HUMANITARIAN LOGISTICS
OF PHARMACEUTICAL DONATIONS

by

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HUMANITARIAN LOGISTICS

OF PHARMACEUTICAL DONATIONS

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Abstract

The study focuses on the humanitarian logistics of pharmaceutical donations. The research focuses primarily on the upper-section of the supply chain, meaning pharmaceutical companies (suppliers) and various nonprofits. The goal of this paper was to obtain a more detailed understanding of humanitarian logistics and the hurdles that pharmaceutical donations must overcome. Three interviews were conducted with three different companies each representing best practices in different humanitarian scenarios. Interviews were conducted with Defyrs Inc., the International Trachoma Initiative, and Novartis. The interviews provided valuable insight into humanitarian logistics and will provide useful information to other companies in the industry.
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Introduction

The world is currently facing a humanitarian crisis. Over the past decades, the number of natural disasters, the number of people impacted by natural disasters, and the economic damage caused by natural disasters has increased drastically (Majewski, Navangul, & Hensen, 2010). Level 3 emergencies, the highest classification of a humanitarian crisis by the United Nations, are currently occurring in Iraq, Syria, the Central African Republic, and the South Sudan (Fragoso, 2014).

Humanitarian crises have led to an increased focus on the importance of logistics. Within the humanitarian industry between 40 and 80 percent of total spending goes towards logistics, making efficient supply chains a top priority (Majewski et al., 2010). Following a crisis, top priority is given to food, clean water, medicine, and shelter. The transportation of medicine is subject to more complex issues than the transportation of food and water. The need for humanitarian aid is increasing and it is vital that medicine is able to reach people in need.

There have been multiple studies conducted regarding humanitarian logistics. Research shows the importance of partnerships within the humanitarian supply chain. Kotsi, Van Wassenhove, and Hensen (2014) in particular focused on the importance of cross-sector partnerships in order to attain a more holistic view of the supply chain. A holistic view of the supply chain is critical because it allows for the various entities involved to understand how they all fit together in reaching a common goal. Healsip, Sharif, and Althonayan (2012) went even further and looked into the importance of collaboration between nonprofits and the military in times of
crisis. There has been research on the importance of efficient procurement and allocation within the humanitarian supply chain (Bhattacharya, Hasija, & Wassenhove, 2012). There has also been a great deal of research regarding transportation, especially last-mile transportation, which is critical for humanitarian logistics (McCoy & Lee, 2014). Over the past decade, humanitarian logistics has become an increasingly important topic for academic research.

While there is a large amount of research on humanitarian logistics as a whole, there is very little research focused on pharmaceutical donations specifically. Little attention has been paid to the complexities and challenges of medical supply chains in developing countries (Jahre & Spens, 2010). Throughout the paper medical and pharmaceutical will be used interchangeable with no distinguishable difference implied. One major role of the medical supply chain is improving global health in the developing world with preventative medicine. Preventative medicine has the ability to save thousands of lives around the globe but there are very few studies dedicated to the logistics of medicine donations in particular. Pharmaceutical donations are unique and face a variety of obstacles regarding quality assurance and trade barriers that other donations do not face. More research is necessary regarding the logistics of pharmaceutical donations.

The purpose of this paper is to gain an understanding of the logistics behind pharmaceutical donations. The paper will examine existing research on humanitarian logistics and see how it is applicable to medical donations and also point out the gaps in current research. The paper will seek to answer a variety of critical questions including: What is the best way to approach pharmaceutical
donations? How can the nonprofit supply chain be improved? Finally, what are the various obstacles and problems that pharmaceutical donations face?

The research will begin with an overview of the subject of humanitarian logistics. Then, the paper will focus on a review of current literature that pertains to pharmaceutical donations. In-depth case studies of specific pharmaceutical companies will be included, tracing medicine from supplier to end consumer. The paper will end by acknowledging a series of best practices that are represented by the companies interviewed while still taking into account the various hurdles that must be overcome.

**Literature Review**

**Humanitarian Logistics**

Humanitarian logistics has been defined as, “the management of humanitarian emergency relief supplies, efficiently and effectively, from source to the beneficiaries” (Chikolo, 2006, p. 1). It is a broad topic, encompassing a vast array of activities, such as procurement, warehousing, transportation (both local and international), product tracking, and managing customs (Chikolo, 2006, p. 1). While minimizing total logistics costs is important, unlike commercial logistics, it is not the main concern for humanitarian logistics. Rather, the primary concern of humanitarian logistics is the reduction of human suffering (Holguín-Veras, Jaller, Van Wassenhove, Pérez, & Wachtendorf, 2012). However, to look at humanitarian logistics as a single broad topic is detrimental to gaining a true understanding of the process.
There are four phases to humanitarian logistics in general: mitigation, preparedness, response, and recovery. Within these phases it is necessary to know how to respond based on the level of need. To begin, one must be able to differentiate between a disaster and a catastrophe. While both events are tragic, they vary in terms of destruction, demand, and complexity. In regards to a disaster, local infrastructure and supplies are only partially destroyed meaning that local supplies and distributors can be used in the initial relief. In contrast, in the case of a catastrophe, the affected area has undergone significant damage and is forced to rely almost entirely on external sources in order to obtain necessary supplies (Holguín-Veras et al., 2012). “The Tohoku (Japan) tsunami’s impact on the town of Minami Sanriku, and the Port-au-Prince earthquake (Haiti) exemplify catastrophic events” (Holguín-Veras et al., 2012, p. 495). Whether an event is a disaster or a catastrophe determines the level of response.

