

Stakeholder-guided development of dialysis vascular access education materials

Adeline Dorough¹, Julia H. Narendra¹, Caroline Wilkie², Akhil Hegde¹, Kawan Swain¹, Emily H. Chang¹, Terence Oliver³, and Jennifer E. Flythe^{1,4}

1. University of North Carolina Kidney Center, Division of Nephrology and Hypertension, Department of Medicine, UNC School of Medicine, Chapel Hill, NC
2. Punta Gorda, FL
3. Hussman School of Journalism and Media, University of North Carolina, Chapel Hill, NC
4. Cecil G. Sheps Center for Health Services Research, University of North Carolina, Chapel Hill, NC

Corresponding Author: Jennifer E. Flythe MD, MPH
University of North Carolina Kidney Center
7024 Burnett-Womack CB #7155
Chapel Hill, NC 27599-7155
jflythe@med.unc.edu
(tel) 919-445-2656
(fax) 919-966-4251

KEY POINTS

- Guided by 105 stakeholders, we developed mixed-media vascular access education materials that acknowledge common patient concerns.
- Preliminary findings suggest that the education materials are promising to improve vascular access understanding among patients.

ABSTRACT

Background: Initiating hemodialysis via an arteriovenous (AV) access is considered best practice for most patients. Despite the well-recognized advantages of AV access, 80% of U.S. patients start hemodialysis with a catheter. Limited patient knowledge about vascular access, among other factors, may play a role in this high rate. We used iterative stakeholder input to develop novel, mixed-media vascular access education materials and evaluated their preliminary acceptability.

Methods: We conducted preliminary focus groups and interviews with key stakeholders to assess patient vascular access understanding and elicit perspectives on existing education materials. We then used stakeholder input to inform initial development and iterative updates to the content and design of an animated video and complementary brochure. Video development (scripting, storyboarding, animation) was guided by an evidence-based framework and two health behavior change models. We assessed acceptability of the completed materials with patients and medical providers/personnel via interviews.

Results: Overall, 105 stakeholders participated in education materials development and review (80 patients/care partners, 25 medical providers/personnel). Preliminary qualitative work included 52 patients/care partners and 16 providers/personnel; video development included 28 patients/care partners and 9 providers/personnel. The video script, storyboards, and animation underwent 14, 4, and 9 stakeholder-guided iterations, respectively. Responsive changes included aesthetic modifications, technical updates, and content additions (e.g., HD circuit, access self-monitoring, enhanced patient testimonials). The final 18-minute video and complementary brochure define vascular access types, describe care processes, outline potential complications, and address common patient concerns. Interviews with 28 patients/care partners and 9 providers/personnel from diverse geographic regions revealed preliminary acceptability of and enthusiasm for the materials by patients and providers.

Conclusions: In collaboration with key stakeholders, we developed mixed-media vascular access education materials that were well-received by patients and providers. Preliminary findings suggest that the materials are promising to improve vascular access understanding among patients.

INTRODUCTION

Initiating hemodialysis (HD) via an arteriovenous (AV) access is considered best practice for most patients. Compared to central venous catheters, AV accesses are associated with lower risk for infection, cardiovascular events, hospitalizations, and death.¹⁻³ Despite the well-recognized advantages of AV access, 80% of U.S. patients start hemodialysis with a catheter.⁴ While complex barriers related to the health system (e.g., insufficient inter-provider communication), patient (e.g., emotional distress), and clinical status (e.g., uncertainty about time to kidney failure) contribute to this high rate,⁵⁻⁷ limited patient understanding of vascular access may also play a role.

Health education interventions have potential to enhance understanding, improve self-management, and positively impact health outcomes among individuals with chronic kidney disease (CKD).⁸ However, we lack standardized approaches to vascular access education and related care processes. Currently, such education is combined with programs about kidney failure treatment options, despite the unique emotional experiences and clinical complexities associated with vascular access. While written education resources exist,⁹⁻¹² their use is variable, and most materials do not directly address patient concerns such as worries about dialysis, needles, and/or disfigurement. As such, there is need for novel vascular access education approaches that are patient-centered and delivered at an appropriate health literacy level. Emerging data suggest that animating health information can enhance learning and retention across literacy levels.¹³⁻¹⁶

Accordingly, our objective was to develop mixed-media vascular access education materials that acknowledge patient emotions (e.g., fear, reluctance) while providing realistic insight into the care steps and potential complications that may arise during the process of creating a viable AV access. Throughout the project, we used iterative stakeholder input to guide content, imagery, and tone. We then evaluated the preliminary acceptability of the developed materials with stakeholders.

METHODS

Overview

Figure 1 depicts project activities. In preliminary focus groups and interviews, stakeholders identified the lack of mixed media, patient-centered education materials as a barrier to AV access-based HD initiation. In response, we developed a vascular access education brochure and produced an animated video. We used iterative stakeholder input to inform material content and design.

