmmm.) that’s the thing an’ it, an’ it’s awful.’ P10, p13, 488 |
| Preferences to see images | P: ‘We don’t look at the scans any more. We just go in and discuss the changes.’ P2, p2, 54 |
| ‘I always want to see them, obviously.’ P7, p2, 50 |
| ‘I couldn’t care less, whether we had a picture or not.’ P10, p11, 377 |
| ‘Now when I go, I prefer seeing the scans.’ P12, p2, 53 |

| Emotional responses to first seeing MRIs |  |
| Positive | P: ‘You were giggling (when first shown MRI)? (NT laughs. C. Yeah.) (…)’ |
| C: ‘Cos’ um, ‘cos’ it was fun-ny.’ P6, p2, 60 |
| ‘Sometimes I do think… images of your brain are really intrusive. ‘Cos’ it think it’s so personal. But then, at the same time, erm… I was happy to see it.’ |
| P14, p3, 90 |
| Neutral | P: And then when I actually went into the room and saw the scan, it didn’t really mean a lot to me, what I saw.’ P11, p3, 83 |
| Negative | ‘I could see the scans and I knew what it meant… I’d… get a little bit worried and I would cry or something, cos it made me feel upset, ‘cos’ obviously I knew what I’d have to go through again.’ P12, p2, 63 |
| ‘I just remember my first thought, thinking ‘That’s it. There you go. They’ll um, erm… That’s it. That the end of (Child), and knowing that [they’ll] die. (…) Because the tumour was massive.’ P12, p2, 78 |

| Understanding of images |  |
| Images that can show | P: ‘It was interesting to see where the er, you know the brain, the water brain, the water of (their) brain goes and that.’ P8, p5, 161 |
| Anomalies | P: ‘If there is an abnormality, somewhere else as well, like… one side of the head, s’like side of your brain is slightly bigger than the other as well or misshapen, it shows that as well.’ P13, p2, 50 |
| Tumour present or not | NT: ‘Is it (the tumour) the smaller circle or the bigger circle?’ C: ‘Little one.’ P6, p4, 144 |
| ‘Is it in the head, what size is it, is it okay.’ P2, p3, 87 |
| Tumour size | ‘I, I found it really informative to see (the doctor) and then to be able, for (them), to show me, especially with the MRIs with the different dimensions of it. (Child)’s was always changing shape.’ P7, p2, 66 |
| Tumour shape | ‘I, I found it really informative to see (the doctor) and then to be able, for (them), to show me, especially with the MRIs with the different dimensions of it. (Child)’s was always changing shape.’ P7, p2, 66 |
| Tumour location | ‘So for me, it’s just showing me where the brain tumour isss, in, my head… really.’ P2, p1, 78 |
| Origins/how long tumour there | ‘Erm, it (the MRI) can tell you, like what, they, what they need to get rid of (NT: Mmmm.), why it’s there… (…) Erm, how it’s caused, and things like that.’ P8, p2, 66 |
| Next treatment | ‘Erm, they (MRIs) might, they might tell you things like chemotherapy and things like that.’ P8, p2, 70 |
| Healing | ‘Everything we needed to know regarding the tumour and (their) healing process and if it spread, we knew from, the MRI.’ P6, p12, 398 |
| Everything | ‘NT: Is there anything you think the scans, don’t tell you?’ C: ‘No. Like it’s all there. Good.’ P5, p4, 118 |
| Images that cannot show | ‘Can’t tell youuuu, ummm, whether it’ll come back or not.’ P8, p3, 92 |
| ‘It can’t forecast anything for you. So it’s only showing a picture of there and now.’ P7, p3, 78 |
| Next treatment | ‘It can’t tell you how long it will be, to wait, for your op ter, actually take place. (pauses)’ P8, p3, 93 |
| When tumour active or not | ‘Say if my tumour’s growing when they’d taken a scan, and they can see it over time on the scan, how it grows, without like on the same photo.’ P12, p5, 166 |
| Feelings | ‘It, it, it cannot tell how I’m feeling. (Coughs) (NT: Mmmm.)’ (Silence) P3, p5, 183 |
| Origins/how long tumour there | ‘Err, they can’t tell you how…, like, why it’s there, and how… So, like, why so why it’s happened to you… and not someone else.’ P8, p3, 91 |
| When cured | ‘Can’t tell youuuu, ummm, whether it’ll come back or not. (NT: Mmmm. Mmmm.)’ P8, p3, 91 |
| ‘But what else does it not tell me? Erm. (Silence) I don’t know. I, I’m not sure. (…) Ya know if it’s gone, or whatever.’ P11, p5, 169 |
| All the effects from the tumour | ‘P: Can’t show side-effects. Mmmm (…) It shows, what’s goin’ on in the brain physically, but not all the, ‘motions, and the, all thee… that type of side of things.’ P3, p10, 351 |
| Tumour type | ‘P: Don’t know if they could, they wouldn’t be able to tell what sort of tumour it was.’ P8, p3, 85 |
| Confusion | ‘C: I need the results. But if it means ‘I’ve gotta wait, then you sort of have to.’ P2, p5, 165 |
| Limits of understanding | ‘I always want to see them, obviously.’ P7, p2, 50 |
| ‘I couldn’t care less, whether we had a picture or not.’ P10, p11, 377 |
| ‘Now when I go, I prefer seeing the scans.’ P12, p2, 53 |

