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ORIGINAL RESEARCH

Real-World Quantitative Insights into the Treatment Experience of Patients with Cancer in the USA with Subcutaneous Versus Intravenous Drug Delivery

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ABSTRACT

Introduction: While oncology treatments have traditionally been delivered through the intravenous (IV) route of administration (ROA), subcutaneous (SC) alternatives have become increasingly available. Research comparing real-world patient experiences with these ROAs in the USA has been limited. This study aimed to quantify and compare preferences, satisfaction, and daily life impact between SC and IV delivery for patients with cancer in the USA experienced with both ROAs in a real-world setting.

Methods: Patients with cancer in the USA experienced with both SC and IV delivery were eligible to complete a 45-question web-based survey if they were at least 18 years of age, had a confirmed self-reported cancer diagnosis, and received both SC and IV treatment for the same condition within the past 24 months. The survey assessed treatment preferences, treatment site information, daily life impact, and feelings about potentially receiving at-home SC treatment. A free-response question was included to capture patient preferences in their own words.

Results: Of 201 patients completing this survey, 89.6% of patients indicated a preference towards SC delivery and 5.5% towards IV. Patients were typically more satisfied-to-very satisfied with SC delivery (78.6%, 33.3% IV), often owing to a reduced treatment burden and improved independence, convenience, and ability to cope with their illness. Satisfaction with SC treatment was also greater across the variables of appointment travel time (53.7%, 30.3% IV) and total time at a treatment facility (67.7%, 30.3% IV). When asked about hypothetically receiving at-home SC injections, over 80% of patients perceived a potential benefit.

Conclusions: To our knowledge, this study was the first in the USA to survey real-world treatment preferences of patients with cancer experienced with both SC- and IV-delivered care. Findings demonstrated a strong overall preference towards SC delivery, providing valuable insights and highlighting the need to broaden treatment considerations to include patient perspectives.

Prior presentation: A portion of this work was presented as a poster at International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Europe 2024, held 17–20 November 2024 in Barcelona, Spain.

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Key Summary Points

Why carry out this study?

Studies of route of administration (ROA) preferences among patients with cancer in the USA have been limited and primarily conducted within the constraints of clinical trials, but have not been well-documented in the real-world oncology setting.

This study sought to provide insight into the experiences of patients with cancer in the USA regarding convenience, adherence, daily life impact, and overall preference and satisfaction relating to the subcutaneous (SC) and intravenous (IV) administration of cancer therapeutics in a real-world setting.

What was learned from this study?

A majority of patients who were experienced with both ROAs preferred SC treatment, often reporting that SC treatment was more convenient, less emotionally distressing, less disruptive to everyday life, easier to continue, caused less pain or discomfort during treatment, provided more independence, and improved ability to cope with their illness.

SC treatment was commonly preferred by patients with cancer in the USA as it provided many benefits to their daily lives and relationships, often positively influencing treatment continuation, which may have improved the treatment experience for patients with cancer.

INTRODUCTION

Biotherapeutics for the treatment of cancer have traditionally been administered through the intravenous (IV) route of administration (ROA); however, subcutaneous (SC) delivery has become an established alternative in cancer care [1–3]. Each ROA carries its own advantages and disadvantages that should be considered for each patient [4]. Real-world research comparing the patient experience between SC injections and IV infusions has been particularly limited in patients with cancer in the USA. Consequently, patient preferences towards ROA and the reasons for these preferences are not fully understood and may not be prioritized in either product development or treatment decision-making [5]. Since patients are experts on living with their conditions, gaining an understanding of patient preferences could better inform cancer care decisions to support treatment adherence and thereby improve clinical outcomes [6–8].

Assessments of patient preference between SC and IV delivery for cancer therapeutics have been mostly limited to clinical trials [9–11], single-site studies [12], or did not examine patients with cancer and had relatively small sample sizes [11]. Results from clinical trials, healthcare database analyses, and systematic reviews comparing the SC and IV ROAs suggest that SC delivery may provide treatment cost and time savings for the patients, as well as reduced healthcare resource utilization and cost savings to healthcare services [13–18]. Data from observational studies, clinical trials, health economics-focused surveys, and economic models suggest that patients prefer SC over IV administration [4, 10, 11]. However, as data from clinical trials may not be generalizable to the real-world experience owing to their strict protocols, additional research is needed to fully understand patient preferences and perspectives in a real-world setting across parameters that may influence the experience of patients with cancer in the USA.

