

# Scalp cooling: a qualitative study to assess the perceptions and experiences of Australian patients with breast cancer

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## Abstract

**Purpose** Chemotherapy-induced hair loss is a common and distressing side effect. Scalp cooling is increasingly being used to reduce this hair loss. The purpose of this study was to explore patients' perceptions and experience of scalp cooling.

**Methods** Seventeen Australian women with a diagnosis of breast cancer participated in a focus group ( $n = 4$ ) or a semi-structured interview ( $n = 3$ ). Both scalp-cooled and non-scalp-cooled participant views were sought. Participant perceptions and experiences of scalp cooling were discussed as part of patients' overall chemotherapy experience and a thematic analysis conducted.

**Results** Five themes emerged from the data: (1) scalp cooling in the context of treatment decision-making discussions, (2) hair loss expectations vs. experiences, (3) treatment-related expectations vs. experiences, (4) the promise of faster regrowth and (5) satisfaction with scalp cooling and future scalp cooling decision-making considerations. Information during treatment decision-making was the primary factor that influenced whether patient expectations were met. Faster regrowth was a motivator to continue treatment. Efficacy and tolerability of scalp cooling influenced future hypothetical treatment

decision-making for both scalp-cooled and non-scalp-cooled participants.

**Conclusions** This study provides the first in-depth exploration of patient attitudes to scalp cooling. The results highlight a need for accurate information regarding efficacy and tolerability as well as hair care information to assist patients with their treatment decision-making.

**Keywords** Breast cancer · Scalp cooling · Qualitative · Interviews · Focus groups

## Introduction

Hair loss is a common side effect of many chemotherapy regimens and is a significant source of distress for patients [1, 2]. Women with breast cancer frequently rank hair loss as one of the top three most distressing side effects [3–5], with approximately one third of patients mentioning hair loss during their first consultation with the oncologist [6]. Of concern, for a small number of patients, the fear of hair loss influences their treatment decisions. For patients, hair loss is a visual reminder of their cancer and represents a public statement of cancer [5].

Hair loss typically starts between 1 and 3 weeks after first dose, depending on chemotherapy regimen, with total hair loss evident within the first few treatment cycles. There is a small but growing body of literature confirming scalp cooling is an effective treatment to reduce chemotherapy-induced hair loss [7–9]. Scalp cooling is a supportive care intervention applied concurrently with chemotherapy, and although the mechanism is not completely understood, it is hypothesised that scalp cooling works through vasoconstriction leading to decreased local concentration of chemotherapy, decreased cellular uptake at the hair follicle and reduced metabolic uptake.

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Many of the efficacy studies conducted to date have involved small sample sizes or single sites; however, consistent with previous reviews [10], a recent meta-analysis summarising the available data confirmed scalp cooling significantly reduced chemotherapy-induced alopecia (RR 5 0.38, 95 % CI 5 0.32–0.45) [11]. Additionally, a large cohort study conducted through the Dutch Scalp Cooling Registry confirmed 50 % of the patients with scalp cooling had good hair preservation, with a range of between 8 % (TAC chemotherapy) to 94 % (docetaxal) The study also reported that higher dose and shorter infusion time, older age, female gender and non-West-European type of hair significantly increased hair loss during scalp cooling [8]. Despite the variability, the technology is reported to be well tolerated and there is high patient satisfaction [9, 12–14]. For example, Betticher and colleagues found that scalp cooling reduced the risk of hair loss by 78%, with adverse events experienced by 3.3 % ( $n = 8$ ) of participants and only 30 of 199 patients (12.6 %) receiving scalp cooling discontinuing due to tolerability issues such as

headaches, sensation of cold or pain [9]. Similarly, Protière and colleagues evaluated tolerance of scalp cooling among 48 women receiving mitoxantrone and cyclophosphamide for their breast cancer and reported acceptability was high, with women generally very satisfied with their choice to scalp cool. Only 9/48 patients reported tolerability issues significant enough to cease scalp cooling [7].

Although the technology has been available in Europe for more than a decade, scalp cooling has until recently been unavailable in Australia. The increase in the use of scalp cooling has primarily been driven by consumer demand. However, patient experiences have not been explored in depth and there is a paucity of information about patient decision-making with respect to scalp cooling. The aim of this study was to qualitatively explore both scalp-cooled and non-scalp-cooled patient experiences and perceptions of scalp cooling to gain an understanding of patients' perspectives and potential motivations for undergoing scalp cooling as well as the unmet needs they may experience (Fig. 1).

