

The Role of Biomedical Visualization in Medicine and Health

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Visual Communication for Public Health

Healthcare providers, patients and their families, the public, the media, governments, and non-government organizations all need to be able to converse during a public health threat, but these diverse groups do not necessarily “speak the same language.” A good translator mediates between speakers of different languages, and biomedical visualization specialists can use visualization as a common language to help bridge the gap. A picture is a universal language that transcends not only every cultural boundary but also every conceptual boundary.

In response to reports of Ebola hemorrhagic fever in West Africa in 2014, the Centers for Disease Control and Prevention (CDC) fully participated in an international response to the outbreak. This included educating the general public in the nations of Guinea, Sierra Leone, Liberia, and Nigeria about how to avoid Ebola infection; educating healthcare workers about taking the steps necessary to protect themselves and prevent the spread of the virus; and improving communications between everyone involved [1].

Visual information specialist Dan J. Higgins, Division of Communication Services for the CDC, was called upon to assist emergency response officials in Sierra Leone. There was a need for posters and handouts showing small care facilities that had been established in local communities, so people could get treated as quickly as possible. Community Care Centers (CCC) had been set up to provide suspected Ebola patients with food, water, oral rehydration solution, antipyretics and analgesics while undergoing tests for Ebola virus disease. Patients who tested positive for the virus were transferred to larger Ebola Treatment Centers [2].

Higgins created a poster depicting a typical CCC unit (Fig. 1). This simple, isometric perspective view of the camp is accurate, yet simple and straightforward. It was created in a hand-done style using bright colors to be easily read by the Sierra Leone rural population (D. Higgins, personal communication, June 3, 2015).

The same view of the CCC unit was re-colored and repurposed for healthcare workers (Fig. 2). Camps are divided into red zones and green zones, and the way traffic flows within the camp is very important. The light red zone is where patients enter and are housed while being treated. The darker red zone is for patients who are extremely sick. Healthcare workers in full personal protective equipment (PPE) enter the light red zone through the gate behind the blue building and are required to travel through the “less sick” section to the dark red, “more sick” section. The green zone is where staff work and rest and where the healthcare workers don their PPE and dry them (D. Higgins, personal communication, June 3, 2015).

GO TO THE COMMUNITY CARE CENTRE CLOSEST TO YOU TO RECEIVE CARE



If you are ill, you are welcome at the Community Care Centre.



Your family can call care givers for updates.



You can see and talk to your family.



Care givers will give you food and drink. They will treat you with kindness and respect.



If you have Ebola, you will go to an Ebola Treatment Centre near your family.



Figure 1. Poster for Sierra Leone rural population. 2014 © CDC/Dan J. Higgins (2000 UIC Biomedical Visualization graduate)