SC alternatives to biologics traditionally delivered via the IV ROA have become increasingly available [1–3, 19], and more patients with cancer will be provided with the opportunity to try SC therapeutics in the coming years. However, there appear to be barriers to its uptake in the USA compared with other countries [20], highlighting an unmet need to understand patient perspectives on this ROA in the USA. In order to gain insight into the perspectives and preferences of patients with cancer in the USA on treatment ROAs in real-world settings, we

Table 1 Patient demographics and screening results among respondents who qualified and completed the survey

Demographic	Percentage (%)	Number ($N = 201$)
Q2. Age		
20–29 years old	0.5	1
30–39 years old	9.5	19
40–49 years old	25.4	51
50–59 years old	17.4	35
60–69 years old	30.3	61
70–79 years old	15.9	32
80 + years old	1.0	2
Q39. Gender		
Male	33.3	67
Female	66.2	133
Other	0.0	0
Prefer not to answer	0.5	1
Q40. Hispanic, Latino, or Spanish		
Yes	20.4	41
No	79.6	160
Prefer not to answer	0.0	0
Q41. Racial background		
African American or Black	22.4	45
Asian	10.9	22
American Indian or Alaska Native	1.5	3
Native Hawaiian or other Pacific Islander	0.5	1
White or Caucasian	62.2	125
Other	1.5	3
Prefer not to answer	1.5	3
Q42. Area of the country where you receive cancer treatments		
Mid-Atlantic	48.3	97
Southwest	27.9	56
South	10.0	20
West	9.0	18
Midwest	4.5	9

Table 1 continued

Demographic	Percentage (%)	Number ($N = 201$)
Rocky Mountain	0.5	1
Q43. Description of area		
Rural	37.8	76
Suburban	36.3	73
Urban	24.9	50
Unsure	1.0	2
Q44. Highest degree of education completed		
Elementary/primary school	5.5	11
Secondary/high school or general equivalency diploma (GED)	17.9	36
Some college or certification program	32.3	65
College or university degree	36.3	73
Graduate/post-graduate degree	8.0	16
Q45. Type(s) of health insurance coverage		
Medicare	25.9	52
Medicaid	19.9	40
Private health insurance (offered through employer)	44.3	89
Private health insurance (individually purchased)	14.4	29
Military/veterans coverage	3.5	7
Uninsured	0.0	0
Other	0.0	0
Q4. Have you ever been diagnosed with any of the following?		
Multiple myeloma	57.7	116
Breast cancer	34.3	69
Non-Hodgkin's lymphoma	7.5	15
Mantle cell lymphoma	0.5	1
Colorectal cancer	0.0	0
Lung cancer	0.0	0
Prostate cancer	0.0	0
Skin cancer	0.0	0
Other	0.0	0
None of these	0.0	0

Table 1 continued

Demographic	Percentage (%)	Number ($N = 201$)
Q8. Have you had any of the following treatments given to you as an SC injection?		
Daratumumab and hyaluronidase (Darzalex Faspro)	39.3	79
Bortezomib (Velcade)	19.4	39
Trastuzumab (Herceptin Hylecta)	17.9	36
Pertuzumab with trastuzumab and hyaluronidase (Phesgo)	12.4	25
Rituximab and hyaluronidase human (Rituxan Hycela)	7.0	14
Darbepoetin alfa (Aranesp)	4.0	8
None of these	0.0	0

All parameters were self-reported by the patient

IV intravenous, *N* sample size, *Q* question, *SC* subcutaneous

conducted a survey of patients with cancer experienced with both SC and IV delivery for their cancer therapeutics. The objectives of this study were to determine if patients with cancer in the USA had a demonstrated preference between SC and IV delivery for their cancer treatments, as well as quantify and compare their satisfaction and observed treatment burden with each ROA.