Once an appropriate response, whether immediate or as needed, is determined, the focus turns to recovery. There are two sub-phases of the recovery process. Short-term recovery “is the transitional stage between response and long-term recovery, where activities such as managing donations and volunteers, conducting damage assessments, securing temporary housing, restoring lifelines and clearing debris takes place” (Holguín-Veras et al., 2012, p. 497). This process focuses on meeting the important immediate health, food, water, and shelter needs. Long-term recovery, on the other hand, “aims to foster either a return to normality or an improved quality of life” (Holguín-Veras et al., 2012, p. 497). Long-term recovery efforts are more stable and predictable than short-term recovery demands.
Regular humanitarian logistics is concerned with long-term recovery whereas post-disaster humanitarian relief is concerned with the short-term recovery phase. Due to different support structures, commodity flows, demand, and levels of urgency it is important to know the different sub-categories under the broad definition of humanitarian logistics (Holguín-Veras et al., 2012).

Over the past few decades the field of humanitarian logistics has become increasingly important. The need for humanitarian aid has been increasing since 1975 due to an increasing number of catastrophes. Figure 1 displays this increasing trend. “The increasing magnitude, complexity, and unpredictability of these emergencies have made it very difficult for humanitarian organizations to provide effective relief to the victims” (Majewski et al., 2010, p. 4). These factors have only served to increase the importance of more efficient and effective logistics within the
humanitarian sector. According to the Fitz Institute, “disaster relief is 80% logistics” (Chikolo, 2006, p. 1), meaning that logistics is absolutely crucial in providing humanitarian relief due to its importance as a bridge between external and internal, its ability to improve efficiency and speed, and the data that is created by the process. Humanitarian logistics serves as “a bridge between disaster preparedness and response, between procurement and distribution, and between headquarters and the field” (Chikolo, 2006, p. 1). Logistics is necessary to seamlessly connect start to finish and without efficient supply networks aid would be unable to reach those in need. The data that is produced throughout the logistics process is invaluable in the pursuit of continued learning and improvement (Chikolo, 2006). The newfound awareness of the importance of humanitarian logistics has led to an increase in academic research regarding the topic. Current trends suggest that the number of catastrophes, the number of effected peoples, and the financial damage will only continue to increase, making the increased efficiency and speed of humanitarian logistics crucial. (Majewski et al., 2010) Table 1 shows just how dramatically the cost of such disasters has increased over the past few decades.

**Table 1: Natural Disasters and their Consequences**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>1975</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of natural disasters</td>
<td>76</td>
<td>396</td>
</tr>
<tr>
<td>Estimated economic losses (approximate figures)</td>
<td>US$3.55 billion</td>
<td>US$43.44 billion</td>
</tr>
<tr>
<td>Number of people dead</td>
<td>133,858</td>
<td>14,878</td>
</tr>
<tr>
<td>Number of people affected</td>
<td>41,119,085</td>
<td>209,119,886</td>
</tr>
</tbody>
</table>

Source: Data provided by Buggey, 2007.
Pharmaceutical Logistics

While there are various research studies concerned with humanitarian logistics as a whole, academic research concerning pharmaceutical donations is scant. However, recent epidemics, such as the current Ebola outbreak in West Africa, will likely lead to increasing interest and research on the topic. People in the field, such as Marianne Jahre, who assessed drug supply chains in the Karamoja Region of Uganda, recognize the “need for continued work to improve the drug supply chain” (Jahre & Spens, 2010, p. 58). Medical donations are a crucial part of the humanitarian supply chain. There are two types of medicine donations: emergency and non-emergency donations, matching up with the regular humanitarian logistics and post-disaster humanitarian relief sub-categories. Emergency donations are important in post-disaster humanitarian logistics, providing immediate relief to temporary needs and include antibiotics, antifungals, and analgesics. Non-emergency donations fall under the category of regular humanitarian logistics and focus on public health improvement (Kotsi et al., 2014). Due to the limited amount of research, both emergency and non-emergency donations are taken under consideration. According to a survey done by The Center for Pharmaceutical Health Services Research, “more than one-third of the dollar value of all US healthcare assistance is donated by pharmaceutical companies to humanitarian agencies” (Russo & Wertheimer, 2004, p. 41). In 2004, the Partnership for Quality Medical Donations (PQMD), a consortium of nine pharmaceutical companies and a dozen humanitarian agencies, funded 4,147 long-term projects and 189 disaster relief missions in 89 countries. These donations represent only a
fraction of what is donated globally. Pharmaceutical donations save lives and improve public health in developing countries (Russo & Wertheimer, 2004).

Non-Government Organizations, (NGOs), also play a large role in the donation of medical supplies. During the 1990s, two US NGOs alone donated over 16,000 medicines to 129 countries (Kotsi et al., 2014). Nonprofits have even begun to fund drug research at pharmaceutical companies in hopes of improving global health. By becoming ‘venture philanthropists’, nonprofits are hoping to push pharmaceutical companies to continue research on life-saving drugs that normally would have been dropped due to low sales potential (Begley, 2007). NGOs and pharmaceutical companies are attempting to work hand-in-hand in order to improve global health and improve the supply chain.