**Fig. 1** Interview schedule for both focus groups and interviews

#### Introductory Hair Loss Questions:

- What changes in your hair did you expect before chemotherapy?
- How do you feel about experiencing changes in your hair/hair loss during chemotherapy?
- How did changes in your hair and/or hair loss affect your everyday life?
- Did you have any expectations about growth of hair?
- How do you feel about experiencing growth of hair during/after chemotherapy?

#### Scalp cooling experiences:

- Can you tell me a little bit about your experiences of scalp cooling?
- What perceptions did you have about scalp cooling before you started chemotherapy?
- What information (if any) did you receive from your cancer care team about changes in hair or hair loss due to chemotherapy?
- What information (if any) did you receive about scalp cooling (prompt: during treatment decision-making discussions, subsequently)?
- Is there other information that you would have liked to receive?
- Based on your experience, what things should people know before making the decision to have scalp cooling?

#### Scalp cooling future considerations:

- If you needed to have chemotherapy in the future, based on what you know currently, would you use scalp cooling? What factors would influence this decision?
- What would encourage/discourage you to choose to use scalp cooling?
- Would you use scalp cooling if you knew there was a one in two chance that it may not preserve your hair?
- When would you make the decision to stop scalp cooling if you perceived it was not working?

#### For those who have had scalp cooling

- Would you recommend scalp cooling to others? If so why, if not why not?

## Methods

Eligible participants were women diagnosed with a histologically confirmed breast cancer between October 2010 and March 2014 who had and completed chemotherapy treatment at a single metropolitan cancer centre in Sydney, Australia. Scalp cooling was available at this site from 2010. Potential participants were identified from hospital records and purposefully sampled to include both scalp-cooled and non-scalp-cooled patients. Participants were eligible if they had been treated for breast cancer after 2010, had sufficient English to participate in a focus group or interview and were aged 18 years or older. Potential participants were contacted by the research staff and invited to participate in a focus group. Those who were unwilling to participate in a focus group discussion were offered the option of a confidential semi-structured face-to-face interview. Written consent was obtained for all participants. Interviews and focus groups were conducted between August and September 2014.

The focus groups and interviews were conducted by a member of the research team (AOR) experienced in group facilitation in a cancer context. A semi-structured interview schedule was developed using open-ended questions and more specific probes. Participants were asked to reflect on the impact of chemotherapy-induced hair loss and their perceptions and experiences of scalp cooling. All focus groups and interviews were digitally recorded and transcribed verbatim. A thematic analysis was undertaken using a constant comparative methodology. Recruitment continued until no further new themes emerged from the data, that is theoretical saturation of themes had been achieved. To confirm saturation, a further three interviews were conducted to check no additional themes could be identified.

Based on a grounded theory approach, the data was analysed using open, axial and selective coding [15]. Two researchers (JS and BB) independently reviewed all transcripts and compared and categorised participant responses. An initial coding framework was developed and the data coded to examine the relationships and patterns within and among the categories. The transcripts were then recoded to confirm the framework and identify higher order concepts. At each step of the analysis, all inconsistent findings were discussed until consensus was reached. Ethics approval was obtained from St Vincent's Hospital Human Research Ethics Committee (approval: 13/254).

## Results

Four focus groups (mean length 60.7 min) and three interviews (mean length 46.2 min) were conducted. A total of 14 women participated in the focus groups, and 3 women elected to participate in interviews. Reasons for electing to participate

in an interview rather than a focus group were lack of availability to attend the scheduled focus group and wish for confidentiality. Both women who underwent scalp cooling as an adjunct to their chemotherapy ( $n = 11$ ) and women who had chemotherapy alone ( $n = 6$ ) were included in this study to explore the breadth of patient experiences with respect to scalp cooling perceptions and decision-making. Non-scalp-cooled participants included women who had been offered scalp cooling and had elected not to cool ( $n = 3$ ) and women not offered scalp cooling due to scheduling or efficacy issues ( $n = 3$ ). Table 1 lists focus group and interview participation for both groups. Mean age of participants was 55.2 years (range 43–74 years). All participants had completed treatment between February 2011 and July 2014. Table 2 lists participant demographic and clinical characteristics. Of the scalp cooling participants, two indicated that they prematurely ceased scalp cooling due to hair loss or tolerability issues.