METHODS

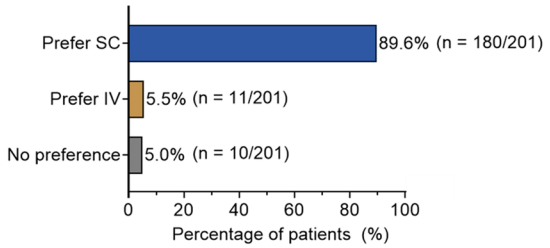
Study Design and Survey Population

This real-world study utilized online survey data collected from patients with cancer in the USA to examine their lived experiences with SC and IV delivery of their cancer treatments. The survey, conducted between 23 May 2024 and 27 June 2024, was approximately 20 min in length, containing 44 fixed-response questions and 1 free-response question (Table S1). This study included patients at least 18 years of age who were residents of the USA with a confirmed self-reported cancer diagnosis and received one, two, or more SC injection treatments within the past 24 months of any of the following treatments (alone or in combination with other treatments): daratumumab (Darzalex Faspro) [22], trastuzumab (Herceptin Hylecta) [23], pertuzumab with trastuzumab (Phesgo) [24], rituximab (Rituxan Hycela) [25], or bortezomib (Velcade) [26]. Darbepoetin alfa (Aranesp) was also included as it is an add-on therapy used to manage the side effects of cancer therapeutics and can be administered by either the SC or IV ROA [21]. Patients also had to have current or prior experience (having received one, two, or more treatments) with the IV counterparts of these treatments or others for the same condition within the past 24 months [27–30]. Patients who did not meet these inclusion criteria were excluded from online survey participation.

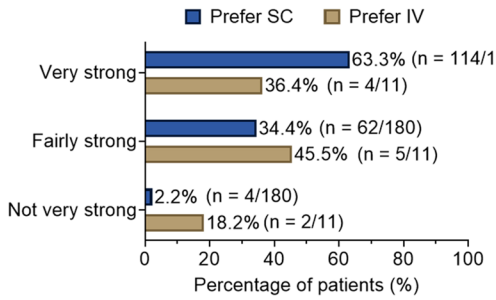
This study aimed to collect survey data from 200 patients with cancer in the USA who had experience with both SC and IV delivery of their cancer therapeutics. An expanded US physician recruitment network, including oncologists and hematologists, was leveraged to employ a collaborative approach whereby healthcare professionals (HCPs) actively participated in the recruitment, screening, and engagement of patients based on eligibility criteria, such as specific medication usage and ROA experience. Participants were approached by their HCP, and those who consented were provided with an online system/email address to register. The brief survey included screening questions, core survey content, and demographic questions (Table S1). Key

Survey Results

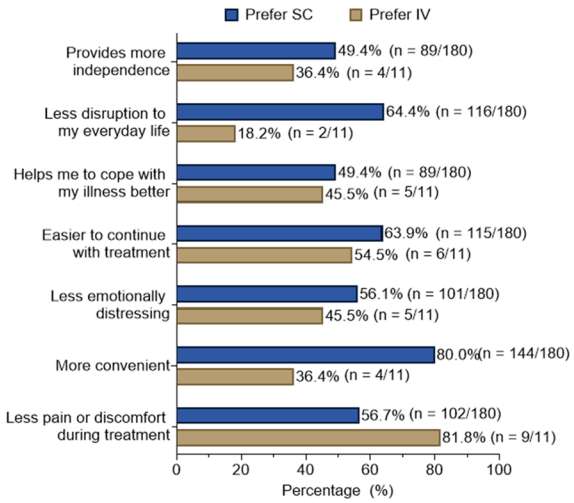
Q32. Of these two types of treatments, taking everything into consideration, which do you prefer?



Q33. How strong is this preference?



Q34. What are your reasons for this preference? Check all that apply.



Supporting Patient Quotes (Q31)

Prefer SC (89.6%):

- *"I no longer have early morning appointments (with SC) and I don't have to spend most of my day in the oncology clinic. Makes more time for me and my family."*
- *"Injections save me a lot of time. They have positive impact on my life."*
- *"The IV process impacted me and my family in a negative way compared to taking the subcutaneous. It was aggravating for me and my family while I was receiving IV and less stress on us when I was taking the subcutaneous."*
- *"The injections are so easy to take, I do not have to spend a lot of time in the physician's office."*
- *"I like the SC cancer treatment better because the treatment time is much faster and the location is very convenient than IV."*
- *"(SC) has made a difference with my caregiver. Gives him more free time and less stress on both of us."*
- *"Treatment time for SC is so much faster than IV - it doesn't take up my entire day. I also prefer to be independent when taking my treatments."*
- *"Huge life improvement with SC injection - I spend years of my life getting IV medications, I want my time back."*

Prefer IV (5.5%):

- *"The infusion (IV) has made the treatment process less intrusive than the injection."*
- *"I believe the IV through vein is more impactful. The doctors are present when it's time for the infusion and it's not painful like the injection."*

No preference (5.0%):

- *"Either one was fine. Just do what you have to do."*

Fig. 1 Patient preferences between SC and IV administration. *IV* intravenous, *Q* question, *SC* subcutaneous

quantitative research process elements occurred sequentially as follows: participants received a survey invitation; participants completed screening questions such as age, diagnosis, and confirmation of previous treatment; and following completion of the screening questions, qualified participants were able to complete the core survey content and closing demographic questions.

