Identity Construction Environments:
Supporting a Virtual Therapeutic Community of Pediatric Patients undergoing Dialysis

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ABSTRACT
We describe a five-month pilot project conducted in the dialysis unit at Boston's Children's Hospital. Pediatric patients with renal disease used the Zora graphical multi-user environment while facing hemodialysis. Zora is an identity construction environment specifically designed to help young people explore issues of identity, while engaging in a participatory virtual community. This paper presents the experience and evaluates the feasibility and safety of using Zora in a hospital setting. It describes how Zora facilitated explorations of identity and mutual patient support and interaction. Finally it also presents design recommendations for future interventions of this kind. More generally, this paper explores the potential of technology specifically designed with therapeutic purposes to help patients cope with their illness.

Keywords
Multi-user virtual environment, pediatric patients, dialysis, therapy, identity, storytelling, virtual communities.

INTRODUCTION
Identity construction environments are computational tools specifically designed to support children to put together different aspects of their identity [1] While their mission is to help young people construct a well-grounded sense of self, identity construction environments can also serve therapeutic functions. This paper describes how pediatric patients with end-stage renal disease (ESRD) at Boston's Children's Hospital built and inhabited a virtual city using one of these identity construction environments, Zora.

Zora is a 3D graphical multi-user environment that integrates storytelling and computation [2]. It was designed to help young people explore issues of identity, while engaging in a participatory virtual community. Users build virtual rooms and populate them with objects and characters representing aspects of themselves, program them with storytelling behaviors, and converse with others in real-time through an avatar.

The dialysis unit at Boston's Children's Hospital has a constant population of young patients with ESRD. These young people facing hemodialysis form a community because they share a common medical condition and treatment. Yet, at the same time they are confined to bedspace that allows little social interaction. One of the goals of this pilot project was to explore the potential of Zora to facilitate mutual patient support. In order to investigate this, the study examined the feasibility and safety of using the Zora virtual environment in a hospital setting. More generally, this study explores the potential of using computer technology specifically designed with the therapeutic purpose of helping patients cope with their illness. This study grows out of collaboration between the Departments of Psychiatry and Nephrology at Boston's Children's Hospital and the MIT Media Laboratory.

BACKGROUND
The dialysis unit has a constant population of young patients with ESRD who attend three times a week for approximately four hours per session. Hemodialysis is only sufficient to ameliorate or prevent some, but not all, of the complications of renal failure. Studies have found evidence of psychological resiliency, but also significant constraints and burdens on patients with ESRD facing hemodialysis [3] The treatment often significantly disrupts the social, emotional and academic experiences of young people [4].

Patients with ESRD facing hemodialysis are an ideal population to benefit from the use of identity construction

environments such as Zora. They are struggling with issues of personal identity and are in need of interventions that support expression of emotions, working on relationships, being involved in meaningful activities and seeking support from others with similar experiences [5].

Patients already form a community with a shared medical condition and treatment that makes them and their lifestyles different from that of other young people their age. However, two factors hinder the formation of a community in which social support networks and patient interaction can fully develop. First, patients are on different dialysis schedules. Therefore they do not always know each other and/or have the chance to interact. Second, although some patients spend many hours together in the same room, they cannot communicate with each other in a private way while in treatment. The dialysis process ties them to unmovable beds that are too far apart physically to allow adequate social conversations.

Multi-user environments represent a potential innovative technique to respond to the medical crises and social isolation faced by young people with ESRD. Turkle explored how computer mediated communication on the Internet has become a social laboratory for experimenting with issues of psychological and social identity [6]. There are many "virtual" support groups in cyberspace for a wide variety of physical illnesses as well as numerous sites for obtaining factual information about pediatric illnesses. For example, The National Cristina Foundation, Express Link-up, Apple Computer, and The Starbright Foundation aim at helping ill children communicate with one another on line. Other computer applications, such as the Internet-based Experience Journal [7] and the interactive storytelling environment SAGE [8] were used by both parents and children with congenital heart to share their personal stories as a way to handle the stresses of having invasive medical procedures, surgery and hospitalizations.

THE TOOL: ZORA

Zora is a 3D graphical multi-user environment designed to support the exploration of identity through storytelling and programming. Users can create a virtual city and populate it by designing spaces, objects and interactive characters that can be programmed to engage in interactions with other users. They can also write stories about them. The name Zora was inspired by one of the cities that Italo Calvino describes in his book "Invisible Cities": *"This city is like a honeycomb in whose cells each of us can place the things we want to remember...So the world's most wise people are those who know Zora."* [9].