The preliminary focus groups, interviews, and draft education brochure assessment were conducted as part of a broader Geisinger Health quality improvement (QI) project aiming to improve rates of AV access-based HD initiation.¹⁷ These activities were approved by the Duke Health Institutional Review Board (IRB) (Pro00075488). Video development activities were approved by the University of North Carolina (UNC) IRB (20-0369). Participants provided informed consent.

Preliminary focus groups, interviews, and draft brochure

We conducted focus groups and interviews with stakeholders from Geisinger Health in Danville, PA, and UNC Health in Chapel Hill, NC. Care partners and patients with non-dialysis-dependent advanced CKD (estimated glomerular filtration rate (eGFR) ≤ 20 mL/min/1.73m²) and a preference for HD, or HD-dependent kidney failure who initiated HD within 1 year were eligible for focus groups. Interviewees included nephrologists, surgeons, interventionalists, and clinic personnel. Research coordinators recruited patients and providers using IRB-approved in-person and over-the-telephone recruitment scripts. We used purposive sampling to recruit individuals with diverse vascular access care experiences and professional roles. Two research coordinators (one from each site) with prior experience in qualitative data collection completed joint training to ensure standardized use of this project's moderator and interview guides (**Supplemental Table S1**). In addition, the research coordinators received training about

vascular access from a CKD educator, nephrologist, and two patients with vascular access experience. Both coordinators performed a mock interview observed by the principal investigator prior to research data collection. All research interactions were recorded and professionally transcribed.

Findings were used to draft a preliminary vascular access education brochure for the Geisinger Health QI project.¹⁷ During the QI project, we collected user feedback (patient, medical provider/personnel) through semi-structured interviews to inform brochure modifications and video development.

Video development and production

Strategy and target population

We used Williams' adaptation of the Medical Research Council (MRC) Framework for the development of visually based interventions to guide video development. The framework has four stages: 1) selecting a theoretical basis, 2) developing a narrative to establish structure, 3) storyboarding and creating imagery, and 4) establishing acceptability and understanding.¹⁸ We aimed to develop a 15-minute video to balance the need to communicate detailed information without overtaxing the viewer. Our target audience is people planning for HD as treatment for kidney failure and their social supports. Ideally, the materials would be used in the dialysis preparatory phase to support preemptive AV access creation. However, the information is also relevant to individuals who have already initiated HD.

Development process

Selecting a theoretical basis. Video objectives were to: 1) improve understanding of vascular access and potential complications, 2) increase the perceived benefits of AV access, 3) reduce uncertainty surrounding vascular access care processes, and 4) increase self-efficacy in navigating such processes. To guide video content and format, we drew upon two health behavior change models derived from social psychological theories: the health belief model and Leventhal's self-regulation model.¹⁹⁻²¹

Developing a narrative. After selecting the theoretical bases, we worked with stakeholders to draft and iteratively refine the script, using the principles from Hill-Briggs' 5-step methodology for adaptation of patient health information to achieve a 5th-grade reading level. Specifically, we employed short sentences with active (vs. passive) voice and defined essential medical terms (e.g., thrill, bruit, cannulation).²² We used transitions between a professional narrator and a patient narrator to retain viewer attention and reinforce important concepts.

Storyboarding and creating imagery. A professional animator (T.O.) then drafted storyboards. The animator selected subway imagery to depict the "journey" and visually communicate the non-linear aspects of associated care. This approach naturally supported the patient recommendation of content segmentation through subway stops. We incorporated photographs of real vascular accesses and ultrasound images to supplement animated graphics.

Animation and sound production. The animator then converted the static storyboard images into flowing video sequences, and a professional audio engineer added the narrations, background music, and supporting sound effects to create a cohesive narrative.

Acceptability and understanding. We sought to establish video content preliminary acceptability and understanding through stakeholder interviews.

Stakeholder input

Throughout video development, we gathered input from stakeholders through semi-structured interviews. Using the same recruitment criteria and strategies as for preliminary data collection, we recruited participants from UNC Health-affiliated practices. In addition, we relied on a patient database to recruit patients from other health systems who had previously expressed interest in learning about research opportunities. All interviews were conducted by an experienced interviewer using standardized guides (**Supplemental Table S1**). The master's trained interviewer has more than 4 years of experience performing semi-structured research interviews with individuals with kidney disease, their providers, and other relevant stakeholders.

During script-related interviews, interviewees read-along to an audio-recorded script; the interviewer sought input on content, narration style and pacing, and potential visual supports. The script underwent 14 stakeholder-driven iterative revisions. During storyboard and video interviews, interviewees examined storyboards or the video (in part or in whole); the interviewer sought feedback on graphics, sound effects, and flow. Interview questions focused on content completeness, technical accuracy, design, and patient-centeredness. In cases where we made responsive technical changes (e.g., thrombectomy animation, needle positioning) or content additions (e.g., HD circuit, access self-monitoring), we returned to the recommending stakeholders to affirm the updates. The storyboards and video underwent 4 and 9 stakeholder-driven iterative revisions, respectively.