Institutional review board (IRB) approval was obtained prior to patient recruitment; the final survey document and research plan received IRB review exemption by the Sterling IRB. This research was conducted according to the Helsinki Declaration. All HIPAA/patient privacy requirements were followed for patient recruitment, communication, obtaining and analyzing data, and by the participating personnel/facilities. All participants provided consent prior to participating in the online survey.

Data Collection and Analysis

A web survey software application was used to execute the online survey and assessments. The survey was programmed so that unanswered questions were not permitted and once a question was answered, the respondent was directed to the next question on the computer screen. To minimize survey bias, respondents were unable to change responses to previously answered questions. The survey site was monitored in real-time to ensure that no respondent group (e.g., medication-type or treatment frequency) was oversampled.

The data are reported as descriptive statistics for the survey administration, study population, and core survey questions. Readouts included: treatment administration metrics, survey patient demographics, the number of respondents who selected each response, the percentages of respondents selecting each response, and an overall descriptive evaluation comparing data between SC and IV responses. No inferential statistics of differences between SC and IV were calculated. Free-text responses were evaluated qualitatively to understand individual patient preferences in their own words.

RESULTS

Patient and Treatment Characteristics

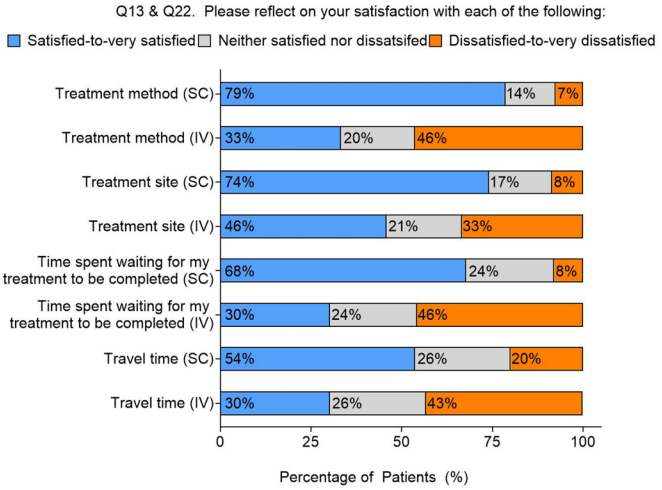
A total of 201 patients with cancer in the USA qualified and completed the online survey. Of patients who completed the survey, the mean (SD) age was 56.5 (12.3) years, with a majority of respondents being female (66.2%) and white or Caucasian (62.2%) (Table 1). Survey respondents were generally evenly split between rural, suburban, and urban communities, and most lived within the Mid-Atlantic (48.3%) or southwest (27.9%) regions of the USA while receiving treatment. Most respondents had a college or university degree (36.3%) or had completed either some college or a certification program (32.3%). Approximately half of respondents had private health insurance, 25.9% had Medicare, and 19.9% had Medicaid.

Most respondents self-identified as having multiple myeloma (57.7%) or breast cancer (34.3%) (Table 1). Daratumumab (39.3%), bortezomib (19.4%), and trastuzumab (17.9%) were the most common SC-administered treatments among the survey respondents, while darbepoetin alfa was the least commonly used (4.0%). Most respondents were currently receiving SC treatment (96.0%), with 97.0% of patients having received two or more SC injections, while 94.5% of respondents had received at least two IV infusions (Table S2).

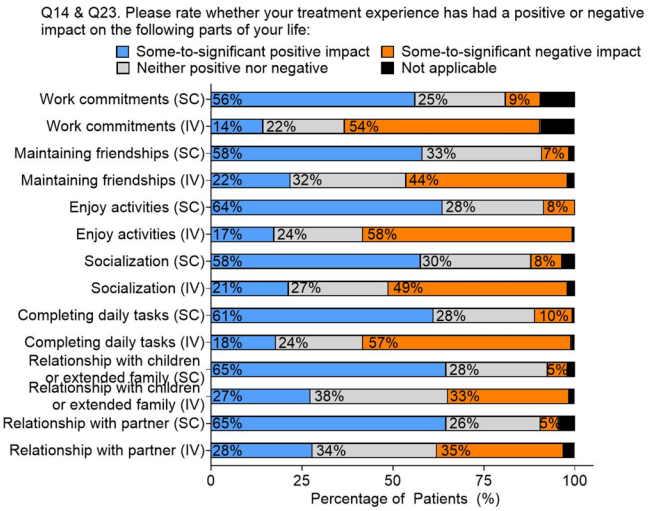
Comparison of Patient Preference and Satisfaction with SC and IV Treatment Options