Due to the large number of partners involved with pharmaceutical donations, the supply chain for such donations are inherently complex. The supply chain for medical donations requires a series of internal and external stakeholders to work together. Internal stakeholders include donors, intermediaries, recipients, and beneficiaries. While organizations such as the World Health Organization (WHO), Ministries of Health, the Media, and local manufacturers are considered to be part of the external environment (Kotsi et al., 2014). The WHO provides a series of guidelines regarding pharmaceutical donations. The WHO's *Guidelines for Medicine Donations* were created to improve the quality of medicine donations and to prevent useless and dangerous medicines from entering disaster and war-torn areas. This is important for pharmaceutical companies so they are able to help in disaster relief rather than becoming a hindrance. The *Guidelines* reflect the need for quality and
effective coordination and collaboration within the donation process (World Health Organization, 2011). Pharmaceutical companies and charities are not forced to adhere to the WHO Guidelines but many US companies have opted to sign the guidelines (Kapp, 1999). Pharmaceutical donations are subject to conform to both WHO and governmental regulations.

However, even with these regulations inappropriate drug donations are still a large problem. A 2001 study conducted by the WHO in coordination with the World Bank and the European Association for Development and Health found that thousands of inappropriate medicines are still being donated. The study found these inappropriate donations were being sent from small relief agencies or involved government-to-government donations. Smaller relief organizations have a difficult time meeting regulations and providing safe donations showing that “drug donations are not for amateurs” (Russo & Wertheimer, 2004, p. 47).

Along with inappropriate donations and governmental hurdles, pharmaceutical donations are plagued by a series of other problems. Communication and coordination is key to a well-functioning supply chain, but uneven power distribution can threaten overall coordination. Donors can exercise power over intermediaries who are reliant on them for donations. In turn, intermediaries can exercise excessive control over recipients due to a similar reliance. Failure to match supply with demand can have especially traumatic results in terms of pharmaceutical donations. A shortage of medical donations can result in the loss of life, human suffering, and the spread of disease. Whereas, an excess of donations can be a financial weight for local charities and lead to stockpiling,
meaning that potentially dangerous and expired medicines could be released at a later time. To improve the matching of supply with demand, donors can operate their own pharmaceutical donation programs and intermediaries can work to build a more knowledgeable workforce and implement standard operating procedures. Insufficient funding is also a problem the plagues medical donations. Intermediaries and recipients often struggle to find sufficient funds to distribute pharmaceutical donations. This is a frequent problem within the industry. During high-profile disasters, nonprofits are able to receive sufficient funds due to a large surge of donations, but usually companies are left floundering. Breakdowns in communication are also a common and catastrophic issue (Kotsi et al., 2014).

Many of these problems can be combatted through a holistic approach to pharmaceutical donations. The holistic approach is a three-pronged approach, featuring the development of cross-sector partnerships, mapping internal operations, and managing end-to-end supply flows. The development of cross-sector partnerships aims at “leveraging the complementary skills of different sectors and to provide solutions for public health problems that each sector struggles to address individually” (Kotsi et al., 2014, p. 19). Mapping the internal operations of each partner will lead to a greater understanding of partners and will allow for a more cooperative effort. Finally, managing and designing end-to-end supply chain flows “improves accountability of each partner, establishes rules for prioritization of needs, and helps assessing new initiatives given constraints of current resources” (Kotsi et al., 2014, p. 22). Fortunately, a variety of solutions have been identified for to the current issues facing medicine donation supply chains.
Long-term solutions include the placement of logistics advisors at storage areas in the affected area who can use their knowledge and skills to increase capacity, forecast future needs, and improve supply flow. Another solution is the consolidation of safety stock so medicine is more accessible and easily transported. Short-term quick fixes include offering logistics training, storage improvement kits, developing a transportation loan program, and implementing an electronic data exchange mechanism (Jahre & Spens, 2010).