| ‘Seeing is believing’ or proof | P: ‘I don’t like just being told ’No. Everything’s fine’. (NT laughs) I’m like, ’Well, hang on, prove to me that it’s fine, first.’ P13, p2, 57 |
**Value of MRIs**

**Aesthetics**
Half the participants wanted to view images out of curiosity, or fascination, as did some family and friends.

**Aiding understanding**
Almost every participant found MRIs aided their understanding (and that of loved ones) by visualising an ‘invisible’ condition; even the parent who had not seen any, believed MRIs would enhance understanding. Parents sometimes wanted to show their child MRIs when they were older and could understand what the child had been through.

**Contextualised knowledge/emotional benefits**
Many found seeing the images reassured them that the prognosis was better than they feared, or had previously been. Seeing the images gave some parents perspective, making the tumour a more tangible problem to solve and reducing anxiety, fear or distress. For a few participants, MRIs made the condition ‘more real’. One parent reported MRIs eased grieving for their anticipated healthy child and aided acceptance of the situation.

**Enhanced control**
Most parents felt more informed about the condition and better prepared emotionally to handle it; being ‘in the dark’ without MRIs. Only parents (half), wanted to keep images for their personal records. A strong majority recognised that others would have different preferences for viewing MRIs (all/no/specific images), so the choice was important.

**Enhanced working relationships**
Being able to view the same images as their clinical team made a few parents feel more involved in their child’s healthcare, promoting transparency and increasing trust.

**No value**
Patients not wanting to view MRIs believed it would not bring any benefits. The one parent that did not view MRIs believed that any benefits would be outweighed by increased distress.

**DISCUSSION**
This study gained perspectives from young patients and parents on how they emotionally respond to, understand and value seeing brain tumour MRIs. Feelings on first seeing MRIs varied, though patients often did not remember. Feelings often changed over time, as did preferences to see MRIs. All families that viewed these found some value in it. The one parent that had not viewed MRIs presumed that they would increase their understanding, and valued having had the choice. Generally, patients and parents understood what could and could not be seen from...
MRIs, though there was an assumption, mostly by parents, that the bigger the tumour, the more life-threatening. Though there are similarities to adult patients viewing their medical images, there are also differences. Similar to previous studies, this study found that there was a strong sense that what could be seen in them was real and self-evident. Though almost all the parents and nearly half the patients suggested that what was shown was ‘obvious’, over half the parents and all the patients doubted their understanding of, or were incorrect regarding, what the images showed. Half the parents and a quarter of the patients expressed both of these contradictory views. This may show the power of the image, which suggests an exact correspondence with the body, or trust in MRIs from their being used as ‘proof’ of disease by doctors when visible symptoms are absent.