In this real-world survey of patients with cancer in the USA who had experience with both SC and IV treatments, 89.6% of respondents preferred SC treatment over IV treatment (5.5%), or had no preference (5.0%) (Fig. 1). No differences in overall preference were observed between men and women or between races. Of the 180 respondents who preferred SC injections, 97.8% indicated that this preference was fairly-to-very strong, and 81.8% of the 11 respondents who preferred IV infusions indicated that this preference was fairly-to-very strong (Fig. 1). Patients

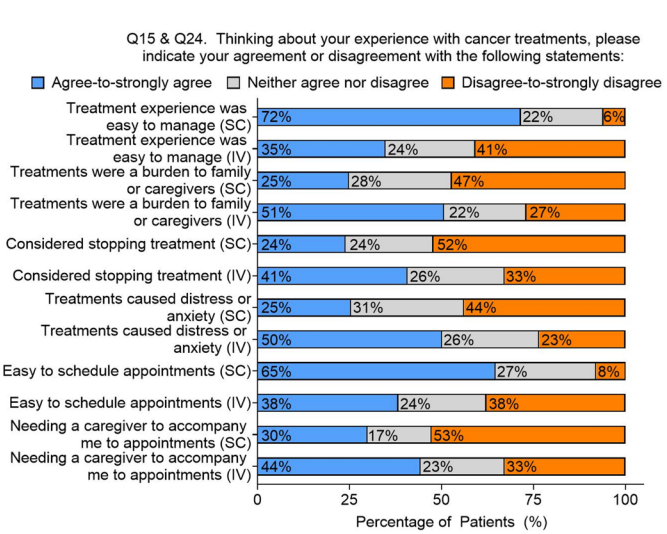
a


Q13 & Q22. Please reflect on your satisfaction with each of the following:
Satisfied-to-very satisfied
Neither satisfied nor dissatsifed
Dissatisfied-to-very dissatisfied
Treatment method (SC)
79%
14%
7%
Treatment method (IV)
33%
20%
46%
Treatment site (SC)
74%
17%
8%
Treatment site (IV)
46%
21%
33%
Time spent waiting for my treatment to be completed (SC)
68%
24%
8%
Time spent waiting for my treatment to be completed (IV)
30%
24%
46%
Travel time (SC)
54%
26%
20%
Travel time (IV)
30%
26%
43%
0
25
50
75
100
Percentage of Patients (%)

b


Q14 & Q23. Please rate whether your treatment experience has had a positive or negative impact on the following parts of your life:
Some-to-significant positive impact
Some-to-significant negative impact
Neither positive nor negative
Not applicable
Work commitments (SC)
56%
25%
9%
Work commitments (IV)
14%
22%
54%
Maintaining friendships (SC)
58%
33%
7%
Maintaining friendships (IV)
22%
32%
44%
Enjoy activities (SC)
64%
28%
8%
Enjoy activities (IV)
17%
24%
58%
Socialization (SC)
58%
30%
8%
Socialization (IV)
21%
27%
49%
Completing daily tasks (SC)
61%
28%
10%
Completing daily tasks (IV)
18%
24%
57%
Relationship with children or extended family (SC)
65%
28%
5%
Relationship with children or extended family (IV)
27%
38%
33%
Relationship with partner (SC)
65%
26%
5%
Relationship with partner (IV)
28%
34%
35%
0
25
50
75
100
Percentage of Patients (%)

c


Q15 & Q24. Thinking about your experience with cancer treatments, please indicate your agreement or disagreement with the following statements:
Agree-to-strongly agree
Neither agree nor disagree
Disagree-to-strongly disagree
Treatment experience was easy to manage (SC)
72%
22%
6%
Treatment experience was easy to manage (IV)
35%
24%
41%
Treatments were a burden to family or caregivers (SC)
25%
28%
47%
Treatments were a burden to family or caregivers (IV)
51%
22%
27%
Considered stopping treatment (SC)
24%
24%
52%
Considered stopping treatment (IV)
41%
26%
33%
Treatments caused distress or anxiety (SC)
25%
31%
44%
Treatments caused distress or anxiety (IV)
50%
26%
23%
Easy to schedule appointments (SC)
65%
27%
8%
Easy to schedule appointments (IV)
38%
24%
38%
Needing a caregiver to accompany me to appointments (SC)
30%
17%
53%
Needing a caregiver to accompany me to appointments (IV)
44%
23%
33%
0
25
50
75
100
Percentage of Patients (%)

