

Original Article

One Size Does Not Fit All: An Exploration of Compression Garment Use in Patients With Postural Orthostatic Tachycardia Syndrome

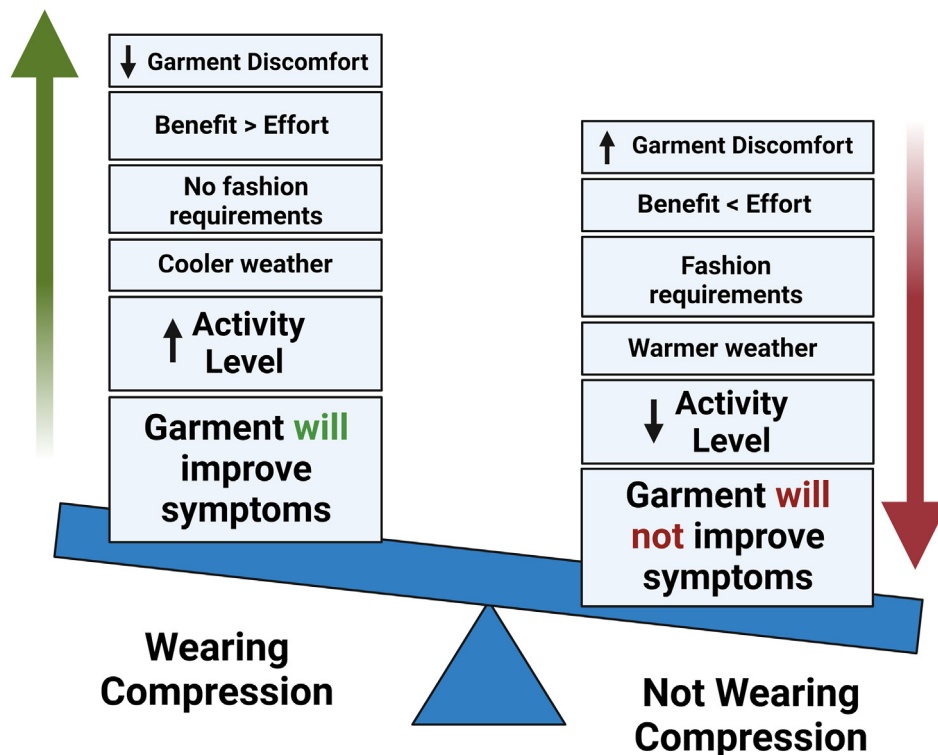
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Why do patients with POTS choose to use a compression garment (or not)?



ABSTRACT

Background: Postural orthostatic tachycardia syndrome (POTS) is a chronic form of orthostatic intolerance that primarily affects female patients. Despite the severity of POTS, there are no approved medications for use in patients with this disorder. Compression garments are a commonly prescribed nonpharmacological treatment, but little is known about the patient experience with compression. In this study we aimed to evaluate the patient experience with compression garments using a structured survey and semistructured telephone interviews.

Methods: A focused survey was designed as a component of a larger clinical trial on compression garment use in patients diagnosed with POTS. Building on the survey, semistructured telephone interviews were conducted with POTS patients. Recorded interviews were transcribed and coded in a thematic analysis using a descriptive-interpretive approach.

Results: A total of 27 participants completed the survey, and 20 participants completed the telephone interview. Patient experiences with compression were variable, with some participants experiencing significant benefits, and others reporting minimal to no benefits. Six themes that influenced garment use were identified: the potential benefit of the garment to improve symptoms, specific activities patients will be undertaking, environmental conditions, garment attributes, psychological and cognitive aspects, and financial considerations.

Conclusions: Participants engage in a daily cost-benefit analysis when making decisions to use a compression garment. Clinicians should be aware of the benefits of and factors that limit use of compression garments as a treatment for POTS.

Postural orthostatic tachycardia syndrome (POTS) is a chronic form of orthostatic intolerance that primarily affects female patients. Patients with POTS experience a heart rate increase of 30 beats per minute or more within 10 minutes of standing, without a decrease in blood pressure ($> 20/10$ mm Hg) and in association with chronic orthostatic symptoms.¹ Patients with POTS experience significant economic and employment effects,^{2,3} and reduced quality of life.⁴

Despite the apparent severity of POTS symptoms, there are no approved treatments for patients with POTS, and patients are treated with a combination of off-label pharmacological and nonpharmacological treatments. One commonly prescribed nonpharmacological treatment is compression garments.⁵ A recent clinical trial showed that compression garments reduce standing heart rate by shifting fluid pooled in the abdomen and legs back to the heart, leading to an increase in stroke volume.⁵ Although compression garments are commonly used as a treatment for patients with POTS, little is known about the patient experience with these garments.

