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Benefits of Air Transportation vs Ground Transportation in the Medical Field

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Honors Thesis:

Topic: Benefits of air transportation vs ground transportation in the medical field

Research questions:

1. Is there a greater outcome for patients transported by air?
2. Is there a difference in access to equipment for ground and air runs?
3. Since the collaboration of Lifeline, has there been a better survival rate and patient satisfaction?

Intro:

Issues with cost, possibility of crashing, pilots, medical care,

Abstract:

The risks and benefits of air ambulance transportation is compared yearly to see if the benefits outweigh the risks for patients and healthcare workers. Lifeline, specifically, is the only flight service with no helicopter crashes. They have successfully stabilized and transported the patients to the best hospital where they receive life-saving care. The Indiana State Trauma Care Committee continues to collect data throughout the year to go over certain patient situations and how to better the outcomes or their overall performance. While both air and ground ambulance services are used to transport patients, the patients deemed most critical based on the scene, are flown to the respective hospital. Each of the specific transportation services, they are equipped with the proper tools and equipment to save the patient's life when necessary. Overall, the statistics are being looked at to improve patient transfers and better the outcomes of survival rates. Physicians and other medical personnel are working to improve their skills and learn from each patient's case.

Intro:

An ever popular trend in saving lives during extreme medical emergencies has become air transportation. Since its development, in most severe emergencies, medical personnel have had to make the decision to call in air transportation; as opposed to ground transportation to greater ensure the survival rate of said victims, or so it is perceived. With this thought in mind, one must ask the following questions and review the data that has been collected to see the benefits and the success rates associated with ground versus air transportation, their outcomes, survival rates and the critical factors, such as safety, costs, limitations, etc., that could inhibit this type of patient treatment

Background:

Need for timely medical transportation in the Indiana hospitals is crucial when it comes to helping patients in need. “Many of them die for want of timely EMS. Thousands of these accident victims could have been saved if timely medical intervention were available to them. Thus, the need of quality EMS is an unmet need of the masses” (New Delhi, 2010). The most common mode of transportation is a ground run, or ambulance. Use of air transportation is very important for the patients deemed the most critical. In Indiana alone, there are eight Level 1 and Level 2 Trauma Centers (Indiana State Trauma Care Committee, 2015). They receive the most critical patients because they are equipped with the proper equipment and experience needed to stabilize patients. The Emergency Medical Technicians (EMT’s) are responsible for being the first ones on the scene of a medical emergency. From that point, they work to stabilize the patient and determine the immediate level of care needed. When the patient is not in a critical state and coherent enough, they are able to tell the EMTs which hospital they would like to be transferred to. In cases where the patient is not stable enough to request a specific hospital, the EMT’s will make a decision based on crisis. The more immediate patients will go to the closest Trauma Hospital (Indiana State Trauma Care Committee).

According to the Indiana State Trauma Care Committee (ISTCC), during the first quarter of 2015, ambulance transfers totaled 4730 runs. The data includes runs to Level 1, 2, 3, and non-trauma centers. As for helicopter transports, they totaled 323 transports during the first quarter. The data includes Level 1, 2, 3, and non-trauma centers as well (Indiana State Trauma Care Committee, 2015). The Indiana State Trauma Care Committee was established in 2012 to help keep track of the trauma patients and the advancements within trauma centers. Since the

establishment, data has been reported monthly, quarterly, and yearly in regards to bettering the trauma centers. There are regulations the trauma centers have to abide by as well as the means of transportations. Such regulations include certifications, medical advancements, and safety of the patient and medical personnel. Being able to have access to the data collected by the ISTCC encourages all personnel involved to better their services to the patients and work to the best of their ability.

Not only are there regulations for the different medical transporters, there are several related issues studied by hospitals and other researchers. These issues include: the cost of the transportation, safety during travel, safety for the patient regarding medical care, experience of the pilots or drivers of the ambulance, and overall knowledge of the medical personnel. It is very important for the hospitals and the transportation services to communicate while in route to the hospital (Indiana State Trauma Care Committee, 2015). To achieve the best outcome for the patient, physicians and nurses need to be as prepared as possible before the patient arrives. The transportation services call in and give a general report to the hospital detailing the condition of the patient. Once the patient arrives to the trauma center, the EMT or nurse who traveled with the patient will give report to the hospital. From there, the physicians and nurses work together to stabilize the patient and prioritize the care they are giving the patient.