Video and written materials alignment

We then updated the content and aesthetics of the preliminary brochure to match the video by 1) aligning wording and definitions, 2) adding stakeholder-recommended topics, and 3) incorporating video imagery. We assessed acceptability of the final materials with patients/care partners and medical providers/personnel via interviews.

Analysis

We used descriptive statistics (count (%), median [interquartile range]) to report participant characteristics and materials' acceptability. We imported preliminary focus group and interview data transcriptions into ATLAS.ti software (Version 7, Berlin, Germany) and used directed content analysis to identify barriers to vascular access care,²³⁻²⁵ focusing on education-related gaps for this presented work. Three researchers used line-by-line coding to group text according to education-related deficiencies (e.g., content, style, reading level). Specifically, the data were split into smaller units, named based upon their content, and then grouped according to conceptual similarities.²⁵ Through iterative discussion (i.e., triangulation), researchers resolved discrepancies and reached consensus on the coding scheme.

During video development and production, we analyzed stakeholder interviews to guide revisions to the script, storyboards, and video. Data were compiled in tables organized by video development stage, interviewee type, and material aspect (e.g., content, tone, imagery). Two researchers independently reviewed and coded the data to identify content for potential revision. When considering responsive changes, we weighted information provided by ≥ 2 interviewees. To ensure validity and credibility, we performed member checking (i.e., participant validation) where we asked participants to review the education material changes made in response to their initial interviews and confirm their accuracy.²⁶ We considered development steps complete when member checking produced no suggested revisions. We deemed the materials final when acceptability testing yielded $>90\%$ acceptability, and stakeholders suggested no further modifications.

RESULTS

Participant characteristics

Table 1 depicts project participants. Preliminary qualitative work conducted to identify deficiencies in existing vascular access education materials included 4 focus groups with 18 patients (9 HD, 9 advanced CKD) and 6 care partners, and 16 individual interviews with providers/personnel, all from Geisinger Health and UNC Health. During the Geisinger Health vascular access QI project, 28 people with advanced CKD (median [interquartile range (IQR)] eGFR, 21 [17, 24] mL/min/1.73m²) reviewed the preliminary education brochure.

Video development and review participants included 28 patients (6 HD, 18 advanced CKD, 1 transplant), 3 care partners, and 9 providers/personnel. Among patient participants, the median [IQR] age was 58 [52, 77] years and 12 (42.8%) had a high school degree or less. Among provider participants, the median [IQR] time serving in their role was 5 [4, 11] years.

Education-related findings from preliminary focus groups and interviews

In focus groups, patients and care partners reported feeling uncertain navigating vascular access care processes and identified the need for more comprehensive, patient-centered education materials (**Supplemental Table S2**). They also emphasized inclusion of patient testimonials to acknowledge and validate emotional experiences (e.g., reluctance, fear). Patients underscored the importance of frankly describing the variable experiences and potential complications associated with viable AV access creation. In interviews, providers affirmed the importance of the aforementioned, reflecting on their own experiences with patients who were unprepared to participate in shared decision-making or manage common complications due to limited understanding of vascular access. Patients and providers acknowledged that the breadth of information could overwhelm audiences, and therefore suggested segmenting the material, presenting vascular access care processes as a multi-step “journey.” We used these findings to inform development of a preliminary vascular access education brochure.

Initial testing of draft education brochure

Overall, patients responded positively to the preliminary education brochure’s content, format, and length (**Supplemental Table S3**). Specifically, the “journey” concept clearly depicted the steps involved in getting a vascular access and definitions improved understanding of terminology. Of the 28 patients who reviewed the brochure, 27 (96%) would recommend it to other patients. Several patients suggested developing a video to reinforce and expand upon the brochure concepts, citing a desire for more in-depth information that could accommodate different learning styles.

Stakeholder-informed video development

Supplemental Table S2 contains participant quotations from all stages of materials development. **Table 2** displays a summary of the stakeholder input and responsive script,

storyboard, and video changes. Specifically, input was obtained from 21 individual participants (12 patients, 9 providers) across 47 unique interactions. **Figure 2** provides examples of stakeholder-informed, patient-centered concepts applied during video development.

Script development

In early script interviews, stakeholders affirmed the importance of the included concepts but suggested simplifying technical descriptions and elaborating on practical aspects (e.g., life impact, timeline). Patients and providers recommended adding information about vascular access maintenance procedures (e.g., angioplasty, catheter thrombolysis) and providing more detail about HD (e.g., cannulation, dialysis circuit). In general, interviewees appreciated repeated information to facilitate understanding, but a few considered the redundancy a distraction. In response, we shortened or spaced-out repeat descriptions. Related, we consolidated the interspersed patient testimonials into summary sections at each “journey stop.” In near-final script interviews, stakeholders reported that these changes effectively signaled content transitions, reinforced key information, and, most importantly, infused the script with humanity and “real life” experiences. In addition, stakeholder input guided word changes to promote technical accuracy and an appropriate health literacy level (e.g., incorporating and defining terms such as “vessel mapping” and “maturing”). The script was deemed “final” upon interviewee approval of modifications during member checking.