Participants' narrative accounts of their cancer treatment highlighted a range of experiences related to hair loss and scalp cooling and confirmed hair loss as an important side effect for patients. Motivations for agreeing to scalp cooling were similar to those reported previously and included the impact of hair loss on self-image and illness representation. In general, scalp cooling was perceived as a proactive way of managing hair loss. Further exploration of patient perceptions of their scalp cooling experiences highlighted five main themes: (1) scalp cooling in the context of treatment decision-making discussions, (2) hair loss expectations vs. experiences, (3) treatment-related expectations vs. experiences, (4) the promise of faster regrowth and (5) satisfaction with scalp cooling and future scalp cooling decision-making considerations. Examples for each of the themes and related sub-themes are provided in Table 3.

### Theme 1: Scalp cooling in the context of treatment decision-making discussions

Participants who underwent scalp cooling reported their oncologist discussing scalp cooling in the context of a wider treatment discussion. The information provided was generally

**Table 1** Focus group and interview participation

	No. of participants	Scalp cooled	Non-scalp cooled
Focus group 1	6	5	1 <sup>a</sup>
Focus group 2	2	2	0
Focus group 3	2	2	0
Focus group 4	4	0	4
Interviews	3	2	1
Total	17	11	6

<sup>a</sup> Participant attended the wrong focus group but elected to participate

**Table 2** Participant demographic characteristics

Variable	No. of participants	
Ethnicity	Caucasian	16
	Non-Caucasian	1
Education	Primary school only	0
	Lower general secondary education or vocational training	3
	Pre-university education, high vocational training, university	14
Living arrangements	Living alone	1
	Living with spouse/partner only	4
	Living with a child, child in law, grandchild	1
	Living with another relative	1
	Living with unrelated people	0
Employment	Living with spouse/partner and children	10
	Fulltime employment	5
	Retired	2
	Disability support pension (carer)	4
	Part-time employment	1
WHO clinical status	Unemployed	4
	Homemaker	1
	Fully active	14
	Restricted in physically strenuous activity but ambulatory	3
	Ambulatory/capable of self-care	0
Treatment(s) received	Capable of limited self-care	0
	Completely disabled	0
	Surgery + chemotherapy	5
Chemotherapy	Surgery + chemotherapy + radiotherapy	12
	Chemotherapy only	0
	FEC-D	7
Scalp cooling system	TC	8
	DOCE	2
	Penguin caps	5
	Paxman	1
Percentage hair loss	Digitana	5
	Non-scalp cooled	6
	<20	1
	21–40	5
	41–60	1
	61–80	4
71–80	2	
81–100	6	

*FEC-D* fluorouracil epirubicin cyclophosphamide + docetaxel, *TC* docetaxel cyclophosphamide, *DOCE* docetaxel

verbal, and current scalp cooling efficacy evidence was discussed together with the oncologist's anecdotal experiences. Participants were able to recall being informed of the possibility of some hair loss, and many were aware that the treatment was new in Australia. Faster regrowth post-scalp cooling was also a feature of these conversations. Participants reported receiving less information about the process of scalp cooling and tolerability issues. They also

received little information from either the oncologist or the nursing staff about how to care for their hair during treatment or information that could be given to hairdressers. A number of the non-scalp-cooled participants reported the option was not presented as part of their treatment decision-making. These participants generally became aware of scalp cooling through other patients, and three were offered the option but declined.