The need for physicians, EMTs, and nurses in flight nursing has grown in regards to medical transportation. A typical flight crew consists of: a pilot, nurse, EMT, and in some cases a Nurse Practitioner (NP), or physician. Not every flight is equipped with the same personnel but it is important to have a person on the flight with the ability to give medication as needed. As for ambulance runs, they consist of EMT's which are also able to administer certain

medications. The flights are able to do more on the scene because they have more resources and educated personnel. However, it is usually a much more traumatic event when they arrive. They need experience in critical care, emergency room, and high stress areas such as a trauma hospital. While the work they do is very important, there is a board and committee overseeing every move they make. They use the data to make informed decisions about improving care and education for the personnel. This goes for both air and ground runs throughout Indiana.

Purpose of Research:

It is well known there is always a need for air and ground transportation in the medical profession. It is extremely overwhelming when they receive a call to go to the scene of an incident. Not only do they have to come equipped and ready to help, they have to think very quickly once they get there because they do not receive substantial information before they pick up the patient. They are able to assess the situation once they arrive on the scene and make informed decisions based on their assessments. Enroute to the hospital, they chart and keep the patient stable and comfortable along the way. They also make sure to call in report to the receiving hospital. Whether the patient is coming via ambulance or helicopter, the guidelines remain the same.

From this background information, I want to investigate both air and ground runs in terms of patient survival rates, injuries in regards to similarities in the scenes, time taken for transportation, education level of medical personnel, and patient satisfaction. The use of ambulances in regards to medical transportation is commonly seen within a community. Not only do they transport medical alerts, they are used to transport patients from different hospitals to get them to the facility that can best accommodate them and give them the best

results. Helicopters are used for the most critical patients whom people tend to think of as motor vehicle accidents but they also include progressive life-threatening situations such as blood clots.

I will be looking at specific data from the Indiana State Trauma Care Committee and look for real life stories from patients who have been through the Level 1 Trauma system. I want to compare the data over the last three years to get a better understanding of what is going on at this point in time and how the facilities can improve.

It is important to synthesize data in regards to success rates in patients. This information is compiled based on the level of care the patients receive from educated and experienced trauma teams. Information can be gathered from the scene as well as once they enter the hospital. It is also important to look at the reliability of the ambulances and helicopters. They need to be in the best shape for transportation because every second counts when trying to help patients. It is just as important to look at the level of education for everyone involved in patient care. When looking at the similarities to cases, I want to look at what is wrong with the patient and how it is similar when they are being transported by ambulance or helicopter. I want to see if a certain patient needed the helicopter transport or if they would have survived being taken by ambulance and vice versa. More specifically, the success rates and the condition and reliability of the transportation.

Approach to Research:

The data collected will consist of qualitative and quantitative data. I will look at personal stories from IU Health, Union and Regional Hospital, Franciscan Alliance, and Eskenazi Health. These hospitals will also be used to look at the education level of trauma team members and

the accreditations of the teams. The Indiana State Trauma Care Committee website will also be used to compare the data the epidemiologists have compared over the last three years. Also looking at the success rates and credibility of the flight operations such as LifeLine which has both an air and ground transportation.

Summary:

The need for medical transportation is very important but it is even more essential to have committees and groups who are able to analyze each situation and look for improvements. Since the gathering of the Indiana State Trauma Care Committee, issues have been resolved more quickly and satisfaction rates have improved. Hospitals throughout the state are constantly working together to better each facility and work closely with modes of transportation. Finances need to be looked at because there is a cost to keep facilities and transportation running. There is also a high cost for patients but in the end, the hope is to have them survive and be satisfied with their care. Helicopters and ambulances are changing the lives of patients and medical personnel each and every day. It is extremely beneficial to work cooperatively with them throughout the medical profession.

Intro:

Throughout the paper, issues regarding benefits of air and ground transportation will be addressed as well as financial issues. The comparison of survival rates as well as death rates based on the transportation will be observed to look at any significant difference. It is important to explain all the evidence obtained to get a clear picture of what is positively and negatively going on within the transportation system for medical cases. Personal experience within the medical field from both the ground and air transportation side will be looked at as

well as the role the nurses and physicians play in the care of patients. The specific questions being answered are: 1. Since the collaboration of LifeLine, has there been a better survival rate and patient satisfaction? 2. Is there a difference in access to equipment for ground and air runs? 3. Is there a greater outcome for patients transported by air?