Perishable Goods Supply Chain

Due to the lack of research on pharmaceutical logistics, it is necessary to supplement the information. The time-sensitive nature of pharmaceuticals allows for many parallels to be drawn between pharmaceuticals and perishable goods. Medicine is a form of perishable goods because it undergoes deterioration (He & Wang, 2012). “Deterioration is defined as decay, damage, spoilage, evaporation, obsolescence, loss of utility or loss of marginal value of a commodity that results in its decreasing usefulness” (He & Wang, 2012, p. 4580). Thron, Nagy, and Wassan (2007) state that, “Owing to their common fragility and limited lifetime, handling those goods is far more complex and includes much higher risks compared to non-perishable products” (p. 364). The perishable goods supply chain is susceptible to demand disruption, such as an epidemic, political upheaval, or earthquake, like any supply chain but the effects of these disruptions is magnified due to deterioration (He & Wang, 2012). Due to the unique obstacles faced, “significant differences emerge between conventional supply chain strategies and those needed for perishable products” (Blackburn & Scudder, 2009, p. 135).
Suggestions for improving the supply chains for perishable goods are incredibly similar to those suggested for improving the flow of pharmaceutical donations. Collaboration is emphasized as a key to improving the supply chain. Collaboration causes increased visibility and has shown “positive effects on supply chain performance” (Thron et al., 2009, p. 365). However, collaboration is much easier in theory than in actual implementation. Common collaboration issues include “difficult implementation, over-reliance on technology in trying to implement it, fear of relinquishing control, or a lack of trust” (Thron et al., 2009, p. 365). Companies must work constantly to improve their collaborative efforts. It has been suggested that “coordination of activities across companies, improving information flows, and collaborative redesign of the supply chain as well as its products and processes” are ways to improve the perishable goods supply chain (Blackburn & Scudder, 2009, p. 130). Information sharing increases demand transparency, allowing for perishable goods (pharmaceuticals) to be available when and where they are needed (Thron et al., 2009). Moreover, increasing the throughput rate and the safety stock levels are also suggested as ways to improve the supply chain. However, companies must be careful not to increase the average age of inventory by too much, causing more expired products (Thron et al. 2009). He and Wang (2012) suggest that companies prepare for a variety of demand disruption scenarios in order to improve preparedness. Improvement suggestions for perishable goods supply chains can be applied to pharmaceutical donation logistics.
**Theoretical Framework**

Due to the lack of academic research regarding the pharmaceutical donation supply chain, it is necessary to look at other research under the umbrella of humanitarian logistics to see if any solutions suggested could be applied to pharmaceutical donations. Majewski et al. (2010) makes a series of general recommendations, including increased investment in key technologies and human resources to increase efficiency and reduce cost, increase capacity and work with partners to better meet growing global needs, and design effective performance measurement metrics in order to analyze efficiency and effectiveness.

When applying commercial supply chain practices to humanitarian logistics it is important to note that the situations are extremely different, especially in terms of post-disaster humanitarian logistics, and that these practices must be adapted to meet the special needs of the humanitarian supply chain. Supply chain management (SCM) best practices that can be adapted to humanitarian logistics include:

“Demand forecasting, inventory management, avoid bullwhip, right push-pull boundary, standardization, information integration, postponement, collaborations, resource sharing, partnerships, logistics restructuring, supply chain visibility, supply chain design, buffering, inventory pooling, tight monitoring and tracking, and design leverage” (Van Wassenhove & Pedraza Martinez, 2012, p. 312).

Each of these SCM best practices are well known and can be adapted to humanitarian logistics, however, they will not produce the same effect as within commercial logistics. The Structured Analysis and Design Technique (SADT) can also be applied to humanitarian logistics to improve coordination and response. SADT “can be used to cope with the complexity through a team oriented, organized
discipline of thought and action, accompanied by concise, complete and readable word and picture documentation” (Heaslip et al., 2012, p. 382).

Partnerships are a commonly suggested solution. “Through the different stages of a disaster, collaboration with different actors can help reduce cost and increase speed in the supply chain” (Tomasini & Van Wassenhove, 2009, p. 558). Coordination through clusters is also suggested. Clusters allow for vertical and horizontal coordination and allow for increased coordination. However, it is important not to place too much emphasis on coordination at the expense of the development of individual efficient and effective supply chains (“Coordination in humanitarian logistics through clusters”, 2010).

**Methodology**

Research on the topic of the humanitarian logistics of pharmaceutical donations was compiled through a series of interviews and an extended literature review. This is a qualitative research study. Interviews were conducted with industry professionals at Novartis, Defyrus Inc., and the International Trachoma Initiative (ITI), which was established by Pfizer and the Edna McConnell Clark Foundation. In conjuncture with these interviews, an extended literature review was conducted in order to give a more complete picture of what was happening at these companies and to provide background information.
Research

Defyrus Inc.

Defyrus Inc. is a relatively small pharmaceutical company based in Toronto, Canada. Defyrus, in collaboration with Mapp Biopharmaceutical Inc. and LeafBio Inc., has recently began to garner global attention due to ZMab and ZMapp, two experimental drugs being used to treat Ebola in West Africa and the United States (Kim, 2014). Research on Defyrus Inc. and their Ebola drugs was gained through interviews with Dr. Jeffrey D. Turner, who is the President and CEO of the company. Dr. Turner founded the company back in 2008. Prior to founding Defyrus, he was the founder of Nexia Biotech, which he founded in 2000. He is a tenured Professor in Molecular Genetics at McGill University.

The Ebola Outbreak

The initial announcement regarding the recent Ebola outbreak was made on March 25, 2014 when the World Health Organization (WHO) announced outbreaks of Ebola hemorrhagic fever in Guinea, Liberia, and Sierra Leone. The disease rapidly began to spread, especially in densely populated urban centers. Confirmed cases of Ebola have resulted in deaths in six countries: Guinea, Liberia, Sierra Leone, Nigeria, Mali, and the U.S. (Ebola: Mapping the Outbreak, 2015). As of March 3, 2015, there have been a total of 23,983 cases of Ebola hemorrhagic fever, of which 14,366 are laboratory-confirmed cases. The current death toll stands at 9,823 (2014 Ebola Outbreak in West Africa, 2015). According to the most recent report, the number of confirmed cases of Ebola has increased in the week leading up to March 1 in both Sierra Leone and Guinea. In these countries the outbreak still remains out of control, as shown in Figure 2.
Past Outbreaks of Ebola