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RÉSUMÉ

Contexte : Le syndrome de tachycardie orthostatique posturale (STOP) est une forme chronique d'intolérance orthostatique qui touche principalement les femmes. Malgré la gravité de ce syndrome, il n'existe aucun médicament approuvé pour traiter les patients qui en sont atteints. Les vêtements de compression constituent souvent le seul traitement non pharmacologique prescrit, mais il existe peu d'information sur l'expérience des patients avec ces vêtements. Dans cette étude, nous avons cherché à évaluer l'expérience des patients utilisant des vêtements de compression par le biais d'un sondage structuré et d'entrevues téléphoniques semi-structurées.

Méthodologie : Un sondage ciblé constituait une composante d'une étude clinique plus vaste sur l'utilisation de vêtements de compression par des patients atteints du STOP. À partir du sondage, des entrevues téléphoniques semi-structurées des patients ont été réalisées. Ces entrevues ont été enregistrées, retranscrites et codées au moyen d'une analyse thématique utilisant une approche descriptive et interprétative.

Résultats : Au total, 27 participants ont répondu au sondage et 20, à l'entrevue téléphonique. L'expérience des patients avec les vêtements de compression était variable, certains y trouvant des avantages significatifs tandis que d'autres en tiraient peu d'avantages, voire aucun. Six thèmes influant sur l'emploi de vêtements de compression ont été relevés : effet positif potentiel des vêtements de compression sur les symptômes, activités spécifiques projetées par les patients, conditions environnementales, attributs des vêtements, aspects psychologiques et cognitifs et considérations financières.

Conclusions : Les participants devaient effectuer chaque jour une analyse du coût et des avantages avant de décider s'ils allaient utiliser un vêtement de compression. Les cliniciens doivent être conscients des bénéfices et des contraintes associés à l'utilisation des vêtements de compression dans le traitement du STOP.

In this study we explored the patient experience with compression garments using a patient survey and semistructured telephone interviews. The main purpose was to answer the question, "What is the patient experience with compression garments?" Understanding the decision whether to wear the garment can help clinicians understand the benefits and downsides of compression garments in management of patients with POTS.

Methods

Compression garment survey

Study participants. This study received ethical approval from the University of Calgary Conjoint Health Research Ethics Board (REB17-2393) and the authors confirm that patient consent forms were obtained for this article. This research adhered to the ethical guidelines for research in human participants. Participants with a physician diagnosis of POTS were recruited from the Calgary Autonomic Investigation and Management clinic. The POTS criteria are a heart rate increase of 30 beats per minute or more within 10 minutes of upright posture, in the absence of orthostatic hypotension ($> 20/10$ mm Hg decrease), and in association with chronic orthostatic symptoms.^{1,6-8}

Survey design. A focused survey was designed as one component of a larger clinical trial on compression garment

use in patients diagnosed with POTS. The survey included questions about compression garment use, types of garments, frequency of use, benefits and limitations and barriers to garment use. Participants were e-mailed a secure Research Electronic Data Capture (REDCap, Vanderbilt University, Nashville, TN)⁹ link to complete the online survey.

Data and statistical analysis. Survey data were exported to REDCap and imported into SPSS statistics version 28 (IBM Corp, Armonk, NY) for analysis. Summary statistics were calculated for each question. Participants who did not answer specific questions were excluded from the summary statistics for that specific question. Participants were asked if they believed the compression garment is “uncomfortable.” The data were reversed to “comfortable” for presentation. Data are presented as number of participants and percentage of participants.

Qualitative interviews

Study participants. This study received ethical approval from the University of Calgary Conjoint Health Research Ethics Board (REB18-1824) and the authors confirm that patient consent forms were obtained for this article. Canadian participants with a physician diagnosis of POTS were recruited. A total of 9 participants completed the compression garment survey and the qualitative interview. Convenience sampling was used. Efforts were made to recruit participants across a range of ages and varying lengths of time since initial POTS diagnosis. Enrollment continued until saturation of the data was reached and no additional themes of the data were uncovered.

Qualitative interview design. Participants completed 1 semistructured telephone interview with a member of the research team. Each interview was audio recorded. An interview guide was used (Supplemental Table S1). The primary research question was, “What is the POTS patient experience of using a compression garment?” Secondary questions included the decision-making process regarding the use or nonuse of a compression garment and the benefits and downsides of the compression garment.

Data analysis. Demographic data are presented as number of participants (percentage) for categorical variables and mean \pm standard error for continuous variables. Audio recordings were transcribed by a professional transcription service (Rev, Austin, TX). Transcripts were uploaded into NVivo 12 (Lumivero, Denver, CO) for analysis. Transcripts were reviewed and coded to identify commonalities among participants. Coded text was organized into themes. A descriptive-interpretive analysis was conducted.¹⁰ The data were analyzed iteratively; the earlier interviews informed lines of questioning and probes in subsequent interviews. Themes were independently developed by K.M.B. and M.R. and refined until consensus was reached. These themes were used to create a decision framework for patients and providers on compression garment use. Cost-benefit challenges were identified during the data analysis. In this context, these cost-benefit challenges refer to the mental accounting process patients undertake to determine whether the benefits of wearing a compression garment outweigh the negatives. These negatives might be financial but might also be related to the burdens of sourcing or wearing the garments.