Education:

While there are more than one air ambulance services, Lifeline is a well-known service which is based out of IU Health hospitals and surrounding airports. The service was established in July of 1979. LifeLine consist of a fleet of six helicopters and seven Mobile Intensive Care Units (MICUs), which is used when weather does not permit flying. LifeLine is based strategically throughout the state to provide the best possible amount of service within their specific area. It is a 24 hours a day, seven days a week flight service in charge of transferring some of the most critical patients throughout the state. “IU Health LifeLine operates the most advanced air medical helicopters and mobile intensive care units in the industry” (IU Health, 2015). Their specialties include: neonatal & pediatrics, cardiovascular, neuroscience and high-risk obstetrics, and trauma (IU Health, 2015). LifeLine is “Indiana’s first established air medical transportation service provider- and one of the largest hospital-based providers in the nation” (IU Health, 2015). They are the only flight service with priority at any IU Hospital as well as affiliation with the only two Level 1 trauma hospitals in Indiana. They are also able to fly when other services cannot because of their instrumental flight rating (IFR), GPS, and advanced avionics

Within Indiana, IU LifeLine air transportation has been established. While it is not the only air ambulance service, it is known to work directly with the IU Health hospitals throughout

Indiana. On a flight, there is a certified army pilot, an EMT, and a nurse. In rare cases there will be a physician (IU Health, 2015). The crew can be based in the hospital, such as the team at IU Methodist in Indianapolis. In other cases, they will be based out of the local airport in the town they are in, such as, Terre Haute and Lafayette. The formation of such a system has had many benefits within the medical field regarding patient care. It is important for the crew members to have specific qualifications in order to have such an extreme career. Education wise, a nurse needs to have three to five years of experience within a critical care setting whether it is the Emergency Room (ER) or the Intensive Care Unit (ICU). If they were previously employed in either the ER or ICU at a Level One Trauma Center than they only need to have the minimum of three years of experience (IU Health, 2015). As for the pilots, they will not be hired unless they have a military background of piloting a helicopter. It is important for them to understand how to determine whether the weather is cooperating well enough for flight. They will not take off unless they are able to see for 30 miles because if the visibility is less, it causes too much of risk for the crew members and the patient needing transported (IU Health, 2015).

The EMT's are educated based on the schooling they receive when they initially want to become an EMT. It is important for them to work collaboratively with the nurse on the flight. There is a vast need for flight nurses who are equipped with the knowledge, skill, and experience for the high risk situations. "Air Ambulance is currently seeking specialized flight nurses, to coincide with a program of expansion. Air Ambulance – a division of the Ambulance Service of NSW - provides hospital to hospital transfer for rural and regional patients to metropolitan hospitals and tertiary centres. Essentially, two types of services are provided,

emergency medical transport and non-urgent essential medical transport, in an operating area which covers 800,000 square kilometres" (Australian Nursing Journal, 2012)

Both types of medical personnel bring unique qualities to the scene which is able to enhance the care given to the patient. The nurse is trained in the distribution of medications while enroute to the facility as well as airway protocol. As stated before, the "ABC's" are the most important factors when caring for a patient. The nurse and EMT have to work collaboratively by establishing which intervention they will be performing while on the scene and enroute because it is hard for them to have specific details regarding the scene they coming up on. There are also times when the nurse or EMT will help the pilot with navigation if needed. The role of the nurse once they arrive on scene or at the hospital the patient is being transferred from is collecting paperwork from the facility and charting while in flight, providing resuscitation when needed, and securely strapping the patient to the gurney for transfer. Once they are on the helicopter they will start intravenous lines (IV's), administer medications, perform advanced life support (a certification required within the field of trauma and emergency), monitor vitals, chart, and communicate with the patient to help calm their nerves and explain what is going on. Once they have arrived at the facility, the nurse will carefully unload the patient, process the paperwork, and give report to the doctors and other nurses about the patient's condition and any changes they need to be aware of (IU Health, 2015).