When looking at the numbers regarding how much death and devastation has been caused by the 2014 outbreak it is important to understand why this outbreak is so different and has placed such high demands on both pharmaceutical companies and nonprofits to rapidly adapt their supply chains. Up until the 2014 outbreak, Ebola outbreaks were mostly confined to small villages. Ebola was first identified in 1976 and, until now, the disease had been contained to sub-Saharan Africa. The effects of the disease were still horrendous, however, in many cases entire villages would be wiped out before any treatment could become available.
The disease progression is very fast, killing in 9 to 16 days (J. Turner, personal communication, February 11, 2015). However, the fast-acting nature of the disease meant that usually a person died before he or she was able to spread the disease (the disease requires direct contact with blood or bodily fluids to spread), allowing for outbreaks to remain contained. Figure 3 shows the number of fatalities in comparison to the total number of cases for previous outbreaks.

![Figure 3: Previous Ebola Outbreak Numbers](image)

The recent outbreak of Ebola hemorrhagic fever has caught pharmaceutical companies, nonprofits, and local governments unprepared for an outbreak of such magnitude. The current outbreak has affected so many people due to a variety of reasons. One key reason for the severity of the recent outbreak is location. In the past, outbreaks normally occurred in Central Africa but the current outbreak is
affecting West Africa, where both the people and the local governments are not as familiar with the disease and how to prevent the spread. Urbanization is another key factor. “Urban life has always been an incubator for disease…. West African cities like Monrovia and Freetown, with roughly one million people in each, have given the virus many more opportunities to move and spread, whereas past outbreaks were confined to less populated, more rural areas” (Horowitz, 2014). Other factors such as poor public health, burial practices, and an ineffective international response also contributed to the severity of the outbreak (Horowitz, 2014). Dr. Jeffrey Turner also touched upon how poverty played a part in the spread of the disease. Ebola is a zoonotic disease meaning that it comes from animals. Researchers believe that the disease comes from eating bat. Poverty has forced many in Africa to eat whatever they can to survive including bush meat and as long as people continue to eat bush meat, Ebola outbreaks will continue (J. Turner, personal communication, February 11, 2015).

**ZMab & ZMapp**

The problem with Ebola is that it will kill a person before his or her body is able to make enough antibodies or mount a cellular immune response i.e. white blood cells. ZMab and ZMapp are injections that feature monoclonal antibodies (mAbs), which are able to track and kill the virus even as it mutates. ZMab and ZMapp both have 2g4 and 2g7 and ZMapp has a third component named 13c6. The FDA has not yet approved ZMapp and ZMab for public use and going forward only ZMapp will continue to undergo ongoing regulatory activities, beginning clinical trials in 2015. Defyrus Inc., along with their partners, has been able to send the
injections to West Africa because they have been granted an emergency use investigational new drug exemption (IND). Various countries including the U.S., Switzerland, the U.K., and Liberia granted this emergency IND. IND status means that the FDA believes that the drugs are safe enough to be used on an emergency basis. The drug is provided free of charge to Africa for both regulatory, it is illegal to sell an unapproved drug, and humanitarian reasons. In order for ZMapp to be administered the patient must have a positive diagnosis and must be suffering from the Zaire form of the disease. Zaire is the deadliest form of Ebola and can result in up to a 90% fatality rate.

**Supply Chain**

Prior to the outbreak in West Africa, there were less than 50 doses of ZMapp available, which were intended to be used for small clinical trials. BARDA (Biologics Advanced Research Development Agency) was in charge of the strategic national stockpile (SNS), which is operated by the CDC. BARDA is the only market for Ebola drugs and demand was extremely low. A small stockpile was kept out of necessity because Ebola was weaponized by the former Soviet Union. ZMapp is engineered using genetically modified tobacco plants, which allowed for the drug to be manufactured cost effectively but the process took time. However, following the outbreak in West Africa, BARDA increased funding in order to increase the number of doses and Defyrus Inc., began to plant more tobacco plants. However, demand has severely outstripped their manufacturing capability and they have been scaling up ever since.
The importing nation controls where and how the drug will be used because ZMapp requires an emergency IND. The local ministry of health must authorize the drug for importation and the study design for the clinical trial. The use of ZMapp to treat Ebola in West Africa is considered a clinical trial for regulatory purposes. Working with local governments can be troublesome and can cause some backups in the supply chain, however, due to the scope and severity of the outbreak, local governments were extremely eager to help Defyrus get over any regulatory hurdles.

Transportation of ZMapp is not a challenge; a single person can carry thousands of doses in a briefcase. However, because ZMapp is a biologic drug a cold chain must be in place. A biologic differs from other drugs in that it is manufactured in a living organism, in this case a tobacco plant. There is already an established cold chain in North America and Europe, but this was an initial issue in Africa. However, because patients must travel to centralized treatment facilities in order to be diagnosed it was relatively easy to create a cold chain, however, there is still the remaining logistical problem of getting infected people to the hospitals for treatment when they live in isolated rural areas.