Results

Compression garment survey

Participant demographic characteristics and garment use. A total of 27 participants (n = 25 female) completed the compression garment survey. The mean age of participants was 32 ± 2 years. All participants had been diagnosed with POTS by a physician and were patients at the Calgary Autonomic Investigation and Management Clinic.

Compression garment use. All participants were aware of compression garments as a POTS treatment. In the year before the survey, 63% (n = 17) used a compression garment for POTS (Table 1). Of the most worn garments, 77% were medical-grade or prescription garments, and 59% provided 30–40 mm Hg compression.

In the year before the survey, 41% of participants wore a garment only when their symptoms were worse, 29% wore a garment only when doing specific activities, 18% wore a garment every day for the entire day, and 12% wore a garment every day for part of the day. Participant experiences with compression are shown in Figure 1 and Supplemental Table S2.

Qualitative interviews

Participant demographic characteristics. In total, 20 patients (n = 19 female) completed the telephone interview in 2019 (Supplemental Table S3), with 9 of these participants who also completed the compression survey. The interview length ranged from 9 to 34 minutes (mean, 16 ± 7 minutes). The mean age of participants was 38 ± 2 years. All participants reported they had been diagnosed with POTS by a physician. Just less than half of participants were employed or attending school at the time of the interview (45%; n = 9).

Compression garment use and benefit. All participants were currently using, or had tried, compression garments. Compression garment use at the time of the survey was reported by 60% of participants. Most participants reported they were currently using or had tried waist-high compression tights (80%), and/or knee-high compression socks (75%). Fewer participants reported they were currently using or had tried thigh-high compression stockings (45%) or compression shorts or abdominal shapewear (15%). Participants who experienced benefits were more likely to use compression.

Table 1. Compression garment use from the physiological study survey

Type of garment	Used in past year n (%)	Worn most often n (%)
Waist-high compression	14 (82.4)	9 (52.9)
Abdominal shapewear	5 (29.4)	2 (11.8)
Knee-high compression	5 (29.4)	3 (17.7)
Abdominal binder	4 (23.5)	0 (0)
Thigh-high compression	4 (23.5)	2 (11.8)
Compression shorts	2 (11.8)	0 (0)
Other	N/A	1 (5.9)

N/A, not applicable.

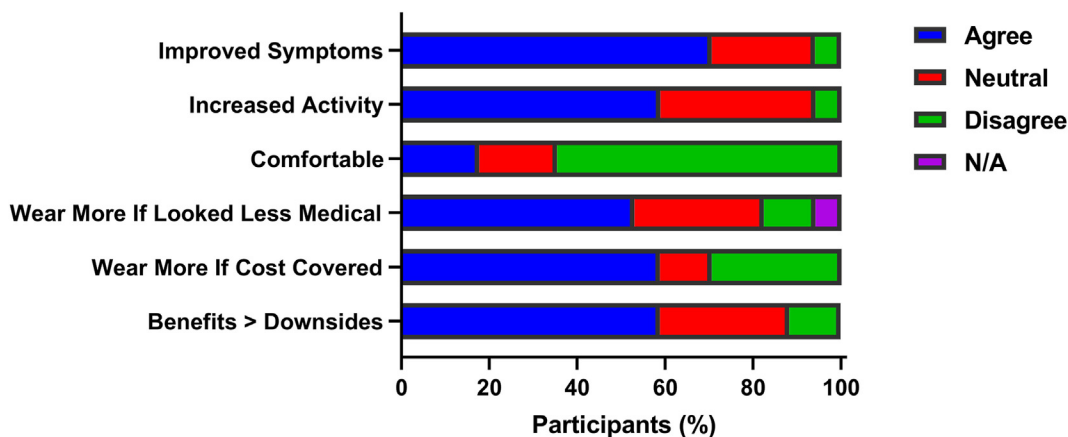


Figure 1. Participant experiences with compression from the compression garment survey. N/A, not applicable.

Two-thirds of participants (67%) currently using compression reported treatment benefits, compared with only 25% of participants who were not using compression at the time of the interview.

Participants engage in a cost-benefit analysis when choosing to use compression garments. The overall finding was that patients with POTS continually engage in a decision-making process regarding compression garment use. Participants encounter “cost-benefit” challenges daily when deciding whether to wear a garment. The interviews revealed 6 themes related to cost-benefit analysis of compression garment use including effect on symptoms, activities undertaken, environment, garment attributes, psychological and cognitive aspects, and financial considerations (Table 2; Fig. 2).

Effect on symptoms

Some participants experience more benefits than others.