◂**Fig. 2** Patient satisfaction with SC and IV. **a** Respondent satisfaction with their treatment for both routes of administration. **b** Respondent experiences of the impact of treatment on aspects of their daily lives for both routes of administration. **c** Respondent level of agreement with statements related to their treatment for both routes of administration. Displayed percentages are rounded to the nearest whole number. *IV* intravenous, *Q* question, *SC* subcutaneous

cited sense of independence, level of disruption to daily life, impact on coping with illness, ease of continuing treatment, level of emotional distress, convenience, and experiencing less pain or discomfort during treatment as reasons for their preference for the SC ROA (Fig. 1). When asked their overall satisfaction with their treatment method, 78.6% of patients were satisfied-to-very satisfied with SC, but only 33.3% expressed this same satisfaction for IV (Fig. 2).

Treatments were generally administered by a HCP, and as such, almost all appointments were reported to take place in a clinical setting (94% SC, 100% IV), with 34.8% of SC and 20.4% of IV appointments occurring in a doctor's office; however, more patients were satisfied with where they received their SC treatment (74.1%) compared with their IV treatment (45.8%) (Table 2; Fig. 2). While patients generally traveled similar distances for SC and IV treatments, travel time was typically less than 1 h for SC appointments (74.7%) and up to 2 h for IV (79.1%). Respondents were more frequently satisfied-to-very satisfied with the time spent traveling to a SC treatment (53.7%) compared with an IV treatment (30.3%). Total treatment time (from when the respondent arrived for treatment to when they departed) typically took less than 1 h for SC (56.2%, 10.4% IV). More than twice as many respondents were satisfied-to-very satisfied with the time spent waiting for SC treatment to be completed (67.7%) than for IV (30.4%). To this point, respondents were five-times more bothered (very-to-extremely bothered) about the time that they spent receiving IV treatment (36.8%) compared with the time receiving SC treatment (7.0%).

This survey also examined the impact of each treatment option on daily-life activities (Fig. 2). Approximately twice as many patients agreed or strongly agreed that IV treatment was a burden to their families or caregivers (50.7%) than SC treatment (24.9%). Survey respondents were less likely to need their caregiver to accompany them to an SC treatment (29.9%) than an IV treatment (44.3%). Respondents felt it was easier to schedule appointments for convenience with SC treatment (64.7%) than IV treatment (38.3%), and consequently, approximately two-times more survey respondents felt that SC treatment was easy to manage (71.6%) compared with IV treatment (34.8%). SC treatment (25.4%) was half as likely to invoke anxiety or emotional distress than IV treatment (50.2%). Respondents indicated that they were almost twice as likely to consider stopping IV treatment (40.8%) than SC treatment (23.9%).

Exploring Patient Perceptions of At-Home SC Injections

This survey also included hypothetical questions that aimed to gauge patient feelings on how at-home SC injections may influence the treatment experience (Table 3). Over 80% of respondents indicated that they would probably-to-definitely see a personal benefit in receiving SC treatment at home rather than at a healthcare facility, either self-administered or administered by a caregiver or HCP. The majority of respondents (52.7%) agreed that receiving SC treatment at home would interfere less-to-significantly less with their own and their family's everyday life than receiving SC treatments at a healthcare facility. Respondents indicated that receiving SC treatment at home would make it easier-to-significantly easier (70.6%) to cope with their illness as compared with receiving SC treatment at a healthcare facility.