Storyboard and video development

In storyboard and early video interviews, stakeholders suggested modifying the color palette to reflect more diverse skin tones, enlarging font size, adding real imagery, and using on-screen text to signal key terms. Many patients expressed concerns about body disfigurement. One woman said “...I’m so concerned that my arm is gonna look like some incredible hulk.” In response, we added photographs of vascular accesses to showcase their variability in appearance. Patients preferred that procedures remain animated to avoid unnecessarily detailed depictions. Interviewees also suggested incorporating a “vascular access

journey map” throughout the video to illustrate progress and depict the non-linear nature of the experience (**Figure 3**).

Final video production

In near-final video interviews, stakeholders reported satisfaction with animation updates, citing improvements in the depiction of content often perceived as dull and complex. Only minor refinements were suggested to support ease of viewership. For example, a few perceived the journey stops as “running together.” In response, we lengthened transitions and added audio indicators to cue the beginning of each “journey stop.” After these edits, the final video was 18-minutes long, 3-minutes more than the target duration. Despite the length, patients found the content neither burdensome nor boring, describing the video as empowering because of its comprehensive and realistic nature. In general, stakeholders found that the animation effectively imparted complex information, while the two narrators, background music, and sound effects held their attention. One HD patient commented, “It was visually interesting, and I wasn’t watching the clock thinking that it was taking forever,” and an advanced CKD patient said, “...the video gave me lots of information that I can just sit with and ask questions later.”

In particular, the patient narrator’s story resonated across stakeholder types. A HD patient commented, “[She] will reduce anxiety and make things clearer. You always can identify with someone who has been through what you’re going to go through.” This idea was evidenced when an individual just beginning their vascular access journey said, “I felt less tense and less worried because of her...” All patient and provider participants indicated they would recommend the video to their peers and patients, respectively.

Understanding and acceptability of post-production materials

The final education package (go.unc.edu/dialysisaccess; **Supplemental Materials**) was evaluated by 25 patients, 3 care partners, and 9 medical providers. Participants hailed from diverse geographic regions, and 13 (77%) of the patients had advanced CKD – the video target

audience. Participants felt that the aesthetics and content paralleled one another, effectively reinforcing important concepts (e.g., vascular access journey, terms) while providing helpful medium-specific individualizations (e.g., space to write-in medical appointments, animated technical procedures). Patients called attention to the accessibility of mixed media, noting “...it’s great because you can watch the video and then take the brochure home and really think about it...” and “...it gives you a chance to keep thinking about it [and] share it with family.” Similarly, a provider commented, “The repeated visuals help [the information] stick with you. Even if a patient is overwhelmed and teary-eyed and mad, [they] can remember these pictures so [they] know how to ask questions.” All 37 (100%) interviewees endorsed use of the materials in practice, exceeding the 90% acceptability threshold.

DISCUSSION

This paper describes the stakeholder-guided process of developing a patient-centered vascular access education video and complementary brochure. The resultant materials use subway imagery to depict the “journey” of navigating vascular access care and include patient testimonials to acknowledge common emotions and concerns, as well as summarize key health information. Preliminary findings suggest that the materials are acceptable to patients and providers and have potential to improve understanding of vascular access and associated care. This work highlights the importance of creating mixed-media health education tools that are infused with patient experiences to enhance relatability and appeal.

A systematic review of qualitative studies found that patients often experience emotional vulnerability, unpreparedness, and loss of control during vascular access planning.²⁷ Our focus group findings supported these data, with stakeholders reiterating the need for education that directly acknowledges patient anxiety, fear, and uncertainty. To do so, we incorporated a patient narrator who is currently receiving maintenance HD. In the video, she tells her own vascular

access story, describing her reluctance to start the journey, fears of needles and pain, and medical complications. The patient's story resonated with viewers, who described "Caroline" as the distinguishing video element, grounding the health information in an authentic voice. Patients found Caroline's story comforting because they identified with her emotions and challenges. Such reactions are consistent with peer mentorship literature that highlights the role of shared patient experiences in normalizing emotions, promoting credibility, enhancing trust, and providing hope.^{28, 29} The patient narrator also reiterated critical information relayed by the professional narrator, aiming to increase viewer understanding and retention. Stakeholders felt this approach was particularly important given the information complexity and volume.