All participants were open to testing compression as a potential management option for POTS. Some participants had significant improvements and described benefits including heart rate reduction, and reductions in fatigue, presyncope, pain, and swelling. Some participants also reported improved cognitive function: “I felt like I could sit up for longer without losing concentration” (patient [P]7). However, the compression garments did not fully resolve symptoms: “I wear them, they help. They’re not a cure, they’re not a miracle” (P9). Other participants had only a slight improvement or could not identify whether the compression garments improved symptoms: “just maybe a little bit” (P4). One participant believed waist-high compression was detrimental. For participants who did not have strong benefits, garment use often tapered off after initial trial, because they realized they did not feel any different either way. For other participants, wearing compression was essential to completing daily activities: “For me it’s not a question. I either wear the garments or I don’t do all these things I’m trying to do” (P5).

Compression strategy changes depending on severity of symptoms. Some participants reported they would choose to wear their garment when their symptoms were worse: “...if

I’m having 2 days where I’m just not feeling super great, like let’s just throw it on and even if it helps 5%” (P16). However, some participants reported symptoms could be so severe they would be unable to put the garment on, which created a dilemma. Participants would continually evaluate use on a daily basis: “when I’m very symptomatic, getting those pantyhose on is exhausting and can take a lot. So, it really kind of just depends how I’m feeling that day, on a daily basis” (P1).

Other treatments modulate the effects of compression.

Often, participants reported they tried compression around the time of diagnosis. During this time participants were starting use of medications as well as other non-pharmacological treatments. For some participants, it was challenging to establish whether symptom improvement was because of compression garments or other factors: “I can’t single out if the compression stockings were working or if it was other things. I did notice a difference once I started wearing them. That was when I was starting to take the medication” (P13).

Compression garments help and hinder other medical conditions.

Participants reported comorbidities like syncope, gastrointestinal, and allergic conditions, as well as joint instability and pain played a role in compression garment use, negatively as well as positively. Some participants reported benefits from use of the compression garments including increased joint stability: “I also have Ehlers-Danlos syndrome...I wear the compression pants to hold my joints together...” (P5), and prevention of syncope: “they reduce the frequency of syncope” (P1). However, other participants reported the garment had a negative effect on other medical conditions including allergic conditions and gastrointestinal conditions.

Activities undertaken

Participants are more likely to use the garment when leaving home.

Participants leaving home to attend work or school, or engage in exercise, were more likely to wear a garment than participants staying home or anticipating lower levels of physical activity: “Obviously dependent on what I’m

Table 2. Themes

Theme	Subtheme
Effect on symptoms	Symptom improvement: patients will consider if the garment has the potential to improve their symptoms Symptom prevention: patients will consider if the garment has the potential to prevent symptom onset Severity of symptoms: compression garment strategy changes depending on severity of symptoms on a given day Role of other treatments: use of compression garments in conjunction with other treatments might make the benefits of compression unclear Role of other medical conditions: compression garments might aid other medical conditions including syncope, but increase challenges for patients with gastrointestinal or allergic symptoms
Activities undertaken	Level of activity: the level of activity to be undertaken influences garment use, with higher activity levels leading to a higher likelihood of garment use Employment and school: compression garments can provide benefits in the workplace and in educational settings Travel: garment use might change (increase or decrease) during travel depending on mode of transportation, weather, and access to laundry facilities Fashion requirements: dress codes or specific fashion requirements might affect garment use
Environment	Weather: hot weather might lead to reduced garment use because of discomfort and overheating when using the garment
Garment attributes	Different situations: patients select different types of garments for different settings. Patients might “risk” not using a garment depending on the specific setting Physical appearance: the physical appearance of the garment was highly important to some participants, and not a consideration for other participants Garment fit: some patients might have difficulty finding a correctly fitting garment and might benefit from a professional fitting Purchase and care: the process to purchase and care for compression garments might be physical and mentally exhausting for some patients, especially if they have not received a detailed prescription Donning procedure: putting on a compression garment can require a significant amount of energy. Participants are unlikely to expend this energy unless they believe they will receive a significant benefit from garment use Discomfort and pain: compression garments might cause discomfort or physical pain
Psychological and cognitive aspects	Empowering: patients reported having compression garments as a tool helped to empower them to take control of their symptom management Support from others: patients receive support and help from other patients when selecting compression garments (eg, in online support groups).
Financial considerations	Cost of garment: compression garments can be expensive and this is a limitation for some patients Frequency of garment replacement: compression garments might need to be replaced frequently and this is expensive. Patients might choose to not wear their garments in specific situations to reduce the risk of damaging the garment Insurance coverage: some patients had insurance coverage for the garments, but experienced challenges with approval

doing...if I was just resting in bed for that day, then I wouldn't wear them” (P3). Participants who required rest were less likely to use the garment: “I also have ME [myalgic encephalomyelitis], so pacing is probably one of my most effective strategies, and I felt like the compression stockings, the full length one, was getting in the way of me trying to relax” (P2). Compression also helped with physical activity: “I can actually get a longer period of time between when I...have to get horizontal again to recover my heart rate” (P5).