**Table 3** Participant responses to illustrate themes

Theme	Participant response	Participant identifier
Theme 1: scalp cooling in the context of treatment decision-making discussions	Yeah, I suppose it was [my oncologist] who suggested it to me when I was blubbering [crying] in the office about my hair, and I don't like seeing me bald, so she suggested using the cold caps, and like that she didn't guarantee - you know, at the time - like complete hair. She said you might lose some of hair and it is experimental	FG2 ,SC8
	[oncologist] said that if you use the cold caps, when you start your chemo, it will thin out. It more than likely will thin out, and that's what I kind of expected. I didn't know anything more after that. Like the condition of the hair or anything like that	FG2, SC7
	I wasn't told directly about it, but I made friends with another woman at the time...and she was saying, "I'm really hoping to get the cold cap." And I thought what's the cold cap? So I asked the breast care nurse,	FG1, NSC6
Theme 2: hair loss expectations vs. experiences	I thought in the beginning - when I had the cooling cap on there would be no hair loss.	FG2, SC7
	slightly coloured by the woman I'd met, who had lost very little...So I just think I assumed I'd be one of the ones that wouldn't lose any	FG3, SC9
	That it was happening too early. I started to lose hair about six days before my second treatment, and I was getting three handfuls a day and I thought, oh, gosh, this isn't going to be good. I probably thought that I wouldn't notice it quite so much.	FG3, SC10
	But I found it quite hard to get some of the knots out because I didn't like to wash it too much because I didn't want it to fall out. So caring for it was quite tricky, and I wasn't really clued up on how to treat it initially	FG1, SC4
	...I saw it as my failing when I lost hair, not the cool cap failing. So I don't know if that would put undue pressure on me to think I failed this and then be disappointed in myself for, one, having got cancer and then to have failed at hair loss too.	FG1, SC1
	I felt guilty that I got breast cancer and that was my failing, and I felt guilty that I obviously had used the wrong shampoo or I hadn't done this right or I hadn't done that right... It was difficult.	FG1, SC2
	And I think because we did have hair, you're going through all the ravages that the chemotherapy can give you. You've got your hair. You don't need to worry about scarves. I thought that was a huge help.	FG1, SC5
	because I've got a bit of hair, no-one recognised that I'd be unwell, so I don't get all the questions and things when I'm out. I can just put my hat on and get on with life and we normal - whatever normal is.	FG2, SC8
	I didn't know when it was going to stop, and I didn't want to be left in the position where I had woken up and I have no hair left now and I forgot to buy a wig	FG2, SC8
	Because I kind of - I kind of knew - you know, two weeks before I came for my infusion - I mean the hair that was around the house - I was more in tears over that - thinking, I'm going through all of this and it's - so it was kind of, okay, we've made this decision [to stop scalp cooling]. Let's just get on with it.	FG3, SC10
Theme 3: treatment-related expectations vs. experiences	because you have more than one treatment, you learn how to cope with the cold caps. So for me it got better. The first one was horrendous, and then you realise you can take this or do that or prepare this way ready for your day.	FG1, SC3
	I was starting to get quite anxious before I came in here ...you learn how to cope with the day of treatment, with the cold caps. So for me it got better.	Int1, SC11
Theme 4: the promise of regrowth	Well, I was a bit concerned because I was losing lots of hair, but [nurse] kept saying, "No, keep it up. You won't lose much more. When your hair does grow back, it'll grow back quicker than if you don't." And it did. She was right with everything	FG1, SC1
	So I lost about 70 % of my hair. There was no time I was going to stop. I was determined to see it all the way through, and [nurse] said If you don't do and you lose all your hair, it'll take you much longer. I grew up on a farm and my farmer brother reminded me it's like when you plant crops just before winter and they're germinated under the ground, so when the spring comes they come up immediately. So that's	FG2, SC7

**Table 3** (continued)

Theme	Participant response	Participant identifier
Theme 5: satisfaction with scalp cooling and future scalp cooling decision-making considerations.	the image that I had; that in fact as soon as I stop it'll start to grow, and that is what happened	FG4, NSC3
	For example, a couple of other ladies that I became friends through this journey, they had used cold cap and they don't wear a wig anymore [while I still do]	
	There is pain involved in it. But I would still do it	FG2, SC8
	Oh, my goodness, yeah. I mean, it sounds like - all those little complicated things, and I said to someone asked me at the end was I glad I did it? Absolutely.	FG2, SC7
	But I think that what's important is that the whole process is probably unpleasant enough, and you really want to get out of the place as soon as you	Int, NSC5

FG focus group, Int interview, SC scalp-cooled participant, NSC non-scalp-cooled participant

## Theme 2: Hair loss expectations vs. experiences

Scalp-cooled participants reported a range of hair loss experiences from thinning of hair to considerable or complete hair loss. A number highlighted that although their oncologist had explained that some hair loss was possible, they perceived that they would be a patient with the more positive outcome. This precipitated a mis-match between expectations and experience for some participants.