However, the aforementioned elements would likely fall short without accommodating different learning styles and literacy levels. Limited health literacy affects more than a quarter of individuals with CKD and is associated with poorer health outcomes (e.g., more rapid kidney function decline, higher mortality).³⁰⁻³⁴ Factors related to limited health literacy including reduced self-management capacity, challenges navigating care processes, and difficulty effectively communicating with providers may, in part, mediate these observed associations.³⁵ Data suggest that animation can help overcome some limited health literacy challenges by improving comprehension and recall.¹³⁻¹⁵ For example, audiences with limited health literacy may have difficulty developing mental representations of static information.^{36, 37} Incorporating dynamic animation and audio narration in colorectal education materials was shown to eliminate recall differences between audiences with lower and higher health literacy.¹³ Moreover, an animated video on kidney allocation provides precedent for utilizing this medium to improve understanding and decisional self-efficacy in CKD populations.³⁸ Therefore, we coupled static (brochure) and dynamic (video) media to enhance viewer information processing, emphasize key points, and improve recall of vascular access information.

Strengths of our project include: 1) use of a validated framework for the development of visually based interventions and 2) health behavior change models to guide content and

development; 2) reliance on a 5-step methodology for lowering material reading level; 3) incorporation of both professional and patient narration; 4) guidance by diverse stakeholders; and 5) input from 80 patients/care partners, including perspectives from 54 individuals with advanced CKD (i.e., the target audience). We acknowledge project limitations. First, we included English-speakers only. While we have translated the materials into Spanish, these require cultural validation and possibly cultural adaptation. Second, the video length could deter viewing. To address this potential limitation, we generated time-stamped video chapters within the 18-minute video and 8 individual “journey stop” video clips to facilitate segmented viewing. Third, we reported solely on the material development process. Future studies should assess the materials’ effectiveness at increasing knowledge, decisional self-efficacy, and improving clinical outcomes. Finally, no education product is ever truly *finished*. While we used formal member checking and acceptability testing to guide our decision to end material editing, we acknowledge that future revisions may be warranted.

In conclusion, we present a vascular access education package comprised of an animated video and complementary brochure. Together, these materials present key information about vascular access, care steps, and common patient concerns. Although future research is needed to evaluate their effectiveness, our data highlight the materials’ potential to improve patient understanding and experiences as they navigate dialysis vascular access care.

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Ventures, Baxter, National Kidney Foundation, Numerous universities; Scientific Advisor or Membership: KDIGO Executive Committee (2020-), KHI Board of Directors (2019-), KHI Patient Preferences Project Chairperson (2019-), American Journal of Kidney Diseases Editorial Board (2017-), Clinical Journal of American Society of Nephrology Editorial Board (2017-), Nephrology Dialysis and Transplantation Editorial Board, Hemodialysis Theme Editor (2018-), Kidney Medicine Editorial Board (2019-), Kidney 360 Associate Editor (2019-). E. Chang reports the following: Research Funding: Lantheus Medical Imaging; Scientific Advisor or Membership: I am on medical advisory board for the North Carolina chapter of the National Kidney Foundation. A. Hegde reports the following: Consultancy Agreements: Truepill; Other Interests/Relationships: ASDIN - Research Committee. C. Wilkie reports the following: Consultancy Agreements: University of Pennsylvania with the HOPE Consortium, University of North Carolina at Chapel Hill, University of Pittsburgh and KHI; Other Interests/Relationships: NKF. The remaining authors have nothing to disclose.

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AUTHOR CONTRIBUTIONS

A Dorough: Conceptualization; Data curation; Formal analysis; Investigation; Project administration; Visualization; Writing - original draft; Writing - review and editing

J Narendra: Data curation; Formal analysis; Investigation; Project administration; Writing - review and editing

C Wilkie: Investigation; Visualization; Writing - review and editing

A Hegde: Investigation; Visualization; Writing - review and editing

K Swain: Investigation; Visualization; Writing - review and editing

E Chang: Investigation; Visualization; Writing - review and editing

T Oliver: Conceptualization; Investigation; Methodology; Resources; Software; Visualization; Writing - review and editing

J Flythe: Conceptualization; Formal analysis; Funding acquisition; Investigation; Methodology; Resources; Supervision; Writing - original draft; Writing - review and editing

SUPPLEMENTAL MATERIAL

Supplemental Table S1. Representative interview guide questions.

Supplemental Table S2. Stakeholder quotations.

Supplemental Table S3. Stakeholder-informed vascular access educational brochure development.