Compression can help in the workplace and educational settings. Some participants specifically wore the garment for work or school. Participants reported compression helped them stand for longer periods and helped with sit-to-stand manoeuvres in the workplace: “I've noticed a huge difference in it from being able to...actually stand up and walk rather than be dizzy and fall back down in your chair” (P10). For one participant, the compression garment helped when she was unable to take her medication on a regular schedule at work: “Sometimes I can't take a break in 4 hours to get...my medications and take them...if I have the compression garments, it gives me a bit more of a bridge to kind of extend that dosing out” (P20). Participants with standing jobs reported definite benefits from the garment: “the difference was night and day. I thought I was going to have to quit because I couldn't stay on my feet that whole shift”(P5). However, a limitation for some participants was the garment cutting into

the back of knees and ankles when sitting for prolonged periods.

Compression use might change during travel. Some participants would only wear the compression garments while travelling, especially during airplane travel: “I wear them when I'm travelling, or if I'm driving for a long part of the day...or if I'm flying” (P8). Hot weather and lack access to laundry facilities while travelling also affected garment use.

Dress codes or requirements can affect garment use. Some participants held employment or participated in other activities that required specific dress codes, which influenced the decision to wear different types of compression or skip compression altogether: “for my job I have to wear certain clothing on different days...[if] what I have to wear that day cannot accommodate them, then I will take the risk [and not wear the garment]” (P11).

Environment and compression garments in summer

It is too hot for compression in summer. The weather plays a significant role in the decision to wear a compression garment. Most participants were less likely to wear the compression garment in hot weather: “the amount of overheating that I feel putting them [waist-high compression] on makes them almost pointless” (P1). Despite this, some participants did continue to wear compression in the summer:

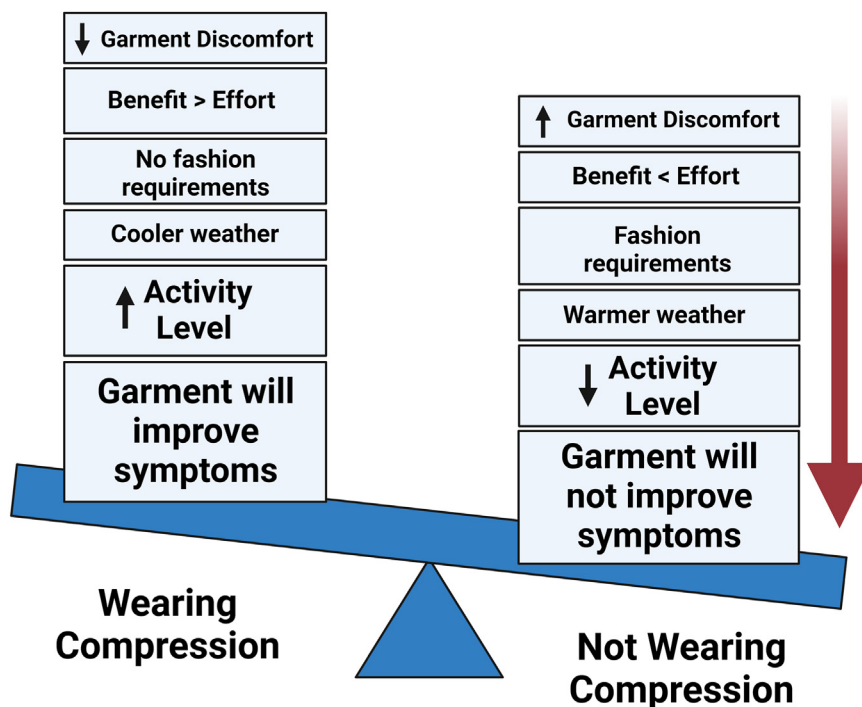


Figure 2. Decision factors. Factors influencing the decisions to use compression garments in the management of postural orthostatic tachycardia syndrome. This illustration was created using BioRender (BioRender.com).

“it’s not that I’m very comfortable when it’s very hot outside...but, I tolerate them well” (P9); with some participants considering knee-high compression rather than other types: “I would rather wear some kind of compression than nothing at all” (P20). One participant reported they believed the garment to be cooling in the summer, but they had selected a specific athletic-type compression short: “I find that I’m cooler a lot of the times when I wear the compression shorts because I’m not getting all that heat build-up in my legs” (P5).

Garment attributes

Using different compression for different situations.

Many factors influenced the decision to wear different types of garments including different activities: “It depends on the activity that I’m doing” (P20); “On a daily basis I wear knee-high and for especially strenuous days I will wear up to my waist” (P15). Some participants with waist-high compression and knee-high compression garments would often opt for less compression by wearing just the knee-high garments. This related to the difficulty in putting waist-high garments on, discomfort or pain from waist-high garments, cost of waist-high garments, and difficulty caring for waist-high garments: “...one of the reasons why I switched to knee-high is the amount of work that would be involved in putting on those waist-high ones, it’s a lot of energy expense” (P12). Participants reported they would choose to wear knee-high stockings because it felt like they were doing something to help, even if the benefits were not as strong as other compression types: “They [thigh-high compression] definitely pack a bigger punch than the calf ones. The calf ones still do their job. But

they’re more for, “I really can’t wear the thigh-high ones today, but I really need something” (P11).