Users are graphically represented by avatars with the owners' image. Children can visit each other's homes and can communicate in real-time through their avatars via text or gestures. Avatars can gather in the City Hall to decide the laws of the virtual city as well as to discuss cases related to community self-government and current controversial news. Users can not only navigate around the 3D virtual

city, but also construct the city's private and public spaces: personal homes, community centers and temples. Temples are shared public spaces that represent cultural traditions or interests. Both personal homes and temples are spatial representations of identity composed by artifacts symbolizing intangible aspects of the self.

Zora is an object-oriented environment, meaning that users can make new objects by cloning existing ones and inheriting its attributes. Objects have the following attributes: 1) presentation attributes, *graphical appearance* and *motion*; 2) administration attributes, *ownership*, which determines who owns the object and therefore can edit it, and *permissions*, which set if the object can be cloned; and 3) narrative-based attributes, *textual description, stories, values* and *conversations*. Zora is implemented using the Microsoft's Virtual Worlds platform, a development kit for building distributed multi-user environments [10].

Zora is an identity construction environment designed upon the constructionist theory of education [11] and narrative therapy [12]. Constructionism asserts that we learn better when we are engaged in building personally meaningful dynamic artifacts to reflect upon and share with others in a community. Narrative therapy emphasizes the development of an individual's self- and shared- understanding by telling their stories or writing them.

In the same spirit as other constructionist virtual communities such as the text-based MOOSE Crossing [13] and the 2D Pet Park [14], kids can program behaviors for their own creations and draw pictures. In Zora, the programming aspect is limited to storytelling interactions. For example, users can describe the underlying turn-taking rules between user and character as well as define the stories to be told in response to certain input.

In Zora narrative serves both a communicative and a cognitive function. Storytelling allows people to communicate with each other or with their created characters. It also serves to organize in a coherent way the artifacts representing aspects of the self in the virtual spaces.

THE STUDY

The five months pilot study reported in this paper was conducted in the dialysis unit at Boston's Children's Hospital. Participants ranging from seven to eighteen years old were identified by the unit's social worker and child life specialist of the unit based on their personal interest. No computer expertise was required. From the total of twelve patients initially recruited, five kids discontinued their participation after one demonstration session due to varied reasons: changes in their medical condition, lack of interest in computers and feeling tired and sleepy during dialysis.

Each of the seven patients who did participate in the study used Zora an average of six sessions that lasted in average an hour. In some cases children engaged with Zora for as much as 3 hours and others for only 15 minutes at a time,

depending on patient's attention span, medical treatment required and general well-being. Patients had access to a networked computer at their bedside (see figure 1). Since there were only three computers, only three children were able to connect to Zora at the same time.
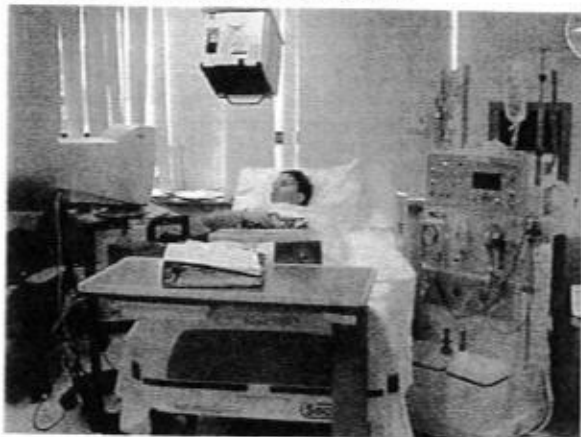

Figure 1: the Zora computer and the dialysis machine

A key component of the success of the project was to obtain the chief nephrologist's approval and support as well as the participation of the unit's social worker, child life specialist and nurses. The child life specialist and three nurses took an active role in participating in diverse aspects of the Zora project.

Research questions

The questions this pilot study looked to address were:

1. Feasibility and safety (i.e. Is Zora an application safe and satisfying for children with ESRD on hemodialysis?)

2. Exploration of personal identity (i.e. How do patients in dialysis use Zora? Is there a connection between using Zora and self understanding of illness?)