In treating the outbreak in West Africa, Defyrus partnered with the World Health Organization (WHO). The WHO has a unit, based in Geneva, which is focused specifically on viral hemorrhagic fever. This unit has a global response network called the Global Outbreak Alert and Response Network (GOARN), which tracks all outbreaks of the disease and monitors the response. Within Africa, on the front lines of the outbreak, Defyrus has partnered with Médecins Sans Frontières (MSF), commonly known as Doctors without Boarders in the U.S., to mobilize Ebola clinics
and provide medical staff to administer the injections. Within the U.S., Defyrus coordinated with the U.S. nonprofit Samaritans purse to treat the two cases of Ebola within the states. ZMapp was the “secret serum” reported on CNN. Relationships with nonprofits is crucial in order to ensure that people in need are able to get the injection before it is too late.

The current outbreak of Ebola in West Africa has transformed how Defyrus thinks about humanitarian logistics. Prior to 2014, Ebola outbreaks were small, isolated, and spaced out allowing Defyrus to approach humanitarian logistics from the viewpoint of improving global health and fell into the category of non-emergency. However, the current outbreak is a humanitarian crisis and has forced Defyrus to rethink its approach to treating Ebola and has transformed its supply chain to meet the needs of crisis. The current outbreak can now be classified as a humanitarian disaster.

**Looking Forward**

Looking forward, past the current outbreak, Defyrus Inc. and its partners are faced with a unique predicament. Defyrus wants to ensure that there is enough supply of ZMapp to meet the current demand in West Africa but the firm does not want to ramp up production too much. The fear is that, following the end of the current outbreak, outbreaks of Ebola will revert back to how they were prior to 2014, meaning small localized outbreaks usually resulting in 10 to 300 fatalities. Defyrus does not want to end up with thousands of doses and a return to very low demand. However, another concern is what if the current outbreak marks a shift. What is moving forward all outbreaks are of a similar scope? This uncertainty
makes forecasting impossible for the future and the firm is forced to walk a thin line between too much and too little. The current plan is to create stockpiles throughout Africa. Defyrus is working with the WHO to create two stockpiles, one in Uganda and one in Nigeria, where Ebola is endemic. By having ZMapp forward deployed, Defyrus hopes to stop any future outbreaks before they reach such a severe magnitude as the one in West Africa.

**Pfizer**

Pfizer is a global pharmaceutical company and is one of the leading names in the pharmaceutical industry. Pfizer is dedicated to improving health around the globe and in 1998, in collaboration with the Edna McConnell Clark Foundation, it co-established the International Trachoma Initiative (ITI). ITI is “an independent not-for-profit organization dedicated to the elimination of blinding trachoma” (International Trachoma Initiative | Pfizer: One of the world’s premier biopharmaceutical companies). Interviews were conducted with the Supply Chain Manager of ITI, Noah Kafumbe. He has been with ITI for four years. Noah Kafumbe was born and raised in Uganda and has a passion for international development. He entered into the field of humanitarian logistics in order to share his skills and knowledge to deliver much needed supplies to people in need to help the live healthy, productive lives.

**Blinding Trachoma**

Trachoma is the “world’s leading infectious cause of blindness” (WHO Alliance for the Global Elimination of Blinding Trachoma by the year 2020, 2014, p. 421). The disease is caused by a bacterium called *Chlamydia trachomatis*. Blinding
trachoma occurs after repeated episodes of the disease, which will eventually lead to trichiasis. This occurs when the eyelashes rub against the eyeball resulting in scarring. Over time this will lead to entropion, which is when the eyelid begins to curl in. Trachoma "is responsible for the visual impairment of about 2.2 million people, of whom 1.2 million are irreversibly blind" (WHO Alliance for the Global Elimination of Blinding Trachoma by the year 2020, 2014, p. 421). One of the most astounding facts about the disease is the fact that it is currently endemic in 51 counties around the globe. ITI, along with the WHO Alliance for the Global Elimination of Blinding Trachoma, is currently working towards the goal of eliminating the debilitating disease by the year 2020. As of today, seven countries (Gambia, Ghana, Iran, Morocco, Myanmar, Oman, Vietnam) "have reported achievement of the targets for elimination of blinding trachoma as a public health problem" with many more countries making great strides in the same direction (WHO Alliance for the Global Elimination of Blinding Trachoma by the year 2020, 2014, p. 421). However, there is still a lot more work to be done if the disease is to be successfully eliminated by 2020.

Pfizer & the International Trachoma Initiative
Between 1999 and 2014, Pfizer has donated over 445 million doses of Zithromax, serving people in 33 countries. ITI is the sole steward of all donations of Zithromax and works with ministries of health to forecast the need for Zithromax. ITI is currently working on completing a global mapping of trachoma to find where the disease is endemic to assist with forecasting. If more than 10% of a population of children between the ages of one and nine has trachoma in a district the area
qualifies as endemic. ITI does not decide where the drugs will be sent. Rather, local ministries of health submit a request, which is reviewed by the Trachoma Expert Committee that convenes twice a year to review applications. Ministries of health have access to the results of the global mapping and can use this information in their applications. The Committee must ensure that the country has the ability to implement a SAFE strategy, which stands for Surgery, Antibiotics, Facial cleanliness, and Environmental improvements. Upon approval, the supply chain of the country will be assessed in order to ensure that the drugs will be able to reach the people who need them. Zithromax can be used to treat other diseases such as STDs and infections so ITI must ensure that the donations of Zithromax are not entering into the commercial sector and that the last mile is intact (N. Kafumbe, personal communication, March 9, 2015).