Physical appearance of garments is important.

The importance of garment appearance varied among participants. Some participants took active steps to hide the garment. As time since diagnosis increased, and with age, participants were less concerned about the garment’s physical appearance: “for the first 2 years, even the knee high ones, I felt affected my willingness to wear anything but long pants. This summer I have said never mind and I’m just going to wear skirts even though it looks silly” (P15). One participant reported, although it was awkward to be wearing the garment in public, fainting in public was worse: “I just really don’t care much what other people think because passing out attracts way more attention” (P1). Another participant rated health more important than appearance: “I’m taking care of my health. I’m not trying to make a fashion statement. I don’t care what other people say” (P9). Some participants discussed changing fashion trends, including more people wearing tights and leggings, as a reason they felt more comfortable wearing compression in public: “when I first started wearing compression, your choices were like the old beige granny stockings... now that I’m older... there’s so many more options that you can find” (P5). This also led to participants encountering specific comments regarding their physical appearance. Additionally, participants commented on the increased style and selection of compression garments available to them: “You can get a lot of different varieties nowadays, so people don’t even know you’re wearing them” (P10). Some participants believed the garments, including shape-wear, improved their physical appearance: “If anything, it

makes you look better” (P5); “They make my butt look nice” (P9).

Fitting a garment can be challenging. One participant reported proper fit was problematic: “Even though I went to someone who does professional fittings and things, they still aren’t quite long enough for me” (P2).

Purchasing and caring for compression requires physical and mental effort. Some participants attended professional garment fittings whereas others purchased garments online. Some participants reported they did not receive detailed information from their physicians, making it challenging to find appropriate garments: “Doctors say to you, a prescription, “Go get 20 to 30,” but they won’t tell you what kind... You sort of feel like you’re left to your own devices” (P12). Some participants would purchase different types of garments for different occasions, including garments with a more formal or sporty appearance. One participant talked about how other patients have less knowledge of garment options, including shorts-style garments for summer. “Every time I see somebody say, “I can’t wear those stockings, it’s 30° [Celsius],” it’s like don’t wear the stockings, wear shorts. They just don’t know what’s out there. And without their doctor telling them what’s out there, it’s like writing a prescription for a drug saying, go get something for your stomach.” (P5).

Some participants reported that the number of available garment options was overwhelming: “I was so overwhelmed, and I should have given myself 2 hours just trying on different styles and such and I guess I just don’t have that time and it’s exhausting enough having POTS” (P14). They noted how POTS could compound the challenge of trying to process types of garments, targeted compression level, and brands available. Location and ability to travel to an in-person fitting is also a limitation because of the fatigue that many patients experience. Patients might settle with an online purchase of a garment that doesn’t fit as well, because they are too tired to go in person. This might lead to negative compression garment experiences and discontinued garment use.

However, 1 participant indicated she had hoped there would be more fashionable options available. Being diagnosed with POTS is a significant, life-altering event, and having more options aligned with “normal” would have been beneficial: “I think that from a social kind of standpoint, it’s such a big adjustment to make that maybe it would have been nice to have it just be more kind of in line with the normal kind of sock shopping experience” (P15).

There are additional challenges for men with POTS. Not finding male compression options, one participant had turned to garments for women. “I came home and said, “Can you buy me some Spanx?” She said, “I’ll have to get you pregnant women’s Spanx”” (P18). Eventually, he was able to find men’s triathlon tights.

Participants also reported challenges about the care of the garments after purchase. The garments can rip and tear, and require careful handwashing to maintain: “You really have to follow the instructions and wash them properly” (P20); “Right now I’m working on 3 pairs of shorts, and 1 pair of pants. So, you know, I’m constantly doing laundry” (P5).

Putting on compression garments is an event in itself.

Most participants reported putting on waist-high compression garments requires a great deal of effort and energy: “It took me about 30 to 35 minutes to put them on... I have to get up earlier and set aside time to put them on” (P19); “it takes so much of my available energy, but I haven’t noticed that it kind of gives back in symptom relief” (P2). Garments that did not include the abdomen required less effort. Participants discussed how the garment is most often put on in the morning, coinciding with the time of day most symptomatic for patients necessitating trade-offs to conserve energy: “Most women feel crappy first thing in the morning with POTS, so they don’t want to take the shower then, so then they either have to not shower or not wear the compression stockings” (P12). For some participants, putting the garment on was not worth the energy expenditure, but others did believe that the benefits were worth it.

Another challenge is having to take the garment on and off repeatedly throughout the day when using the bathroom. Because POTS patients drink large amounts of water, this was a frequent occurrence: “any time you have to pee, which is a lot when you drink 3 to 4 litres of water a day, you have to then wrestle with them again” (P2). POTS patients with gastrointestinal conditions also reported challenges with having to take the garment on and off multiple times, often in a hurry.