There is specific protocols air and ground transportation services have to abide by, such as the equipment they use, in order to successfully pick up and care for a patient. The term used for members of an ambulance is "Emergency Medical Service" (EMS). "Prehospital EMS is most easily recognized when emergency vehicles such as ambulances or helicopters are seen

responding to emergency incidents or transporting patients to or between medical facilities" (Emergency Medical Services, 2015). They are the first ones on the scene and have the job of stabilizing the patient to the best of their ability. They have limited supplies but they are able to attend to the basic necessities, or "ABC." ABC refers to airway, breathing, and circulation. The personnel assess each of the categories and make their next move based on what is found. Airway is the number one thing to assess and stabilize on the patient. Within the ambulance, they are equipped with IV tubing, portable EKG machine, portable oxygen equipment, manual resuscitation mask, pulse oximeter, saline drops, airways for adults and children, AED, cervical collars, lower extremity traction, bandages, and obstetric kits in case of emergencies (American Heart Association, 2007).

Similarly, the equipment used for an ambulance such as; airway, breathing, and cardiac materials, is the same helicopters. Some of the differences include the medication that is able to be administered enroute. Since there is a registered nurse on the helicopter, they are able to administer more medications than an EMT can because it is in their specific scope of practice (American Heart Association, 2007). One of the main differences in the types of flight services would be the advanced use of blood from LifeLine. "IU Health LifeLine is the only critical care transport program in Indiana with blood on-site…in turn decreasing time spent at referring facilities awaiting blood products" (IU Health, 2015). Specifically on LifeLine, they are equipped with liquid oxygen, blood, an inverter that converts to electric power, diesel generator for backup, medical air compressor for medical grade air, high frequency ventilator for respiratory patients, i-Stat handheld blood analyzer for fast and reliable blood results, and an isolette to maintain temperature and oxygenation (IU Health, 2015). The other substantial difference

would be the time used to travel if the patient needed to go to a specific hospital that was far away. Obviously, a helicopter would get there faster and be able to care for the patient along the way with the equipment available to them. As for an ambulance, they are beneficial in ground runs that are in close proximity to certain hospitals. They are able to stabilize the patient with the equipment they have in the amount of time they have.

There is much discussion over "what could've been if patients were treated sooner or tended to faster at the scene." Studies have been conducted to look at data regarding survival rates based on the mode of transportation the patient received. "… Assessments of the quality of injury care demonstrate that care often fails to meet established standards. Studies show up to half of all critically injured patients do not receive recommended care, adverse events are common, and injury care may not meet the needs of certain patients" (Bobrovitz, Santana, Kline, Kortbeek, & Stelfox, 2013). "Although some studies could not find any association between response time and outcome due to the small sample size or focus on severe cases such as trauma, it is logical to assume that shorter response times are beneficial to reduce mortality" (Peyravi, Khodakarim, Ortenwall, & Khorram-Manesh, 2015). This statement can be used for both ground and air travel. The main point about transferring quickly to the hospital is whether or not the patient is transferred fast enough to the hospital that can provide the best care. Rural areas lack Level 1 trauma centers which is harmful for patients in dire need of care. As a result, patients suffer when they are not transported quickly enough. In a specific study, the results concluded "mortality was significantly lower in the Helicopter Emergency Medical Service (HEMS) group (12 percent) than in the two ground transport groups (38 percent and 32 percent)" (Peyravi et. al, 2015)

There is an allotted amount of time for both air and ground transportation. For air services they are allowed 120 minutes and ground services are allowed 90 minutes to successfully transport the patient. In an article about ground transportation, it outlined the four components of transportation which are activation, response, on-scene, and transport intervals.

> "The activation interval is the time from the emergency call to ambulance dispatch. The response interval is the time from ambulance dispatch to the ambulance arrival at the scene. The on-scene interval is the time from ambulance arrival at the scene to the time when the ambulance departs the scene for hospital. Finally, the transport interval is the time from ambulance departure from the scene to arrival at the hospital" (Patel, Waters, Blanchard, Doig, & Ghali, 2012).

These four time intervals combine to give the total pre-hospital time of a patient from the emergency call to hospital door. As for the air transportation, they are to communicate with the closest trauma hospital after they are called out to the scene and assess what the patient's needs are. They have to communicate with the landing zone officer on where to safely find the landing zone. They also have to be aware of the crew members' height and weight so they can balance out the helicopter and get the weight of the patient from the hospital. They will also communicate with air traffic control to be on alert for other aircrafts in the same vicinity (IU Health, 2015).