Parents mostly mentioned being confused when first viewing MRIs, while parents tended to mention ambiguity, such as borderline changes, viewing from a different angle or unfamiliar medical terminology. Though almost all participants found MRIs confusing at some point, almost all found MRIs aided their understanding. ‘Framing’ the information, and viewing the MRI side-by-side with a previous one, helped clarify ambiguities.

Past research has found that with cancer: ‘uncertainty characterises the entire experience…to the period after treatment, when recurrence is a threat…Patients feel a loss of control’. (p.263) Parents of patients with paediatric brain tumours also experience this uncertainty. It is perhaps unsurprising that parents’ most common response about what images did not show was the future, suggesting their desire for certainty regarding their child’s condition. (MRIs often enhanced coping, which a future analysis will explore.) This explains also why only two parents would prefer faster MRI results at the cost of accuracy. No patients wanted this, though many were unsure about prioritising speed or accuracy, or did not want any additional information. Interestingly, nearly half the parents would be keen to know the results from emerging MRI techniques providing information on tumour type, growth and seriousness. Advances in MRI are increasingly giving this information, raising the important question of how to incorporate this knowledge in clinical practice.

Previous studies have found ‘scanxiety’ or ‘fear and worry associated with imaging, both before and after a test (before the results are revealed) in adolescents with cancer. Only 13 to 15-year-old patients mentioned scanxiety, while almost all parents did. Most patients now paid attention to MRIs when previously they had not; having not understood their importance when younger. Parents’ preferences for seeing MRIs were more varied, and for some, had changed over the years, often due to a more stable or positive prognosis.

Over half of both patients and parents wanted to view their images for aesthetic reasons, found previously with adult patients. Only parents (one-third) found that MRIs made the tumour a more tangible problem to solve, or lost some of its power to, for example, distress, terrify or overwhelm. None of the participants talked about MRIs taking the focus away from them in consultations, or feeling more valued or respected by their doctor from having the images shared. Nearly a third of parents suggested that they had a right to see their child’s images. Only parents, not patients, reported feeling more involved, as well as a sense of transparency and trust, from viewing the same images as their clinical team.

RECOMMENDATIONS
- Families should have the option to view their MRIs, though be aware that it may cause a range of unpleasant emotions (often reducing over time). Clinical teams should therefore identify, record and regularly update, each family member’s preferences regarding seeing MRIs.
- Patient families may value a preliminary report by the clinical team ahead of the consultation or radiology report, despite reduced accuracy.
- MRIs can be confusing, even after many years, so clinical teams should initially ‘frame’ their information-giving, for example, ‘good news’ and always make results as clear and unambiguous as possible.
- Clinicians should regularly clarify that the size of the brain tumour, or an increase in size, does not automatically mean a poor, or worse, prognosis.
- Future research is needed to explore factors that impact on, and address, misunderstandings and the challenges of uncertainty in test results; and how medical images can be resources for patient families.

LIMITATIONS
This was a single site study, so the ethos, procedures and processes of the particular organisation may have influenced participants’ responses. Different responses may have been given if parents and patients were interviewed independently, though questions were addressed to the patient first, so as to avoid them giving their perceived ‘correct response’, or attempting to ‘shield’ their parent from their worries. However, having a parent presence was thought to make the patients more comfortable, relaxed and more likely to provide answers, and support communication between participant and researcher. Families were not approached for recruitment if they had recently experienced a relapse or a poor prognosis, so as not to increase their burden or distress, which may have narrowed the range of responses. Maximum variation sampling was used to capture a diversity of experience, given these limitations.

‘Recruitment challenges and sufficient sample sizes are a frequent dilemma’ when researching a rare condition. Although 33 families initially expressed interest in the study, only 14 participated. ‘Bad timing’ and ‘busy lives’ were reasons addressed to the patient first, so as to avoid them giving their perceived ‘correct response’, or attempting to ‘shield’ their parent from their worries. However, the sample was large enough to capture a range of experience, yet small enough to analyse in-depth, and reached theoretical saturation.

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