Optimism and wishful thinking were the primary motivators driving participant expectations. Not surprisingly, many scalp-cooled participants described the distress they experienced when their hair started to fall out and gave graphic accounts of when they realised that they were losing their hair. Hair care was also a source of stress for some scalp-cooled participants as many perceived that they had insufficient information about the types of products to use or how often they should wash their hair to minimise hair loss. They also expressed a need for information to give their hairdressers, as they were also unaware of how to care for hair during scalp cooling.

A number of scalp-cooled participants perceived the hair loss to be a failing on their part. These women reported being worried that improper hair care was a contributing factor to their hair loss. For a small number of participants, a consequence of their high expectations was anxiety and hyper vigilance around hair care and hair loss. These participants highlighted that because they were unsure how much hair they would lose and from what part of the head, they were constantly checking their hair. In contrast to those women who were disappointed with the level of hair loss, a number of women reported less hair loss than expected and were satisfied that scalp cooling contributed to maintaining a higher quality of life during chemotherapy. These women were able to disguise their patchy hair loss and felt less identifiable as a patient with cancer.

All non-scalp-cooled patients experienced hair loss. However, as this was an expected consequence of chemotherapy, participants reported less shock and were more likely to actively control hair loss by shaving their head once hair loss commenced. These participants also described being proactive in arranging head coverings such as wigs in anticipation of their hair loss. Although scalp-cooled patients also described using caps and wigs, there was less planning for hair loss and more reactive management once hair loss started.

Two participants who started scalp cooling also described their decision to discontinue treatment. One of these participants highlighted the time and discomfort far outweighed the outcome of preserving the small amount of hair they retained, although lack of hair to preserve prevented the second participant continuing.

## Theme 3: Treatment-related expectations vs. experiences

Scalp-cooled participants also highlighted the level of pain and discomfort associated with scalp cooling was greater than they had expected. Although none of the participants reported significant side effects such as headaches, several reported pain, anxiety and length of treatment as issues. For the majority of participants, the level of discomfort was insufficient to discontinue treatment. The two participants, who did stop due to hair loss, reported decisional regret with respect to starting scalp cooling, given the level of discomfort and their poor outcomes. Non-scalp-cooled participants perceived scalp cooling as painful. A number of these participants saw this as a barrier to treatment uptake.

## Theme 4: The promise of regrowth

Regardless of the amount of actual hair loss, scalp cooling participants perceived one of the major benefits of scalp cooling was faster regrowth. This influenced participant decisions to undergo and to continue scalp cooling. Faster



regrowth was further reinforced by the nursing staff, and only one participant understood that currently the evidence regarding regrowth was anecdotal. Furthermore, the perception of faster regrowth associated with scalp cooling was also held by non-scalp-cooled participants, who saw their regrowth as significantly slower than those who underwent scalp cooling. The majority of scalp-cooled participants perceived that their regrowth was faster than anticipated, although the differences in hair quality and texture were noted.

#### Theme 5: Satisfaction with scalp cooling and future scalp cooling decision-making considerations

The majority of scalp cooling participants were satisfied with their decision to undertake scalp cooling, and regardless of hair loss would likely scalp cool again. Non-scalp-cooled participants were more cautious about considering future scalp cooling. For both scalp-cooled and non-scalp-cooled participants, efficacy and side effects were the key factors influencing future hypothetical scalp cooling participation. Although a small number of scalp-cooled participants indicated the discomfort was too great to scalp cool again, the majority of non-scalp-cooled participants perceived the additional treatment time per cycle and discomfort outweighed the benefit of retaining hair. Having lost their hair, this group perceived they could cope with hair loss in the future and the 50 % chance of losing hair was not seen as worthwhile investment of time.

## Discussion

This study sought to qualitatively explore the scalp cooling experiences of Australian breast cancer patients. Overall, participant experiences were positive. However, scalp-cooled participants highlighted a disparity between hair loss expectations and experience. However, despite this mis-match, participants did not report scalp cooling to be overly burdensome. Faster regrowth was a motivator to start or continue treatment for the majority of participants. Participants highlighted unmet information need associated with the process of scalp cooling, hair care and tolerability issues. Non-scalp-cooled patients also viewed scalp cooling positively, although were ambivalent about whether they would use the technology in the future. Efficacy and tolerability of scalp cooling reportedly influenced future hypothetical treatment decision-making for both scalp-cooled and non-scalp-cooled participants.