Effective communication is needed during any medical situation. In order to have a successful outcome, medical personnel need to be on the same page when caring for a patient and go into each situation with confidence and knowledge. It is important for the EMS service,

whether ground or air, be in communication with the ER at the hospital where the patient is being taken. The EMS informs the hospital of the EMS unit identification, scene arrival time, hospital pre-notification time, hospital arrival time, dispatch time, symptom onset time & description, scene departure time, medications, procedures, and complications (IU Health, 2015). Based on the information received, the hospital will prepare a trauma room and get the needed supplies and paperwork:

> "A level 1 trauma activation elicits trauma surgeons, emergency medicine (EM) physicians, trauma residents, EM residents, respiratory therapists, pharmacists, emergency nurses, intravenous (IV) transfusion nurses, radiology technicians, laboratory technicians, operating room (OR) charge nurses, and anesthesia providers. The trauma surgeon has up to 6 hours to see the patient, but generally evaluates him or her within an hour" (Jelinek, Fahje, Immermann, & Elsvernd, 2014).

Once the patient arrives, the nurses take over starting IV's and placing the leads on an EKG machine. They will draw blood and help transfer the patient from the backboard to the hospital bed. The doctors will talk amongst themselves and try to figure out what orders need to be called in regarding fluids, meds, and diagnostic tests. They will also use the "ABC" approach to rule out critical conditions. The EMS service tries to stabilize the patient to the best of their ability with the supplies and equipment they have but after the transfer, it is the hospitals job to care for the patient from that point on. The EMS service will give report to the doctors and nurses and they will combine their notes within the chart to enhance the care the patient is receiving. As a result, communication is inevitably important to improve success rates in patients.

Success Rates:

IU Health has documented their patients survival stories based on the care they received from the IU Health team. Specifically, there is a success story about a patient who was in a serious car accident. He was transferred by LifeLine where he was informed his vital organs such as: kidneys, liver, pancreas, and gallbladder were shutting down. The team at IU Health had to work rapidly to try to save his life. He ended up spending 225 days in the hospital doing rehab and healing. He mentioned in his story how wonderful all of the people were he came in contact with. He specifically mentioned the LifeLine team who initially saved his life by stabilizing him out in the field. He was very grateful for the hard work the flight crew performed to save his life (IU Health, 2015).

Another success story was based on a nurse who was employed in the ER at IU Health. She had fallen off her bike and fractured her back. She needed to be flown by LifeLine because her injury was deemed critical. As a result, she was given medical advice from the best neurosurgeons in Indiana which was made possible by the safe transfer from LifeLine. She mentioned the "IU" symbol on the flight suit of the LifeLine nurse was a symbol of hope for her. Though she was extremely scared, she felt safe and new she was in the best hands with the help of LifeLine and the Trauma team at IU Health (IU Health, 2015).

There have been poor outcomes "attributed to underlying hypotension (low blood pressure) caused by acute blood loss compounded by rapid sequence intubation (RSI) medications and mechanics of ventilation decreasing venous return" (Moy & Andino, 2015). This particular study showed the poor outcome related to the use of intubation during the pre-hospital time. It was found that patients were losing more blood because of the time used to

intubate a patient. In a United States (U.S.) study, they found “intubation in non-arrest trauma was successful more often than with non-arrest medical and cardiac arrest patients” (Moy & Andino, 2015). When looking at the logic behind that “ABCs” method medical personnel are taught, airway is the most important aspect to establish during a trauma incident or any medical incident for that matter. It is only right for pre-hospital EMS to intubate a patient who is having trouble breathing and whose vitals are dropping rapid. If a secure airway is established, stopping the bleeding would be the next most important task. In this case, both air and ground transportation has been successful in saving the lives of patients by establishing a patent airway on the way to the hospital. It has shown a greater success rate in the United States.