Compression garments can be uncomfortable or painful.

Participants reported discomfort from the garment including heat, wearing the garment under other clothes, and issues with the garment pinching and rolling. Particularly under pants, participants reported the garment was uncomfortable, and it felt “weird” to be wearing multiple layers: “Not that it hurt... it felt weird” (P9). Other participants had physical pain: “it’s like somebody is squeezing your legs. They were so painful. It just wasn’t worth it for me” (P3). Participants also reported issues with the waist-high garments rolling down and pushing into the abdomen: “it also rolls down... after a while it becomes quite uncomfortable” (P20). One participant reported skin tearing and ripping from particular types of medical compression garments. Despite the discomfort, participants were still willing to use the garment, if they perceived a symptom benefit.

Psychological and cognitive aspects

Compression empowers participants to take control.

Participants reported compression garments provided them with a sense of security and control over their illness: “wearing compression stockings is a huge psychological gain for me because it gives me a sense that I’m doing everything I can to manage my health as best as possible. It’s one thing that is in my control” (P15).

One participant also reported having control over the type of garment they could purchase (athletic vs medical) helped them manage the idea of using compression: “it’s almost like I feel psychologically like I don’t mind so much wearing... the sports ones” (P12).

Other patients are a strong resource. Participants found support from other patients when learning about and purchasing compression garments. One more experienced patient

provided support to other patients around compression garment choice. This was especially helpful when patients have received less information from their doctor. “I’m getting better advice not from doctors, but from other patients” (P12).

Financial considerations

Compression garments are expensive. Some participants noted surprise over the substantial cost and limitations thereby imposed: “...I had no idea that they were going to be as expensive as they were” (P14). Participants who wore compression every day reported 1 garment was not enough, because they need to be hand-washed and air dried, which takes time and energy. Participants also reported the garments wear out, requiring frequent replacement: “...I’m shocked by how quickly they wear out. So, I can easily go through 10 pairs in a calendar year. I wish I had more” (P15). Participants reported they looked at purchasing multiple garments, sometimes opting for lower-priced garments of lesser quality because insurance is unlikely to cover multiple pairs.

Some participants reported choosing not to wear the garment for specific activities because of risk of ripping and the high cost of replacement. Other participants added compression garments to their Christmas and birthday lists, hoping to receive the garments as gifts: “...that was one of the first things on my Christmas list. This was like, “get me a pair of athletic tights that are compression”” (P19).

Insurance coverage can help with the purchase (but there are limitations). Some participants had insurance coverage for the medical-grade garments. However, this was usually only 1 or 2 garments per year. Some participants preferred the sports-style garments, but no coverage was provided for them. Most

participants would purchase more garments if the cost were covered. The lack of coverage of multiple garments leads patients to make compromises on quality or try to use worn-out garments: “...the question becomes, do you drop down to... a lower compression grade that you can buy over Web sites or you just wear them with holes in them or, what do you do?” (P15).

Some participants encountered challenges with their insurance company being unfamiliar with compression stockings and POTS: “The insurance company always put up a big stink... They’d fill all my medications that were so much more expensive, and then we’d send in the compression stockings, and they want all this extra evidence” (P12). Additionally, if the garment purchased does not work or is damaged, there would not be additional coverage.

Discussion

Past research findings have shown the acute benefits of compression garment use in patients with POTS in a clinical laboratory setting,⁵ but previously the POTS patient experience with compression garments was not well understood. This study, on the POTS patient experience with compression garments, revealed benefits and limitations of these treatments, encompassing the overall theme of cost-benefit analysis in the decision whether to use compression. These findings have important clinical implications for the prescription of compression garments for patients with POTS.

Cost-benefit analysis and mental accounting

Compression garment use was an individually negotiated experience. All participants were willing to try compression garments as a treatment for POTS. Participants who experienced benefits from the garment were more likely to continue using compression for POTS symptom management. An