**Supply Chain**

It is important to note that ITI does not have operations at the local site. ITI provides technical assistance to ministries of health. ITI will cover all costs of shipping to point-of-entry, but once the doses have entered the country transportation is the responsibility of the ministry of health. However, many countries in the developing world lack sufficient infrastructure or capital to continue transportation. In such cases, these countries will rely on NGOs to complete the last mile transportation. The main focus of ITI is forecasting. Zithromax requires an eight-month lead-time, meaning that 2016 forecasts have already been completed by mid-March.
Once forecasting is complete, there are many hurdles that ITI must overcome. The first major hurdle is getting the necessary waivers and getting countries to agree not to charge any taxes on humanitarian aid. This is a large issue because many governments do not view trachoma as a major issue. This lack of publicity and knowledge has impacted donations and has led to trachoma being ignored by many around the world. Trachoma is a neglected tropical disease and is not one of the Big 4: HIV, malaria, tuberculosis, and measles. Ministries of health do not view it as a major issue because trachoma is not a life threatening disease, therefore, ITI and Pfizer have been working together to increase awareness of trachoma and to emphasize the effect the disease has on ones quality of life. The second major hurdle is in-country transportation. Trachoma is a disease that ails the poor in rural and isolated areas, meaning that endemic areas can often be difficult to access especially if infrastructure within the country is in poor. ITI must work with the ministry of health to develop plans for transportation, provide technical support, and, if needed, can help the ministry of health get in contact with NGOs who can assist with last-mile transportation. A third major hurdle is ensuring that the drug is not being directed into the cities and the commercial sector. Ensuring collaboration and communication to promote product visibility throughout the logistics process is the best way to prevent shrinkage. The fourth hurdle is shipping requirements. Shipping requirements differ from one country to another and sometimes the sheer amount of paperwork can increase the lead-time. The final hurdle is local conflict and disasters. Civil war can have a major impact on ITI’s ability to transport goods into a country. ITI is ready to ship doses of Zithromax to Sudan and Chad but is
unable because of unrest on the ground. ITI needs the ministries of health to have people mobilized in order to ship but this is clearly impossible during civil war. Disease outbreaks can also cause a major problem for ITI. The Ebola outbreak in Guinea has led to a huge gap in human resources, with all available resources being diverted to the outbreak. As already mentioned, trachoma is not viewed as a major issue by many governments, therefore, when there is an outbreak such as the one in Guinea, trachoma will move down in the pecking order. Natural disasters will also halt the transportation of Zithromax due to the impact natural disasters can have on local infrastructure.

**Looking towards 2020**

To date, ITI and Pfizer have made great strides towards eliminating blinding trachoma. The disease is considered eliminated within endemic communities if the threshold is below 5%. Once this threshold has been met, focus can shift from surgery and antibiotics to sanitation and education. However, the goal of eliminating blinding trachoma by the year 2020 will not be achieved. Unrest in the Middle East has made it nearly impossible to treat endemic areas in the region. The hurdles previously mentioned have also slowed down the treatment. On a positive note, some countries are beginning to move into the surveillance phase and great strides have been made in awareness. The mapping project has resulted in a revelation as to the impact of blinding trachoma and the goal going forward is to get ministries of health to elevate trachoma on their national agenda.
Novartis

Novartis, like Pfizer, is an internationally known pharmaceutical company that is well known for its humanitarian efforts and donation matching. What makes Novartis unique is that the company provides pharmaceutical donations in disaster and catastrophe relief situations. Disasters can strike at any moment so Novartis has had to put in place a process that is flexible and responsive. To gain insight into Novartis’ disaster relief supply chain, interviews were conducted with the Head of Sponsoring & Donations, Leopold Wyss. Leopold Wyss began his work at Sandoz Nutrition in 1987 as the Controller for Europe and later moved on to Sandoz Pharma in Singapore as CFO for Asia/Pacific from 1994 to 1996. When Sandoz merged with Novartis, he continued to work as regional CFO in Singapore until 1998. He worked as CFO in various Novartis divisions until 2008 when he became Head of Sponsoring & Donations.

Disaster Relief

When a disaster strikes Novartis has a series of decision processes in place in order to ensure that the affected area is able to get what is needed, this involves both financial and pharmaceutical donations. “In 2011, [Novartis] revised [their] Disaster Relief Process to enable Novartis to make decisions more timely and efficiently (within 72 hours after an event strikes) and deliver aid in a sustainable and transparent manner based on the needs of the affected communities” (Disaster Relief, 2015). Its decision process was created in order to be modified to respond to the scale of any given disaster. The decision process involves sending medicines first, which includes antibiotics and analgesics, followed by financial donations and
gift matching programs. The process is divided into three scenarios based upon key indicators: the number of deaths, level of destruction, news coverage, and geographic scale. Scenario one involves disasters of a global scale in which all indicators are exceptionally high, referred to in this paper as catastrophes. Examples of a global scale disaster (catastrophe) include the Southeastern Asia tsunami and the Haitian earthquake. Scenario two involves disasters on a regional scale where key indicators are high and several countries are affected, an example of a regional scale disaster in the Southeast Asia typhoon. Scenario three involves disasters of a local scale such as the Chilean earthquake and Pakistan floods where the disaster was geographically limited to one country. Figure 4 demonstrates the global response process for Novartis.