An eye opening success story comes from a personal experience in January of 2015. Being able to fly along with LifeLine for the day proved to be a very educational and life changing event. Stationed out of Terre Haute, the LifeLine team was called to transport a patient from Morgan County Hospital to a Level 1 Trauma Center, IU Methodist Hospital. The patient being transported was suffering from a blood clot in her leg. She had recently lost one of her legs due to a blood clot. The physicians in Morgan County were unable to properly care for the patient because they needed the care of a Level 1 Trauma Center. When the flight team arrived, they gathered the notes on the patient and did a quick assessment. They loaded the patient up and made sure she was stabilized for transport. Upon arrival, the nurse and EMT took the patient to the trauma room in the ER. From there, the doctors and nurses worked collaboratively to figure out how to treat the patient. They needed to bust up the clot before it potentially broke off and traveled to the heart or a lung which is ultimately, fatal. Watching the LifeLine team work

quickly and efficiently to provide the best possible care to the patient in this specific situation was life changing. Becoming a flight nurse is my ultimate goal because of the influence of the LifeLine team that day and especially watching a success story.

Safety of transportation:

There is a great deal of importance in the safety of the medical vehicle being used to transport a patient whether it is a helicopter or an ambulance. LifeLine is the only flight team which has never had an accident or jeopardized a patient's life or the life of the crew while in flight (IU Health, 2015). It is the job of the pilot to inspect the helicopter before each flight and after to ensure proper safety. "IU Health LifeLine goes beyond Federal Aviation Association (FAA) standards to ensure our helicopters are in the most pristine condition. Every part of each helicopter is inspected and replaced as part of a regular maintenance inspection" (IU Health, 2015).

When looking at the size of the helicopter, it is more advanced than any other flight teams in use today. "It provides more space than any other emergency care helicopter in the state. The increased size of our cabin provides us with full body access to patients as well as the ability to transport additional crew members with specialized training for complex critical care cases" (IU Health, 2015). It is important for the nurse and EMT to have the proper amount of space when it comes to caring for the patient on the helicopter. The other flight teams have the required amount of space needed in the cabin of the helicopter but LifeLine is able to provide more room to accurately care for the patient to the best of their ability.

The safety of the helicopter is important while enroute to the hospital but the safety of the patient is also very important. For the crew members, the first task is to make sure the

patient is physically safe; however, it is important to assess the patient's emotional safety if they are alert. Being flown by LifeLine can be one of the scariest events in a person's life. It is crucial to make sure the patient feels safe and to reassure the family of the patient's safety. According to the Journal Of Advanced Nursing:

> "Pertinent responsibilities include helping the patient to obtain necessary care, monitoring and safeguarding the quality of that care, respecting the rights, values and beliefs of the patient and taking actions to ensure that other members of the healthcare team recognize these and acting as a liaison between the patient, family members and members of the healthcare team" (Richmond & Aitkem, 2011).

The flight team serves as more than medical personnel during their time with the patient. In the short amount of time they have together, the medical personnel are caring for the patient but also comforting them in any way. In a way, they become a family because the flight team is all the patient has during the traumatic time in their life. They are putting their lives in someone else's hands in hopes of a successful outcome.

The nurse and EMT who come to the medical scene are in charge of making a quick assessment and determining the extent of the injuries presented. "The patient's injuries may result in multiple pathologies such as bone fractures, soft tissue and vascular damage, hemorrhage, coagulopathy, acidosis and hypothermia, which need to be prioritized and addressed appropriately for optimal outcomes" (Crossan & Cole, 2013). As part of the safety aspect in the care, they need to stabilize the patient for transport and tend to the most life-threatening injuries first. Many times, the patient is being flown because the extent of their

injuries is very critical. They are battling more than one injury which deems them most critical. Prioritization is vital in the safety of care for the patient during transportation.

Success stories are motivation to people in the medical field and also comforting to patients who could potentially need lifesaving measures. However, there are cases when success has not been found. It can be related to the treatment given, transportation issues, or the patients' injuries being too severe and deteriorating too quickly for survival. "Despite the alarming number of U.S. air ambulance crashes in the first half of 2008-which have claimed 16 lives-several healthcare providers say the benefits of air medical services still outweigh the risks involved (Zigmond, 2008). It can be scary for the patient to understand such statistics. Not only is their life in danger, the flight crew's life is on the line. Losing a patient and crew members make the job more difficult, but it takes highly trained personnel to do the job. In cases of crashes, there is a lack of education about the helicopter or lack of inspection. It can also be related to flying when weather was not ideal at the time. Poor decisions are made in a split second that effect people for the rest of their lives. No one wants to put the life of a patient in more extensive danger during transportation let alone, the flight crew who has the ability to properly care for the patient. It is a matter of looking at the ratio of risk-to-benefit. Saving the patient is on everyone's mind because they are providing a much needed higher level of care, but is it worth risk their life and the crew members in the process?