Education Package

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TABLES

Table 1. Participant characteristics.^a

Characteristic	Focus Groups & Interviews (N=40)	Draft Brochure Review (N=28)	Animated Video Review (N=37) ^b
Patients and Care Partners	n=24	n=28	n=28
Participant type			
HD patient	9 (37.5)	0	6 (21.4)
Transplant	0	0	1 (3.7)
CKD stage 4 patient	5 (20.8)	23 (82.1)	6 (21.4)
CKD stage 5 patient	3 (12.5)	5 (17.9)	12 (42.8)
Unknown CKD stage	1 (4.2)	0	0
Care partner	6 (25.0)	0	3 (10.7)
Geographic region			
Southeastern U.S.	11 (45.8)	0	10 (35.7)
Northeastern U.S.	13 (54.2)	28 (100.0)	8 (28.6)
Midwestern U.S.	0	0	3 (10.7)
Western U.S.	0	0	5 (17.9)
Europe	0	0	2 (7.1)
Age (y)	65 [60, 73]	63 [58, 74]	58 [52, 77]
Female	12 (50.0)	9	15 (53.6)
Race			
Black	7 (29.2)	0	12 (42.8)
White	17 (70.8)	28 (100.0)	13 (46.5)
Other			3 (10.7)
Highest level of education completed		--	
Some high school	2 (8.3)		2 (7.1)
High school graduate or GED	12 (50.0)		10 (35.7)
Some college	3 (12.5)		5 (17.9)
4-y college degree or more	7 (29.2)		11 (39.3)
Vascular access type			
Fistula	16 (66.7)	0	4 (14.3)
Graft	1 (4.2)	0	4 (14.3)
Catheter	2 (8.3)	0	3 (10.7)
Fistula and catheter ^c	1 (4.2)	0	2 (7.1)
None	3 (12.5)	28 (100.0)	15 (53.6)
Missing	1 (4.2)	0	0
Clinic Personnel & Medical Providers	n=16	n=0	n=9
Professional role		--	
Nephrology provider ^d	3 (18.8)		4 (44.4)
Surgeon	2 (12.5)		1 (11.1)
Interventionalist	2 (12.5)		2 (22.2)
Nurse	8 (50.0)		2 (22.2)
Nephrology scheduler	1 (6.3)		0
Geographic region		--	
Southeastern U.S.	8 (50.0)		7 (77.8)
Northeastern U.S.	8 (50.0)		2 (22.2)
Age (y)	42 [38, 51]	--	46 [37, 63]
Female	11 (68.7)	--	6 (66.7)
Race		--	
Black	--		1 (11.1)
White	12 (75)		6 (66.7)
Other	4 (25)		2 (22.2)
Time worked in role	7 [5, 9]	--	5 [4, 11]

^a Values are presented as number (percentage) or median [interquartile range].

^b Of the 37 participants, 8 individuals participated in >1 interview.

^c Individuals dialyzing via catheter while AV access healing or maturing.

^d Nephrology provider includes physicians and advanced practice providers.

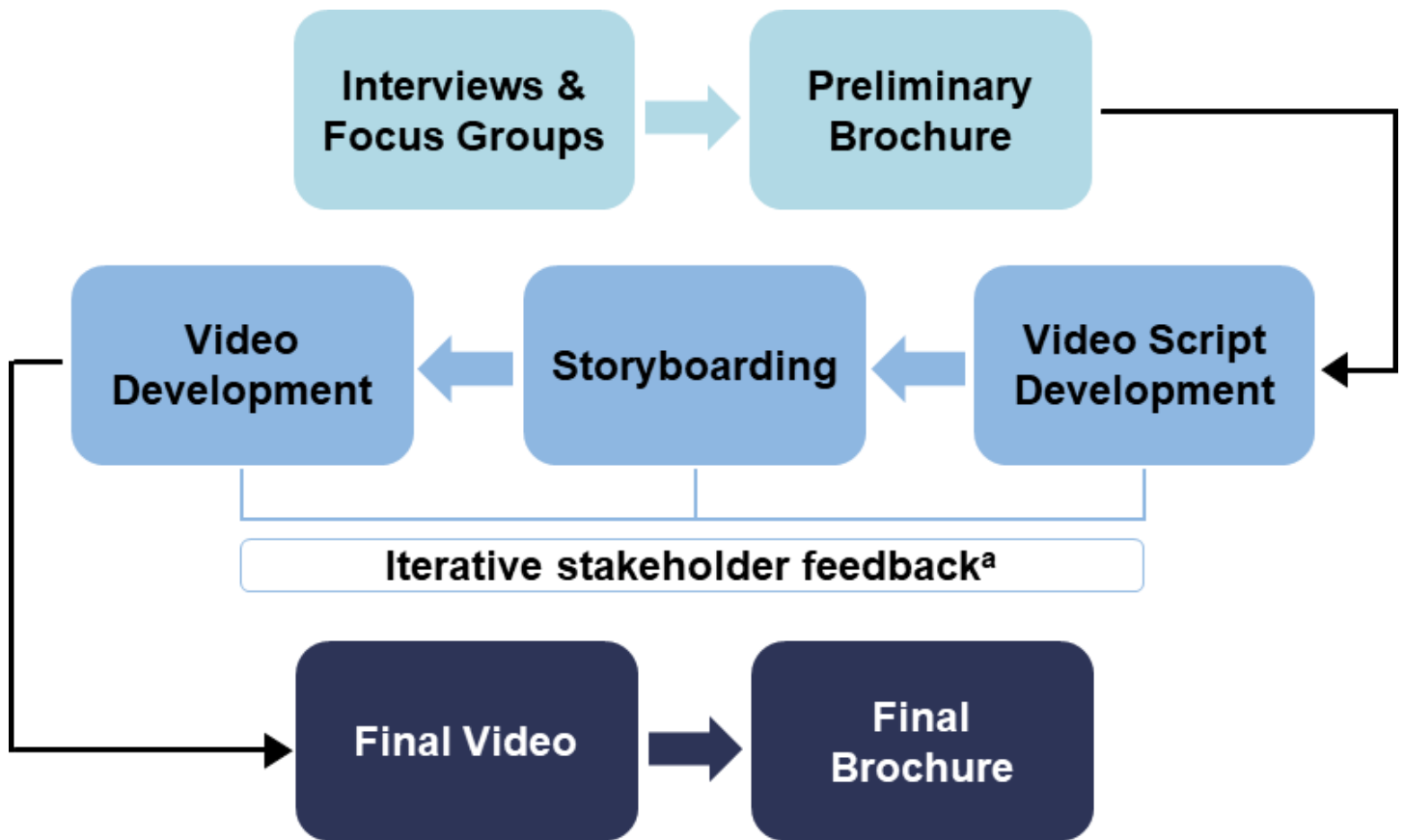
Abbreviations: CKD, chronic kidney disease; GED, General Educational Development; HD, hemodialysis; U.S., United States; y, year.