3. Facilitating mutual patient support and interaction (i.e. Does Zora have any impact on patient's and staff perceptions of social support?)

4. Providing design guidelines for the use of identity construction environments in hospitals (i.e. How can they best help children and families cope with the stresses of having a serious illness?)

Methodology

The Zora system was only accessible by the patients and staff in the dialysis unit, physicians in the Department of Psychiatry and researchers at the MIT Media Laboratory. Computers in the unit had installed the Zora environment, a graphical software and an Internet filtering system. They were mounted on tables suitable for bedside use in the hospital. A digital camera was also provided. Appropriate human studies permission was obtained. In addition, an agreement to respect a code of conduct in using Zora was signed by the patients and parents.

The work in the unit had three different phases, followed by a "service" stage in which the computers were left at the hospital as a service for the community but research had finished.

- *Phase 1: building interest around the Zora project.* This phase was critical as dialysis patients were found to have lower motivational levels to use Zora than seen in previous work with health children. During this phase, which lasted a month, we introduced the Unit's patients and staff to Zora, without asking them to commit to participate in the study. We also participated in different activities organized on the Unit to become familiar with the dialysis environment. *Phase 2: hands-on work with Zora.* We went to the unit four times a week. We rolled the computers to the patient's bedsides and worked on a one-to-one basis. We also trained the child life specialist so she could integrate Zora into her repertoire of activities. While undergoing dialysis, patients logged to Zora and used it for as long as they wanted, while it did not interfere with medical procedures. The goal of this phase, which also lasted one month, was to teach the Zora environment to the patients so they could express themselves through their creations. Within this phase, a field trip to the Media Lab was organized.

- *Phase 3: working remotely.* Once patients became familiar with the technology, they were able to use Zora by themselves. They would roll the computers to their bedside by themselves before the beginning of the treatment or ask hospital staff for help. We agreed on certain days in which we would be logged remotely. At this point of the project, nurses became very involved and requested to have training to learn about Zora.

The work with Zora did not follow any specific syllabus. The idea was to engage patients to use Zora in any way they wanted to, whenever they wanted to, accommodating to their medical, mental and physical needs. Since no commitment was requested for the patients, part of the research regarding feasibility involved the study of the usage patterns of the population.

Evaluation methods

The evaluation methodology was based on an ethnographic approach aimed at gathering a rich set of data to construct a "thick description" of how Zora was used [15]. We did observations of on-line and face-to-face interaction, and analysis of the system logs that recorded, with date and time, everything participants said or did on-line. In terms of qualitative methodology, the log of the on-line interaction was analyzed for recurrent themes, ideas, or patterns. In terms of quantitative analysis, logs were parsed to assess the number of objects, characters and virtual spaces created as well as the number of on-line interactions that occurred during the study.

Semi-structured personal interviews were conducted with both patients and staff. Analysis of the interviews had both a quantitative and a qualitative aspect. Measures of satisfaction and safety were analyzed by calculating mean scores and standard deviations and transcripts were coded to identify recurrent themes. Volunteer participants were videotaped talking about their general impressions and their evaluation about their participation in the project.

RESULTS

During the pilot experience, participants designed a total of 16 virtual places (10% of total creations). The hospital staff created 3, such as the Nurse's Room and the Temple of Feeling Better, *"a place to tell each other ways to cope with hard things "* (see figure 2). The MIT staff created 3 spaces such as the Restaurant. Patients designed personal homes and common spaces such as the Music Room and the Renal Rap, *"a virtual space for dialysis patients to get together do fun things".*
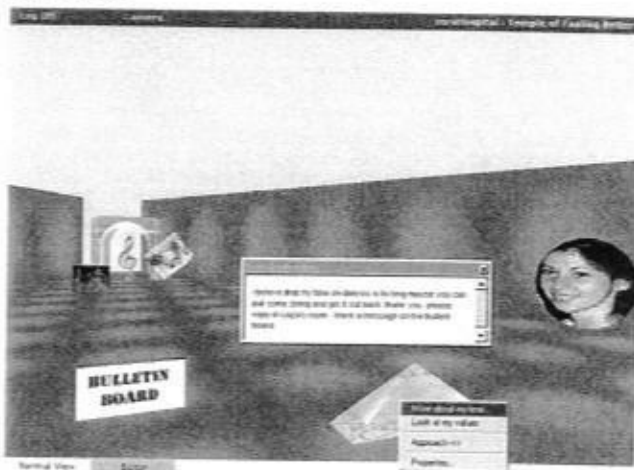

Figure 2: The Temple of Feeling Better

Participants made a total of 94 objects (59%) ranging from pictures of the hospital staff, favorite carton characters and video games. Overall, participants created 14 characters that they called heroes (9%), mostly cartoon characters. The values dictionary of the city had 13 values with their definitions (8%), such as "friendship", "doing something positive to help myself or someone else" and "respect" with the definition "people should be aware of what they do to other people's things."