Within the world, statistics were looked at from 2008 in regards to crashes while transporting a patient. "Accident statistics don't lie. And in 2008, the picture they painted was a grim one: Twelve air ambulance helicopter crashes claimed the lives of 29 crew members and patients" (Pope, 2013). These statistics are unfortunate but the good news is, people can learn

from the mistakes made. As stated before, the lack of education and poor decision making result in unwanted and unnecessary crashes.

There are many protocols needed to be followed during transportation for both air and ground ambulances. Time is a big factor EMS from air and ground services have to take into account. Patients need to be taken to the best hospital for their condition "…unless transport time exceeds 45 minutes or, in the judgment of the emergency medical services certified responder, a patient's life will be endangered if care is delayed by going directly to a trauma center, in which case the patient shall be transported to the nearest appropriate hospital as determined by the provider's protocols" (Indiana Trauma Field Triage, 2011). For example, in Indianapolis, the only hospital qualified to treat burn victims is Eskenazi Health. Depending on the scene or the circumstances of the patient and their condition, they will ultimately receive the best care from physicians at Eskenazi Health. In cases where the EMS transportation is running out of time (the 45 minute protocol for ground runs), they may need to take the patient to the nearest hospital despite the hospital inability to properly treat the patient. One of the reasons a patient would be taken to the closest hospital is because of the rapid decline in their status which results in immediate care no matter which hospital is near. Ultimately, the patient can suffer in the long run because their extent of their injuries were not treated at the proper facility but because of the protocols the EMS services had to follow, they had no other choice. Again, the risk-to-benefit ratio is applied.

Patients could have a better chance of being taken to the proper hospital if they were flown, because they are allowed 120 minutes for transport. It is also important to remember the "golden hour" which is the term used when the patient is most critical and needs treatment

as soon as possible. Medical personnel are working extremely hard during the hour to communicate with the EMS services while at the scene so they know what to expect when the patient arrives to the hospital. They only have a certain amount of time to run tests, stabilize the patient, and determine the next step for their care. They work to keep the patient stabilized, ultimately in hopes of saving their lives.

Similarities in Scenes (Benefits and Risks):

Benefits:

Throughout the research, the risk-to-benefit ratio has been mentioned in each study. It is important to quickly assess the situation and determine what is most beneficial to the patient with the least amount of risk. In regards to helicopter transportation:

> "Only a Helicopter Emergency Medical Service: - Gets to victims 3 to 5 times faster than road units - Flies over obstacles and straightens winding roads - Never gets caught in traffic - Vastly enlarges the health security footprint of a hospital - Reaches victims far from roads - Provides the quickest relief from major pain - Reduces the risks of high-speed road missions - Increases the output of EMS teams - Carries victims directly to specialized services - Saves people from certain death - Saves victims more than 25 km away - Gives the same chance to all, wherever they are (Helicopter Emergency Medical" Services, 2015).

Helicopters have many benefits and advantages in transportation and enhancing patient care which makes them more reliable and a good resource for hospitals to use to help better their success outcomes.

The amount of time reduced from using air transportation is very beneficial. “A significantly reduced arrival time at the scene was shown for HEMS compared to ground EMS, when the flight distance was more than 10 miles” (Mommsen, Bradt, Zeckey, Andruszkow, Petri, Frink, & Probst, 2012). Once again, it is important to get to the patient as quickly as possible and once on the scene, it is important to transfer the patient to the hospital in a timely manner. Being able to reduce the amount of time during transportation will give the physicians at the hospital more time to properly care for the patient and give them a better chance of a positive outcome.

According to a study done which compares German HEMS with ground EMS, the benefits of HEMS were more substantial when compared to ground transportation. Patients with traumatic brain injuries (TBI) and burn injuries were shown to have a better survival rate when transported via HEMS. Overall, based on any diagnosis there was a significant amount of time reduction because of HEMS. The patients were able to be taken to the closest, most appropriate hospital for their condition. They were able to get the needed care from appropriate physicians who were equipped with the tools needed to save a patient’s life (Mommsen, Bradt, Zeckey, Andruszkow, Petri, Frink, & Probst, 2012).