Table 2. Stakeholder feedback on the video and responsive changes.

Script and Storyboarding Feedback	Responsive Change(s)	Video Feedback
Patients		
Helpful information, but some details unnecessary	Shortened technical descriptions	Good overview that stimulates questions, equips patients for care team conversations
Patient-narrated portion is essential, well-timed, and relatable	Included patient’s voice and image throughout video	Patient story is impactful, clarifies information, and eases fears/concerns
“Journey” concept is intuitive; subway imagery is clear; detours imply different experiences	Added more examples to highlight variability in individual experiences	Steps to get an access are easy to follow; transparent content prepares individuals by providing a complete and truthful picture
Add more information about day-to-day life with a vascular access	Added patient-suggested daily activities, questions, and worries	Examples contextualize the information
Cartoons are effective at imparting complex information, but should be paired with real imagery	Added vascular access photographs and ultrasound images	Animation complements the script and is easy to understand; vibrant colors, pace, and tempo facilitate interest
Providers		
Content is comprehensive, but ranges from too technical to too non-specific	Removed excess detail (e.g. term “blood flow rate”); updated overly-simplified concepts (e.g. added detail about access self-assessments)	Addresses common concerns and key topics at an appropriate education level; relevant for both advanced CKD patients and HD-dependent patients
Amount of information is difficult to digest, but topics are critical to include	Re-ordered information; summarized key concepts in patient-narrated portions	Good flow; summaries support learning and bring humanity to technical detail
Provide context to make animation clearer	Added orienting imagery and labels	Animations are accurate and support learning

Figures

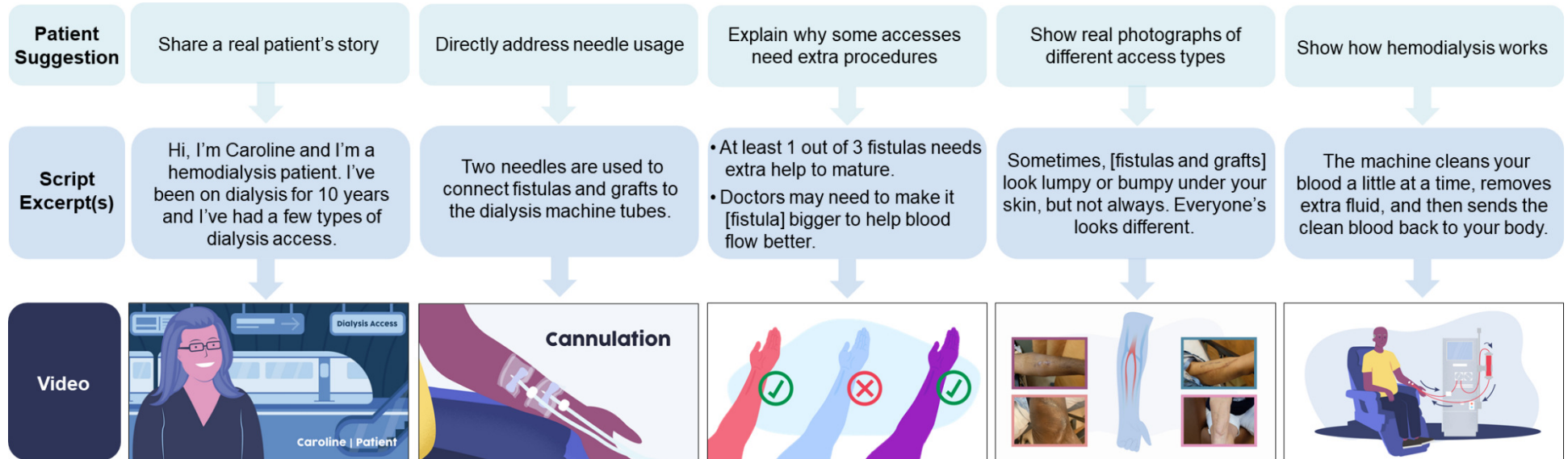
Figure 1. Process of dialysis vascular access education materials development.^a



^a Advanced CKD and dialysis-dependent ESKD patients, medical providers, and clinic personnel involved in the vascular access creation and maintenance process.