The range of hair loss experiences reported by scalp-cooled patients is consistent with previous findings that scalp cooling is effective for approximately 50 % of patients [8, 12]. The women in this study reported their expectations of the scalp cooling to preserve their hair were not congruent with their actual experiences of hair loss. This mis-match was despite acknowledgement that their oncologist discussed the current efficacy

evidence. This is concerning given reports that unsuccessful scalp cooling can lead to additional patient distress and poorer health-related quality of life (HRQoL) [10] and highlights the need for treatment discussions to provide greater clarity of risks, benefits and probability of outcomes to reduce potential of decisional regret and treatment-related anxiety [16].

Patient understanding of current efficacy evidence is particularly important given the aim of the scalp cooling is to reduce a distressing chemotherapy-induced side effect rather than as an anti-cancer treatment. Decision aids and other patient resources such as those available in The Netherlands (see website [www.hoofdhuidkoeling.nl](http://www.hoofdhuidkoeling.nl)) may assist health professionals explain scalp cooling information and support patients to make informed decisions, by outlining benefits, harms, probabilities and scientific uncertainties associated with scalp cooling treatment options [17], given that outcome uncertainties exist.

In addition to efficacy information, participant experiences also highlighted the need for greater patient education and more detailed written information outlining what to expect when undergoing scalp cooling, including how to care for hair during scalp cooling to minimise hair loss and information to provide to hairdressers. Provision of such information is a simple means of empowering patients to better cope with treatment side effects [18]. Hair care information in particular is a simple measure to reduce patient anxiety associated with perceptions that their actions precipitated their hair loss. Information leaflets have been employed in breast cancer more generally to reduce anxiety reactions such as anticipatory nausea and vomiting prior to chemotherapy and may have utility, in conjunction with nurse education, in reducing anxiety around hair care and hair loss. However, it is necessary to identify the most effective format, content and presentation of information for patients.

Interestingly, although hair loss expectations varied, there was general consensus that scalp cooling contributed to faster regrowth post-chemotherapy. This view was held by both scalp-cooled and non-scalp-cooled participants and was perceived as a major consideration when considering whether to continue scalp cooling in light of hair loss. In light of the mis-match between hair loss expectations and experiences, the focus on regrowth by participants during treatment may be a means of maintaining hope that hair loss experiences were transitory. Health professionals reinforced patient perceptions of faster regrowth based on their observations of previous patients, although there is currently a paucity of evidence to support the anecdotal reports. Further empirical research is required to confirm whether anecdotal regrowth perceptions are correct.

Despite the range of scalp cooling experiences, and consistent with previous findings [14], the majority of participants did not find scalp cooling overly burdensome. Most participants were satisfied with their decision to undergo scalp cooling and would likely elect to scalp cool again. Efficacy

and tolerability of scalp cooling were not of concern to those from the scalp cooling group, but delays in treatment to access scalp cooling would be cause to reconsider future (hypothetical) treatment. Non-scalp-cooled patients were in general less concerned about hair loss, were more ambivalent about scalp cooling as a treatment option as efficacy and tolerability were of concern.

The results of this study need to be considered in light of several limitations. Firstly, participants were recruited through a single cancer centre and self-selected to participate in the focus groups or interviews. This may have resulted in a bias towards more proactive patients or patients with more strongly held views of scalp cooling and may limit the generalizability to the wider cancer patient experience. Additionally, those women who elected to participate in an interview were unable to reflect and comment on the views of the wider group and the social construction of a patient view within individual focus groups [19]. Secondly, the study was a retrospective analysis of patient experiences and there may be some recall bias. However, the commonality of issues raised by multiple women increase our confidence that the themes are representative of patient experiences more generally. A strength of this study is the qualitative methods used. This methodology provided a rich exploration of patient experiences. Future work to develop objective measures to assess patient motivations and experiences of scalp cooling are also needed if broader patient experiences are to be assessed.

## Conclusions

Qualitative exploration of Australian breast cancer patients' experiences of scalp cooling confirmed the technology to be an acceptable supportive care intervention for hair loss. Despite overall support, participant responses confirmed the need for greater clarity during treatment decision-making discussions with respect to efficacy. Such information is essential to ensure patient expectations are consistent with current treatment outcome limitations. The study also identified unmet patient information need related to hair care and tolerability issues during scalp cooling.

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## Compliance with ethical standards

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**Conflict of interest** The authors declare that they have no competing interest.

**Data access** The authors have full control of all primary data and agree to allow the journal to review data if requested.

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