Another study was conducted to compare the benefits of air versus ground transportation. As a result, there is a “decreased mortality among patients transferred by air” (Walcott, Coumans, Mian, Nahed, & Kahle, 2011). Overall, the amount of time reduction and reduction of mortality rates for patients are seen as the most important benefit of air transportation over ground transportation.

Risks:

It is important to ponder the negatives of air medical transportation. While people are in a great need of care during a critical time, they are likely not worrying about the cost at the exact moment they are loaded into a helicopter. However, a downfall of air medical transportation is the cost. The overall bill has many elements factored into the total cost. Based on information for the US Air Ambulance: "All of our costs are included within our price: ambulance transport, the cost of the medical crew, all of the equipment and medications and the flight itself. Any changes to costs that might occur as a result of changing patient conditions" (Helicopter Emergency Medical Service, 2015). Ultimately, the total cost of transportation can range from $12,000-$25,000. It is a substantial increase in cost compared to ground transportation. However, when a patient is transported in a helicopter, it is because the benefit outweighed the risk. Overall, the main goal during transportation is to save the patient at any given time.

One of the main negative effects of a trauma team which includes hospital staff and transport staff would be understaffing. According to the American College of Surgeons (ACS) Committee on Trauma (COT), "Optimal resources [at a trauma center include] the immediate availability of board-certified emergency physicians, general surgeons, anesthesiologists, neurosurgeons, and orthopedic surgeons. Physician workforce issues in trauma have attracted increasing attention because the undersupply of trauma surgeons has led to a critical problem in patient access to emergency care" (Glance, Dick, Osler, Mukamel, Li, & Stone, 2012).

Different types of medical runs

The types of medical runs taken on by the ground EMS can vary. Many times it can be a motor vehicle crash (MVC), heart attack, or drug related issue. As for air EMS, they can respond

to either of those issues but they are usually called upon when the scene displays more a traumatic atmosphere. Statistics have been gathered to look at the trend of the busiest months for EMS responders. “Overall downward trends and seasonal patterns with peaks during summer months for both alcohol and speeding-related fatal crashes” (Brubacher, Chan, Brasher, Erdelvi, Desapriva, Abridge, & Pike, 2014). Winter months can also cause an increase in medical runs due to the weather which can cause more MVCs. Ultimately, air and ground services can see similar situations but it is the air transportation that transports the most critical patients when needed to enhance the survival rates.

The final study looked at was looking to see what type of surroundings and medical issues were deemed most appropriate for air transportation. There is a much greater need for air transportation in rural areas where hospitals can be a great deal of miles away. Transporting by ground would take too much time and jeopardize the survival rates of the patients. In conclusion, it was found that “emergency helicopter services can provide considerable health benefits for patients in the rural setting” (Hotvedt, Kristiansen, Forde, Thoner, Almdahl, Bjorsvik, & Ytre-Arne, 1996). The need for safe and fast transportation to the hospital can be bottom line when it comes down to saving the patient.

Conclusion

Through research and personal experience air transportation has deemed itself the better choice. While the cost is substantially different, the success rates are far greater. The risk-to-benefit ratio is once again used to weigh the options when it comes to saving the life of a patient. Based on the research, a reduction in the amount of time used to get to the scene where a patient is and then to transport them to the proper hospital has truly been beneficial.

Air transportation is allowed 120 minutes to successfully assess, stabilize, and transport the patient. They are also equipped with more tools to better care for the patient. It has been proven survival rates increase based on the quicker transportation to the best possible hospital. Ultimately, helicopters more beneficial in a rural setting when hospitals are too far for ground ambulances to quickly transport a patient. Specifically, the LifeLine teams are armed with these most qualified pilots and medical personnel to ensure patient security and satisfaction.

The specific topic of the benefits of LifeLine or air ambulance transportation has a personal meaning. Becoming a LifeLine nurse or a flight nurse in general is the ultimate goal. Having the ability to care for the most traumatic patients in substantially different events is truly remarkable. The technology and knowledge obtained by the flight crew is one in a million. There is an extensive amount of training and qualifications needed to properly care for each and every patient. Proving that the benefits outweigh the risks throughout the research is reassuring. Cost is always an issue throughout society but when it comes to saving lives, if the patient survives, that is truly all that matters. Being equipped with the knowledge and experience to potentially alter a traumatic life event will ultimately be *the* dream career.

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