DISCUSSION

To our knowledge, this study was the first in the USA to survey treatment preferences in a real-world setting among patients with cancer who have received both SC and IV delivery of their cancer treatment across several biologics. The

Table 2 Survey responses regarding treatment site location and travel

Question	SC		IV	
	Percent (%)	Number ($N = 201$)	Percent (%)	Number ($N = 201$)
Q16 and Q25. At what location have you most often received your cancer treatment?				
At a clinic of infusion center at a hospital	35.3	71	44.3	89
At a clinic or infusion center in a location other than a hospital	23.9	48	35.3	71
My doctor's office	34.8	70	20.4	41
In my home (excluded from following questions)	5.5	11	0.0	0
Other	0.5	1	0.0	0
Q17 and Q26. How many miles is that location from your home?		*n = 190*		
Less than 5 miles	11.1	21	11.4	23
Between 5 and 10 miles	31.6	60	26.4	53
Between 10 and 30 miles	28.9	55	31.3	63
Between 30 and 60 miles	26.8	51	27.4	55
Between 60 and 90 miles	1.6	3	3.0	6
More than 90 miles	0	0	0.0	0
Unsure	0	0	0.5	1
Q18 and Q27. How do you generally get to a treatment center to receive your cancer treatment?		*n = 190*		
I drive myself	43.7	83	29.9	60
I am driven by a friend or family member	31.6	60	44.3	89
I use public transportation	18.4	35	17.4	35
I take a taxi or ride share service	5.3	10	7.0	14
I walk	0.5	1	0.5	1
Other	0.5	1	1.0	2
Q19 and Q28. How long, on average, does it take to travel one way to a treatment center to receive your cancer treatment?		*n = 190*		
Less than 1 h	74.7	142	33.3	67
Between 1 and 2 h	21.6	41	45.8	92
Between 2 and 3 h	3.7	7	18.4	37
More than 3 h	0	0	2.5	5

Table 2 continued

Question	SC		IV	
	Percent (%)	Number ($N = 201$)	Percent (%)	Number ($N = 201$)
Q20 and Q29. For each treatment visit, how much time, on average, does it take to receive your treatment as an… (total time)?				
Less than 1 h	56.2	113	10.4	21
Between 1 and 3 h	39.8	80	61.7	124
Between 3 and 5 h	4.0	8	22.4	45
Between 5 and 7 h	0	0	5.5	11
More than 7 h	0	0	0	0
Q21 and Q30. How bothered are you about the total time it takes to receive your cancer treatment as an… (from when you arrive until when you leave)?				
Not at all bothered	41.8	84	11.4	23
Slightly bothered	30.8	62	22.4	45
Moderately bothered	20.4	41	29.4	59
Very bothered	4.0	8	14.4	29
Extremely bothered	3.0	6	22.4	45

IV intravenous, *N* sample size, *n* number of patients for whom that question is applicable, *Q* question, *SC* subcutaneous

selection of specific cancer treatments based on their time on the market with both SC and IV formulations and their usage rates allowed sufficient patient experience with both routes for an adequate patient sample size. Among the 201 patients completing the survey, a strong preference for SC delivery was observed, with respondents often noting the convenience and independence provided by SC treatments compared with IV. In particular, patients typically reported improvements in their ability to complete daily activities and maintain relationships while also experiencing less treatment-related distress. When given the opportunity to compare their SC and IV treatment experiences in their own words, these sentiments were reflected and further emphasized. Patients were twice as likely to be inclined to continue their SC treatment plan compared with the IV alternative. Therefore, while IV may be the traditional ROA, data support a growing preference among patients with cancer in the USA for the SC route owing to benefits in their daily lives and relationships, as well as a reduction in treatment burden.

Patients reported a reduced burden related to treatment time when treatments were administered through the SC route, consistent with previously-reported analyses that have compared SC and IV treatment time [14, 15]. Including wait times, appointments were generally less than 1 h for SC but 1–3 h for IV. Survey respondents were typically more bothered about IV treatment time compared with SC, highlighting the concept of time toxicity, commonly referenced when respondents were able to convey their experiences in their own words. Time toxicity can be conceptualized as the time burden associated with treatment, including time spent at the hospital, coordinating care, travel and wait time at a healthcare facility, as well as the time spent seeking care for side effects and undergoing follow-up testing [31], which can translate

Table 3 Exploratory perceptions on at-home SC injections

Question	Percentage (%)	Number ($N = 201$)
Q35. Would you see a personal benefit in receiving SC injections given at home by you or a caregiver rather than administered by an HCP at a healthcare facility?		
Probably-to-definitely yes	83.1	167
Neither yes nor no	10.0	20
Probably-to-definitely not	7.0	14
Q36. Would you see a personal benefit in receiving SC injections given at home by an HCP rather than at a healthcare facility?		
Probably-to-definitely yes	85.1	171
Neither yes nor no	9.5	19
Probably-to-definitely not	5.5	11
Q37. Would a SC injection received at home interfere more or less with you and your family's everyday life as compared to receiving it at a healthcare facility?		
More-to-significantly more	32.3	65
Neither more nor less	14.9	30
Less-to-significantly less	52.7	106
Q38. Would a SC injection given at home make it harder or easier for you to cope with your disease as compared to receiving it at a healthcare facility?		
Harder-to-significantly harder	13.9	28
Neither harder nor easier	15.4	31
Easier-to-significantly easier	70.6	142