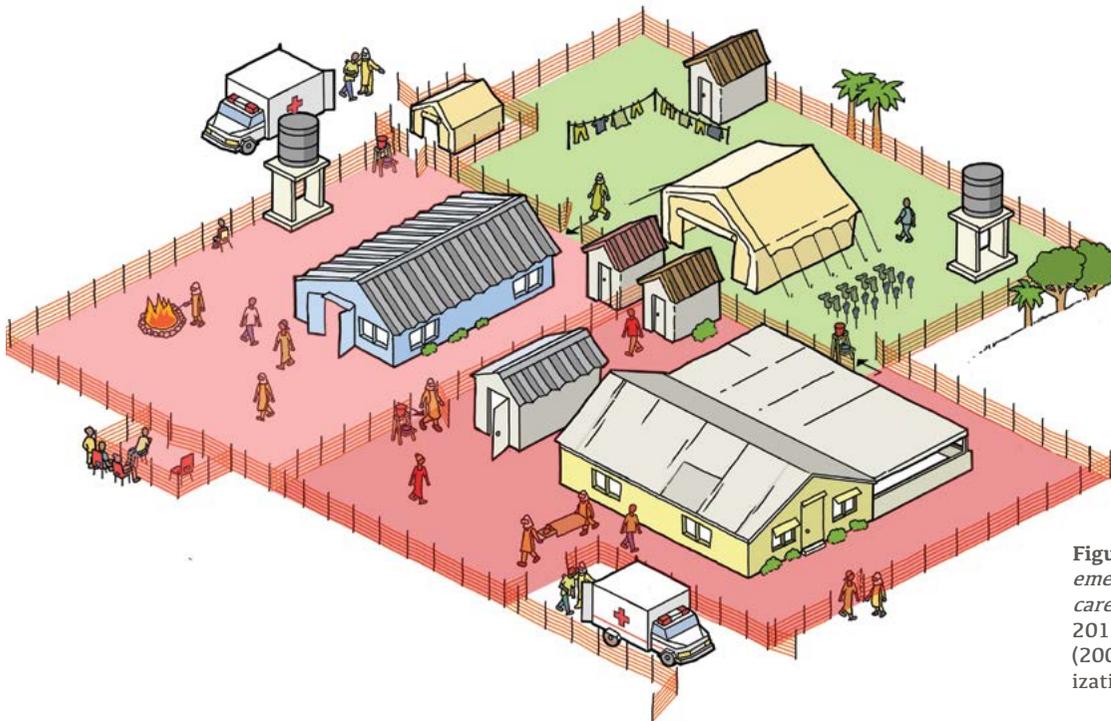


Figure 2. Illustration for emergency response health-care workers. 2014 © CDC/Dan J. Higgins (2000 UIC Biomedical Visualization graduate)

Biomedical Visualization

Biomedical visualization is a multidisciplinary field that draws upon and integrates subject matter from a variety of disciplines including the life sciences, learning science, medicine, graphic arts, computer animation, immersive multimedia, and computer science. Biomedical visualization specialists use compelling and effective visual language to take complex data and abstract ideas and make them easily understood and tangible.

Information sharing among public health professionals and between those professionals and the public is critical to meeting the health needs of individuals and populations. Key stakeholders in public health may not “speak the same language,” but meaningful conversation can occur with the help of skillful biomedical visualization specialists, who are able to translate complex biomedical information into a visual story that explains and teaches.

While didactic medical illustration is used to teach, the power of editorial medical illustration lies in the way it uses visual imagery, and sometimes visual metaphor, to engage the reader and guide understanding. Editorial illustrations used to support an article in a public health publication can take complex concepts and make them accessible. Captivating images can be used to either illuminate subtleties in the text or boldly reinforce one or more of the main concepts in an article accompanied by the illustration. A medical illustrator is able to extract the “essence” of the text and give the article a visual personality.

Using Figure 3 as an example, the illustrator adopts the symbol of Lady Justice to provide context for an article on international criminal law, public health and Rwanda. Traditionally, Lady Justice is depicted with a set of scales representing truth and fairness positioned above a sword representing the power held by those rendering decisions. Here the illustrator uses the sword to represent the crimes of genocide in Rwanda, which is shown as a flag in the shape of the country. Lady Justice, who grasps a set of scales representing a mechanism for the world’s restorative justice, is embracing Rwanda. The illustration provides a visual summary of the article, but it also evokes feelings of tenderness and compassion, establishing an appropriate tone for the discourse.



Figure 3. Editorial illustration for *The Synergy of Public Health and International Criminal Law in Post-Genocide Rwanda*. 2015 © Christine Cote (current UIC Biomedical Visualization graduate student)

Biomedical Visualization at UIC

Founded in 1921 by Professor Thomas Smith Jones, the Biomedical Visualization graduate program (BVIS) at the University of Illinois at Chicago (UIC) is one of only four accredited graduate programs in North America providing professional training for careers in the visual communication of life science, medicine, and healthcare. The program's unique curriculum attracts graduate students from a variety of disciplines such as medicine, life science, art, digital animation, and computer science.



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Onar Vikingstad*

BVIS utilizes the academic resources of multiple departments throughout the UIC campus to support its interdisciplinary studies. A recently revised curriculum strongly emphasizes effective communication and problem solving and provides a solid foundation in medical science, learning theory, and innovative visualization techniques. In addition to illustration and design, course offerings in visualization technology have been expanded to include animation, interactive media, educational gaming, virtual reality, stereography, haptics, and augmented reality.

Close relationships between UIC BVIS and other prestigious Chicago universities and medical centers provide opportunities for student immersion experiences and effective collaboration with peers. For the second consecutive year, BVIS students have had the privilege of contributing editorial illustrations for public health to the Northwestern Public Health Review.

Visual Translators for the 21st Century

We are in the age of visualization. The accessibility of biomedical visualization via mobile devices and other visual displays has made its delivery revolutionary. As part of the healthcare team, biomedical visualization specialists embrace their role as visual translators for the 21st century, leveraging their scientific knowledge and artistic skills to convey complex information for the benefit of everyone in the medical and public health system.

References

1. Centers for Disease Control and Prevention (n.d.). Retrieved from <http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/index.html>
2. Plan International (n.d.). Retrieved from <https://plan-international.org/about-plan/resources/news/how-ebola-community-care-units-are-helping-to-stop-the-spread-of-ebola/>