Table 3. Key recommendations for compression garment use

Recommendation	Details
Provide a detailed compression prescription	Participants need clear information from physicians to make informed choices about compression. The prescription of compression should include the type of garment (eg, waist-high tights, abdominal shapewear), the target pressure rating (generally 20-30 mm Hg, or 30-40 mm Hg), potential brand names, and the duration of use. Patients would benefit most from receiving a specific prescription from their health care provider including the following details: type of garment, suggested brands, pressure rating. Specific medical compression brands include: Jobst (BSN Medical, Charlotte, NC), Juzo (Julius Zorn, Inc Cuyahoga Falls, OH), Mediven (Medi USA, Whitsett, NC) and Sigvaris (Sigvaris Inc, Peachtree City, GA). Specific athletic compression brands include CEP (CEP Compression, Bayreuth, Germany) CW-X (New York, NY), 2XU (2XU Pty Ltd, Melbourne, Victoria, Australia), and Zoot (Zoot Sports, Carlsbad, CA).
Prescribe compression involving the abdomen	Patients should be prescribed a 20 to 30-mm Hg or 30- to 40-mm Hg garment that includes compression of the abdomen. Abdominal shapewear or compression shorts can be prescribed as an alternative to waist-high tights, especially in warmer weather. Compression involving the abdomen, buttocks, and thighs reduces heart rate and symptoms compared with no compression. ⁵ Compression socks (to the knee) only offer a minimal reduction in orthostatic tachycardia and symptoms
Provide alternatives to medical grade compression	Participants might not want to use medical grade compression for a variety of reasons including high cost, physical appearance, and discomfort or pain. High-quality sport garments are an alternative option. These garments typically provide less compression than medical grade, but still provide benefits. Because these garments are designed for athletic activities, they might be more comfortable for patients. Providing this option might help to facilitate garment use
Use compression as part of a comprehensive treatment plan	Compression garments should be used as a treatment for POTS in conjunction with medications, and other nonpharmacological treatments ¹

POTS, postural orthostatic tachycardia syndrome.

important concept revealed is the persistent and unrelenting mental accounting process patients continually engage in when deciding whether to use a compression garment on a daily basis. Patients might encounter decision fatigue from continuous evaluation of multiple factors that influence compression garment use. Each day, a patient might face a different set of complex decisions when deciding to use this treatment. For example, a patient might think they should use the garment on a certain day as a symptom mitigation strategy. They are then faced with a series of calculated decisions: Is it worth the effort to put this garment on? Will I be too hot in the garment? Will the garment work with my outfit? Will the garment be too uncomfortable? Will the garment draw unwanted attention? Are my symptoms controlled enough that I can “get away” with not wearing the garment? The complex set of decisions is a fluid situation, with constantly changing variables. As participants gain experience with compression garments, they refine this decision-making process.

When evaluating compliance with treatment, medical professionals might be unaware of the complex and continuous mental accounting that occurs when patients choose whether to use this treatment. The decision to use compression is significantly more complex than a simple “yes” or “no.” Suggesting different types of compression garments for different situations or having compression garments available as a tool among multiple management strategies, might help ease this decision-making process.

Effect on symptoms

The variable effect of compression on symptoms reported in this study could be due to a number of factors. First, participants were using different types of compression garments with different pressure ratings. Past research has shown that compression involving the abdomen is most effective.⁵ Second, participants might have different underlying pathophysiology causing their POTS symptoms. Participants with more significant blood pooling might benefit more than participants with other pathophysiological findings.⁸ Third, many patients with POTS have comorbid medical conditions, and multisystem symptoms. The role of these symptoms, including gastrointestinal and allergic, might contribute to differing effectiveness of compression.

Patients with POTS are a heterogenous group

Patients with POTS represent a spectrum, with patients experiencing varying levels of disability. Some patients are able to work or go to school, whereas others are confined to their homes because of the severity of symptoms. Compression garment use might be different for different POTS patients. It is also important to note that patients with POTS might experience episodic worsening and improvement of symptoms. What might work as a treatment for a POTS patient at one point in time, might not work at another time. Flexibility in the prescription of compression and options provided to patients can help clinicians prescribe the optimal compression for a specific patient.

Information from clinicians

The initial cost-benefit analysis and decision to use compression by patients can be supported by physicians. By

providing accurate, detailed information about compression at the initial prescription, patients will be best equipped to explore this treatment (Table 3). Participants who received vague information from doctors had challenges selecting an appropriate garment. Most often, when someone mentions compression, people think about knee-high socks. However, in the case of POTS, this is not the ideal garment. The best type of compression garment for POTS is one that includes compression of the abdomen.⁵ This can be waist-high tights, or an abdominal shapewear or shorts-type garment. Despite their minimal benefit for POTS, many participants were using knee-high socks. Education from doctors regarding the best type of compression would help to prescribe treatment more effectively.

Sex and gender considerations

There are fewer compression garment options available for men beyond compression socks. High-quality triathlon or sports tights could be recommended as an alternative to medical-grade pantyhose-style garments.

Strengths and limitations

A strength of this work is the mixed-methods approach. Combining a quantitative survey with a qualitative analysis enriched the perspective and deepened our understanding of compression garment use in patients with POTS. A limitation of this study was the challenge of recruiting male participants, because of the female predominance of POTS.

Conclusions

Compression garments provide some symptom relief to most patients, but they are not a cure for POTS. Compression garments might be more helpful for some patients than others, and there are many factors that influence garment use. These factors should be considered when prescribing compression, and evaluating use, in this patient population.

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Ethics Statement

This study received ethical approvals from the University of Calgary Conjoint Health Research Ethics Board (REB17-2393 and REB18-1824). This research adhered to the ethical guidelines for research in human participants.

Patient Consent

The authors confirm that patient consent forms have been obtained for this article.

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Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at <https://www.cjopen.ca/> and at <https://doi.org/10.1016/j.cjco.2024.07.013>.