Figures

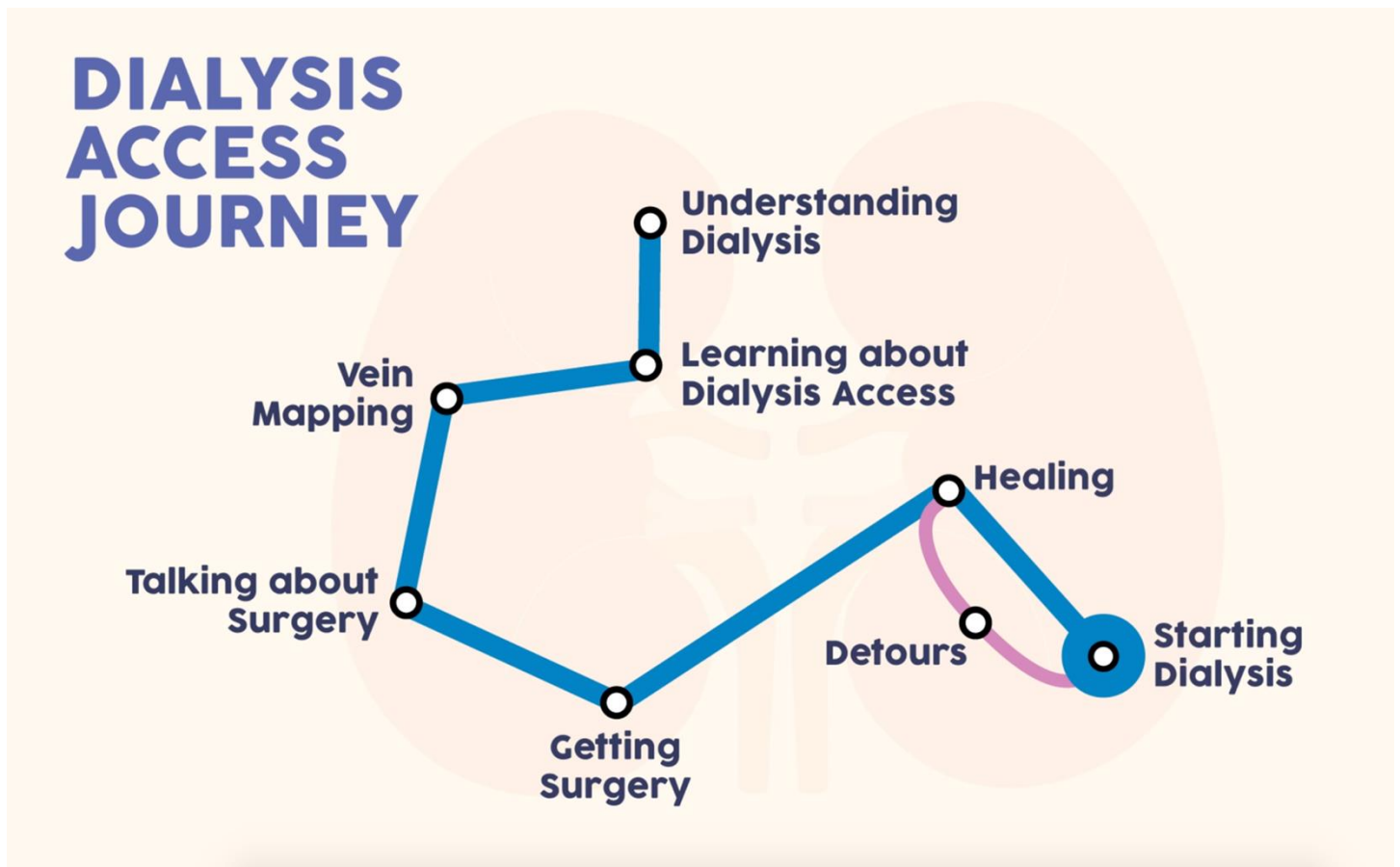
Figure 2. Application of patient-centered concepts in video development.



We used patient suggestions from focus groups and interviews to guide patient-centered concept inclusion throughout video development.

Figures

Figure 3. Imagery depicting a vascular access journey.



To help patients navigate their vascular access journeys, the video is comprised of eight “journey stops” (understanding dialysis, learning about dialysis access, vein mapping, talking about surgery, getting surgery, healing, detours, starting dialysis). This animated map is coupled with audio-aids and appears throughout the video to signal a new “stop,” or a change in the video content. It also serves as an indicator of video progress.