During the experience participants created 5 cases (3% of total). Cases are special types of objects representing events or circumstances to be discussed and agreed upon. They require community members to take action to resolve them. Some dealt with setting up the social organization of the virtual city, such as *"someone changed the appearance of my door and I don't understand why. I would like to suggest as a rule that there is no tampering with other people's stuff",* while others were about personal medical problems.

Participants posted in the bulletin boards 17 messages (11 % of total creations) such as *"I really liked what you guys have done with the renal rap room".* They engaged in interactions with each other more on an asynchronous way than on a real-time way. This is not surprising since not all the participants were in the same dialysis shift and not all of them felt healthy to use Zora at the same time.

Feasibility and safety

In order to assess the feasibility and safety of using Zora in a hospital, in the midst of the dialysis treatment, participants were asked to rate the application using a 7-point Likert scale anchored at one end by "1=not at all" and at the other end by "7=a great deal". Descriptive statistics were calculated for each of these rating scales. Participants were also asked several open-ended questions.

Feasibility

Overall, the seven patients reported that they were very satisfied with Zora (mean = 5.3; standard deviation =1.31) and that they enjoyed very much participating in the experience (mean = 5.71; standard deviation =1.60) (see figure 3). *"It was really nice to have something fun to do at the hospital that could keep my mind off dialysis and that it was not schoolwork, but entertaining",* said a fifteen year old patient.
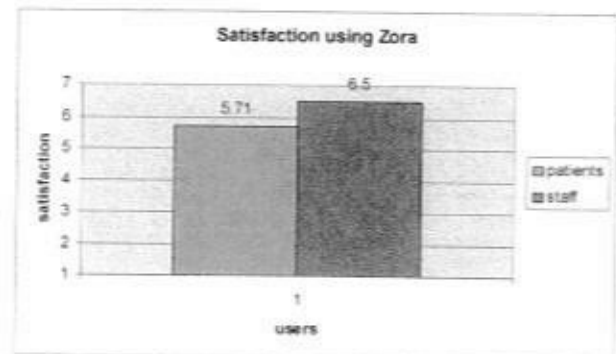

Figure 3: satisfaction of using Zora

When designing the pilot study there were some doubts about how patients, who are usually unmotivated and sleep during most part of their treatment, would engage with Zora and if they would even use it at all. The pilot experience shows that Zora was not only feasible to use with patients undergoing dialysis treatment, but that was also an enjoyable and positive experience.

Hospital staff also reported that they liked a lot to participate in the experience (mean = 6.5; standard deviation =0.58) (see figure 3). For example, the child life specialist noted that being involved with the project helped her learn about the infinite potential of computer applications designed with a structure that might support different forms of therapy. Nurses did not see Zora as interfering with their medical routine. On the contrary, they enjoyed seeing their patients using Zora. One of the nurses said: *"I liked it a lot because I noticed that kids could say things in the computer that they might not say face to face*

and this has a lot of potential. It is a wonderful program for kids who are restricted and limited to the outside world."

Nurses also enjoyed being involved with different logistical tasks, such as helping kids move the computers around and connect to the Internet. At a personal level, the hospital staff enjoyed the fact that Zora helped them learn new computer skills. They regretted that they could not devote more time to participate in the experience and the lack of a dedicated computer.

Safety

Overall, the seven patients reported that Zora was safe (mean = 5.93; standard deviation =1.84) and that participating in the experience was not hurtful (mean = 1.43; standard deviation =1.13). When asked about the safety of using Zora, 17 years old Larry *replied "It might be unsafe if you put certain things in your room that younger kids shouldn't see. But that's the whole point with having the [virtual] city hall, where we set the rules and laws for Zora. I don't think it's not safe for kids."* When designing the pilot study safety was a big concern on the part of the hospital committee on human subjects. They were mostly concerned about the multi-user and open-ended nature of Zora and the fact that it runs on the Internet where kids could easily find inappropriate content. Larry's response shows the importance of having in Zora a space for community participation and democratic decision-making. In his perspective it was the patients' responsibility to make Zora a safe space, and not only a matter of obeying a code of behavior imposed by outsiders[1].