IV intravenous, *N* sample size, *Q* question, *SC* subcutaneous, *HCP* healthcare professional

to indirect financial burden for the patient. Prior studies have suggested that the substantial time spent receiving cancer care can outweigh the modest benefits in survival that the treatment offers [31–33]. Time toxicity can subsequently impact patient caregivers, as their schedules are often tied to the patient, and can impact quality of life of both the patient and their support system [31]. While other studies have been able to demonstrate similar perspectives, these studies have often included fewer than 100 patients [11]. Therefore, the time burden of care must be considered for each patient when creating a treatment plan.

The hypothetical concept of receiving at-home SC treatment administered either by the patient, a caregiver, or an HCP was considered beneficial to most survey respondents, echoing previously published results on home-based administration of SC treatment using an oncologic home-hospitalization model in Belgium [34]. Patients felt that at-home injections would interfere less with their daily lives, a common reason for preferring SC over IV, and assist them in coping with their illness. Self-injection anxiety, patient confidence, ability to perform the injection, and adequate training should be addressed on a patient-by-patient basis to better implement at-home SC injections. These factors can influence treatment adherence and subsequent patient outcomes, and as such, patients

should be treated as individual stakeholders in making treatment decisions.

There were several limitations to this study. For example, this survey queried the overall preference towards either ROA but did not facilitate the direct comparison of SC and IV for questions related to treatment burden or satisfaction. Another limitation was that costs and disease severity were not accounted for; as either may influence patient preference, future studies may wish to include these parameters. It is also possible that a selection bias was introduced, as the use of an online survey may have favored more technologically adept populations. This study only surveyed patients within the USA, as patient-reported satisfaction studies among US patients with cancer have been limited; therefore, these data may not be generalizable to other countries. In addition, while patients were from diverse regions of the USA, almost half (48.3%) were from the Mid-Atlantic region, which may not be generalized to the rest of the country.

Future studies may wish to examine how the inclusion of patient experience and preference data may guide conversations between patients and their physicians regarding the decision of an appropriate treatment plan. Data derived from this study and others may also be of interest in developing policies such as US Medicare site neutrality, which would aim to promote patient choice of care site by ensuring that payments are the same across sites of care. In addition, studies of the patient experience for those who have received at-home SC injections would provide further insight into its value to patients and their caregivers.

CONCLUSIONS

This study was the first, to our knowledge, survey in a real-world setting of patients with cancer in the USA experienced with both SC and IV delivery for their cancer therapeutics across multiple biologics. Results from this survey demonstrated that when given a choice between ROAs, patients frequently preferred SC delivery, often citing an improved sense of convenience and a reduction in treatment burden as reasons for their preference, as well as a greater inclination to continue their treatment. SC alternatives to biologics traditionally delivered via the IV ROA have become increasingly available, and patients will therefore be increasingly presented with the choice between SC and IV delivery of their cancer therapeutics. While administrative and reimbursement differences may impact the choice between SC and IV delivery, an improved comprehensive understanding of the patient experience may better facilitate the broader adoption of SC delivery in the USA. The results of this study highlight the need to broaden treatment considerations to include the context of individual patients in terms of their preferences, satisfaction, treatment burden, and support from caregivers, as consideration of these factors may support treatment adherence and consequently, may improve treatment outcomes.

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Declarations

Conflict of Interest. Robert Epstein is co-founder, CEO, and President of Epstein Health, LLC. JoAnn Krenitsky is co-founder and SVP of Epstein Health, LLC. Phillip Sarocco is an employee and shareholder of Halozyme Therapeutics, Inc.

Ethical Approval. Institutional review board (IRB) approval was obtained prior to patient recruitment; the final survey document and research plan received IRB review exemption by the Sterling IRB. This research was conducted according to the Helsinki Declaration. All HIPAA/patient privacy requirements were followed for patient recruitment, communication, obtaining and analyzing data, and by the participating personnel/facilities. All participants provided consent prior to participating in the online survey.

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