**Figure 4: Novartis Global Response Process**

Source: Data provided by Novartis disaster relief process, 2014, p. 4.
Inside the Decision Process

When a disaster strikes, Novartis relies heavily on its strong relationship with the Red Cross to get accurate data and a clear idea of what is needed. Within hours of a disaster, the Red Cross will alert Novartis about what pharmaceuticals are needed. Once Novartis is aware of the need, the nearest Novartis location will be assessed to see what is in stock. Novartis follows a first in first out (FIFO) strategy with donations to ensure that medications meet the WHO guidelines. One major aspect of the WHO guidelines is that all medications must have a shelf life of at least 12 months remaining. FIFO ensures that all drugs will fall outside this 12-month window. If the necessary pharmaceuticals are not available, Novartis will supply the Red Cross with money in order to purchase the drugs the affected area needs. The Novartis disaster relief decision process is fast, driven, and free of bureaucracy. Speed is essential to the process because when a disaster strikes it is not a question of money, but rather a question of time.

The Red Cross is the main partner of Novartis in disaster relief. Novartis does not want to spread itself too thin by trying to maintain multiple partnerships with a variety of nonprofits. Novartis made the decision, rather, to focus on one single nonprofit, the Red Cross. In turn, the Red Cross has multiple relationships with various local nonprofits that can assist the firm in the transportation and administration of the drugs. Novartis’ relationship with the Red Cross is built upon trust. The Red Cross is globally renowned and Novartis trusts the Red Cross to provide it with accurate information about what is needed. The Red Cross handles all logistics, meaning that Novartis completely trusts it to get the drugs where they are needed. Novartis continually audits the Red Cross to ensure that
pharmaceuticals are reaching the impacted areas. Novartis will visit disaster areas but it is impossible to be everywhere so trust is paramount. Novartis has various contracts with the Red Cross to donate a certain amount of money and donations per year. When there is a disaster, this amount can range from $300 thousand to nearly $4 million dollars. The Red Cross also has the ability to ask for more and adjustments can be made based on the scale of any given disaster.

The main key issues for Novartis are not having enough drugs available, too much help, and cultural barriers. Lacking a sufficient supply of pharmaceuticals is a huge issue but one that Novartis rarely has to face. Novartis is such a large company that the company is able to locate the necessary stock somewhere. However, when the company is unable to provide the necessary pharmaceuticals, it will donate the cash equivalent. Another main issue is too much help. For high profile disasters and catastrophes, such as the Haitian earthquake, there is not enough ground support to handle all of the donations coming in, resulting in donations having to be turned away. Cultural differences can also cause issues. The Red Cross has specific regional divisions such as the Swiss Red Cross, American Red Cross, Japanese Red Cross, and so on. Working with different cultures can pose an issue especially when Leopold Wyss and his team in Switzerland are working with very different cultures. This was an issue when working with the Japanese Red Cross following the earthquake and tsunami in 2011.

Novartis has worked extensively for many years to streamline its decision-making processes to make the firm as agile and adaptable as possible. Its well-planned procedures in tandem with its strong relationship with the Red Cross
allows Novartis to meet the needs of those effected after a disaster or catastrophe strikes (L. Wyss, personal communication, March 17, 2015).

**Conclusion**

Humanitarian logistics is a growing field of research and an increasingly important topic for practitioners and researchers alike. The companies that were studied all employed incredibly different processes in order to meet the demands of three very different scenarios. All three, Defyrus, ITI, and Novartis, represent best practices for the field of humanitarian logistics. Defyrus Inc. was forced to adapt rapidly when the Ebola outbreak occurred. As urban areas grow in the developing world, the risk of future outbreaks will increase and Defyrus provides a good model for other pharmaceutical companies. ITI and Pfizer serve as models for the treatment of chronic diseases in the developing world. There are countless other nonprofits that are striving to eliminate dozens of endemic diseases but the relationship between these two companies and the ministries of health serve as a model for other nonprofits. Novartis focuses solely on providing pharmaceutical donations in response to natural disasters and catastrophes. The decision-making processes designed by Novartis to enable the firm to quickly meet the needs of three different scales of disaster. Its processes should serve as a guideline for all pharmaceutical companies looking to respond to disasters. The experience of these three companies also demonstrates that the development of relationships is key to humanitarian logistics. Further, all were aware of the firms’ individual strengths
(such as in manufacturing, forecasting, or technical support) and through partnerships were able to make up for the areas where the firms were lacking.

Going forward it is important that more research is done in the field. There is very limited research focused specifically on pharmaceutical donations and, in order to improve efficiency and outcomes, more is needed for the future. Such work might include case studies on the Ebola outbreak to gain a better understanding of where the bottlenecks in the system were. Also extensive research could be done on all levels of the supply chain- everything from manufacturing to the last-mile, in order to gain a more comprehensive understanding of the topic.
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