Hospital staff also reported that using Zora was safe (mean = 5.63; standard deviation =1.49) and they all agreed that participating in the experience was not hurtful at all (mean = 1; standard deviation =0). One of the nurses said: *"Zora was a safe place and a safe way for patients to get their feelings out. It was an appropriate way to discuss their feelings. Rather than going out an punching a wall they had an opportunity to discuss things and to learn and to ask anything in Zora."* The child life specialist agreed with this but pointed out the importance of supervising what kids were doing and saying, in case that intervention from an adult was needed. In the five months that the program was running, there was no need of intervention. However, the community of users was small and they all belonged to the same institution.

Exploration of personal identity

While designing the pilot study one of the hypothesis was that patients would use Zora to explore their illness as a key component of their identity. We imagined kids would build

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[1] It is interesting to note that none of the patients refer to the code of conduct they signed before engaging in the experience as having had any impact in making Zora a safer space.

virtual rooms populated by kidneys, dialysis machines and nurses. However, this did not happen. On the contrary, all of the patients consciously avoided any mentioning of dialysis in their virtual rooms. As a fifteen year old said: *"I am already on dialysis and I don't want to put things in my [virtual] room that remind me of dialysis; I don't want to go to other rooms that have that kind of stuff either."* It is not surprising that, when asking kids if participating in Zora helped them gain perspective about their illness, most of them replied that it did not (mean 2.43; standard deviation =2.30) and were happy about that.

Children used Zora as a way to escape from the harshness of dialysis, not to think about it. Patients escaped in two different ways. First, they used their avatars to "move around" the Zora virtual city, while being "tied down" to bed and hooked up to the hemodialysis machine. Patients decided where to go and visit in the virtual city and were able to make decisions regarding how long to stay in the different places. This sense of autonomy and control was one way of escaping the frustrations of dialysis where there is no possibility to move around in a free way, neither to make many choices.

Second, patients escaped the harshness of dialysis by using their rooms to represent aspects of their identity that are usually underplayed during treatment. In general while undergoing hemodialysis, patients spend their time sleeping or watching TV. Their identity is represented by "passive" activities. However, when outside the hospital, like most people of their age, they participate in active endeavors, such as working, going to school or going out with friends. Their image of themselves is not the same inside and outside dialysis. Zora provided a way to bring back the self-image of patients as active agents. It offered a different venue of how to use their extensive time in dialysis in a creative and fun way by engaging in the creation of a personally meaningful project. When asked what she learned during the experience with Zora, a fourteen year old said: *"I learned new things about computers, like how to work with pictures and design my room, but I guess that I also learned about myself because I realized the things that I really care about and what my interests are and how to talk to others about that. In my room in Zora I could put both computers and other things I like."*

Since undergoing dialysis was a common factor for all of the participants none of them felt the need to make it explicit in their rooms. Instead they chose to represent other aspects of their identity. For example, Sharon created an Elvis Presley room with animations of the singer performing in the walls and Rina created a horse haven, with stories and pictures of her horse at home. In future studies it might be worth looking at what happens if patients create a Zora city together with kids that do not share their medical condition and treatment. Will they want to highlight the fact that dialysis is part of their identity? Or will they prefer to ignore it? Another question is what

would happen if kids were using Zora at home instead of at the hospital. By being removed from the machines, would they use the opportunity to reflect about their experiences?

Facilitating mutual patient support and interaction

In order to facilitate mutual patient support and interaction, Zora provided both synchronous and asynchronous ways of communicating and sharing experiences. Kids talked with each other in real-time through their avatars and they also posted messages and wrote stories for their objects and characters.

Patients reported that using Zora helped them make friends or get support from other kids on dialysis in a moderate way (mean = 3.86; standard deviation =2.41). At the same time, they reported that it greatly helped them to feel more part of a group on dialysis (mean = 4.43; standard deviation =1.62). *"I think that I always was part of the dialysis group but using Zora helped me to get to know the people better because I could talk with them and see their interests, what they like and do not like by going to their virtual homes"*, said a 13 years old patient. Hospital staff perceived that using Zora helped patients a lot to make friends (mean = 4.50; standard deviation =1) and a little less in making them feel part of a group (mean = 3.75; standard deviation =0.5) (see figure 4).
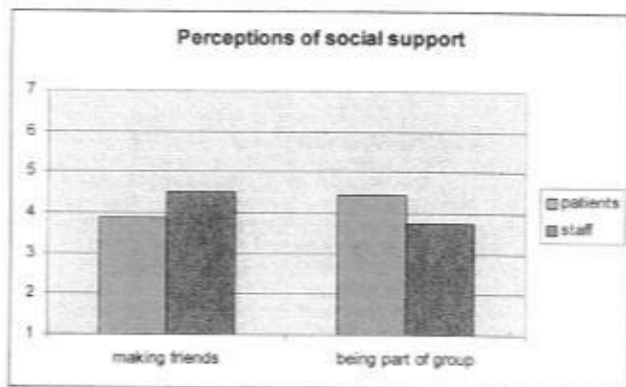

Figure 4: Patients and staff's perceptions of support

Synchronous communication: a private way to talk in a public space

The dialysis room is a public noisy space where patients are physically together for long periods of time. However, since their beds are far apart from each other, they cannot communicate with each other in a private way. Although the dialysis patients have all the characteristics to form a community, they lack the means to converse while undergoing treatment. Most of the patients particularly liked the fact that Zora provided a good way to communicate with each other in a private way, while undergoing the public event of dialysis. *"I really liked that I could use Zora to talk to other kids who were at a distance. Otherwise I would have to yell across the room. But using Zora was great because others could not eavesdrop on my conversation and I felt more comfortable discussing things.*

I particularly liked to talk with others about our favorite nurses, without being heard", said a 13 years old patient.

On-line conversations were not about dialysis per se, but about favorite video games, movies and activities done during the weekend. Most of the conversations were task-oriented such as helping each other to resolve technical problems and use some of the Zora features.

Asynchronous communication: a space to voice opinions

Patients used Zora to post messages in each other message boards and to write stories for their objects and characters. This asynchronous way of communicating their feelings was, as one of the nurses noted, *"a way to help patients that weren't on the same shift together to get an understanding of the other patients when visiting their rooms"*.

Asynchronous communication facilitated the creation of a social network by providing a space for patients to voice their opinions, without the burdens of face-to-face and real-time conversation. For example, 17 year old Larry dropped a case in the "Temple of Feeling Better" in which he complained about the increase of his time on the dialysis machine: *"I believe that my time on dialysis is too long. Most of the patients are on for only three and half-hours . Maybe you can pull some string and get it cut back. Thank you. Please reply in caza's room . Leave a message on the bulletin board"*. He attached the value "pity" to the case but did not define it. At first Larry made his case very small and hid it behind other objects in the virtual temple. Only a very skilled Zora user could find it. Meanwhile, the child life specialist noted that Larry was very upset and couldn't talk about what was bothering him. When we pointed out to her the case that he created in the virtual temple, she used it as a jumping board to engage in a conversation with Larry. Shortly after, Larry made his case big and put it in the center of the temple, thus recognizing the legitimacy of his feelings. Later, Larry engaged with Dr. Joe in an exchange by leaving messages in each other's rooms and expressed that he was very happy to be able to voice his opinions and be heard.

Design recommendations

One of the study's goals was to identify, not only the positive aspects of Zora, but also problems. This is important to the design of future interventions tailored to the particular needs of this complex real-world setting.

*   **Need of a broader community.** In each dialysis session only three patients were able to connect to Zora at the same time. This was due, on the one hand, to the lack of computers, and in the other hand, to the lack of motivated participants in the required age range and the difficulties of having a broad patient population feeling up to work at the same time. Therefore the Zora community logged in on real-time was very small. *"It is kind of lonely in there [Zora] because when you get on there are not many people with you and it is hard to talk with others"*, said a 15 years-old girl. Other

patients pointed out that they felt embarrassed to talk with kids they see everyday about their feelings towards dialysis. They rather talked anonymously. In the future it might be important to increase the number of Zora participants such as involving other dialysis units. Another possibility would be to extend the experience to a large community by including renal transplant and/or at home dialysis patients.

- **Need of more intervention.** Another goal was to observe how patients would use Zora on their own and how they would create a participatory community. However, this patient population requires a lot of direct intervention and guidelines in order to be engaged and motivated in any activity for long periods of time. As the child life specialist noted *"after a point in time the kids get bored with anything, they want bigger and better to keep them entertained, and a lot of them just want to sleep... they don't want to do anything because they are not feeling good."* In future experiences it would be helpful to designate a project coordinator that would propose a tailored syllabus The creation of a syllabus is a big challenge because, due to their medical treatment, not all the patients can engage in the same type of activities at the same time.

- **The question about dialysis content.** All of the patients agreed that they did not want to encounter in the Zora virtual city any content related to dialysis. They wanted Zora to be a space to escape from dialysis. However, all hospital staff had exactly the opposite opinion. They thought that Zora would be an excellent medium to teach kids about dialysis and to engage them in thinking about the process. For example, one of the social workers suggested the creation of a restaurant because food is a big issue for kids undergoing dialysis. The MIT staff set up the virtual space and asked patients to create the menus. For our surprise, none of the created menus took in consideration the particular dietary restrictions of this patient population. Following is an excerpt of a conversation that happened in the virtual restaurant:

> Vitor says 'Washu, do you have any idea about what should wehave in the menu?' ‖
>
> Washu says 'shrugs' ‖
>
> Vitor says 'What drinks do you think we should have in the menu?' ‖
>
> Washu says 'coffee, tea, ice water, etc....' ‖
>
> Vitor 'Which ones do you like best? ' ‖
>
> Washu says 'I like tea with cream and sugar' ‖
>
> Vitor says 'I've never tried that, what about desserts' ‖
>
> Washu says 'ice cream and there is a Chinese dessert that all the nurses love' ‖
>
> Vitor says 'What kind of food do you like?' ‖

> Washu says 'I like Chinese food and Italian foods...noodles and fried rice spaghetti and meat balls" ‖
>
> Marina says 'I wonder if there should be a special menu for people on dialysis...what do you think?' ‖
>
> Washu says 'I guess that is helpful to people but I don't like to be reminded that I need different food' ‖

The question is how to create spaces that engage children in learning and talking about dialysis. These spaces should go beyond displaying information produced by professionals. Patients need to take an active role in their creation. For example, they could be the ones who, working together with the professionals, design the virtual rooms to teach visitors about dialysis. For this to succeed it is important that the activity be authentic, namely real visitors should be invited to walk around these rooms and engage in conversations with the patients. For example, visitors can be kids recently diagnosed with ESRD, medical staff, parents of patients, elementary and high school students interested in medicine.

- **Visualizing data.** Patients reported that using Zora did not help them gain perspective or understanding about their illness (mean = 1.86; standard deviation =1.21). At the psychological level, children did not use Zora to talk about dialysis, but as an escape from it. At the physiological level, Zora did not support patients to explore what happens in their bodies while undergoing dialysis. However, Zora can support both types of interventions in future experiences. On the one hand, a mental health professional can coordinate virtual meetings in the same style than therapeutic communities. On the other hand, the Zora environment can support the collection and display of physiological data provided by the dialysis machines and other medical charts. This data indicates progress in the treatment as well as the level of compliance between visits. If patients were encouraged to pay with this data in a friendly, creative and educational way they could explore "what if" possibilities regarding their own health care. And it would allow researchers to investigate correlations between engagement with Zora and successful medical compliance.

DISCUSSION

More and more hospitals are acquiring the means to connect to the Internet. However, connectivity by itself is not enough. We should ask ourselves how can we use the Internet to support therapeutic work already going on in medical facilities. Identity construction environments, such as Zora, open up new possibilities for mental health care. As shown in this paper, this is both feasible and safe in the context of a hospital setting such as a dialysis unit. Introducing a fun, self-exploratory and community-building computer activity had several positive benefits. Patients used their extensive time in dialysis in a creative way by

expressing themselves and exploring aspects of their identity that are usually underplayed during treatment. They were able to interact with others in similar situation in a private way and voice their opinions about their medical treatment.

Having a computer based application that promotes increased coping and resiliency in the face of medical illness can provide accessibility to an intervention that previously has only been available to those living geographically close to a major pediatric medical center. In the same spirit than therapeutic communities, identity construction environments such as Zora provide the opportunity for patients and staff to participate in social support networks.

ACKNOWLEDGMENTS

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