VeinViewer Case Study:

Lifeblood

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PURPOSE: The purpose of this non-randomized clinical trial was to determine whether the VeinViewer device is useful in locating viable superficial veins for venous access in patients with “known” difficult-to-find and difficult-to-access veins.

MATERIALS AND METHODS: Thirty patients, previously pre-screened and rejected as donors by Lifeblood/Mid-South Regional Blood Center, were chosen by Luminetx for clinical evaluation to determine the effectiveness of the VeinViewer to locate veins in these individuals with “known” difficult-to-find and difficult-to-access veins for blood collection. Over a 20-day period, each patient was invited back to Lifeblood/Mid-South Regional Blood Center, re-screened and imaged with the VeinViewer device to: 1) locate a viable vein for venous access and 2) to attempt venous access of that vein for blood collection with one successful needlestick.

RESULTS: The VeinViewer was 100 percent successful in locating a viable vein for venous access in each patient, which provided the Lifeblood Staff with a 100 percent success rate when accessing the vein for blood collection. In addition, the VeinViewer was successful in aiding staff members in accessing those difficult patients on the very first attempt.

CONCLUSIONS: The VeinViewer imaging device is an effective adjunct assessment tool for the location of difficult-to-find and difficult-to-access veins for blood collection. Lifeblood’s conclusion: VeinViewer = One Needle, One Stick, One Vein, ONE NEW DONOR!

INTRODUCTION
Background

In the modern world of medicine, there are many advances that make it much easier to diagnose extremely complicated disease states. A plethora of very complicated issues in medicine seem to be getting solved on a daily basis. On the other hand, something as seemingly benign as having one's vein accessed for blood tests or blood collection is a minor issue with major implications. It has recently been estimated that there are approximately 1 billion venipunctures per year in the United States alone[1]. Considering the size and magnitude of phlebology, the art of venipuncture should be considered of utmost importance in the scope and practice of modern medicine.

Phlebotomy is instrumental in obtaining blood specimens in order to run the proper laboratory tests needed in most health care settings. Laboratory tests are used in everyday medicine as a vital tool in diagnosing illness and establishing guidelines for therapy. In order to gain access to these results, a best practice approach to phlebotomy must be realized. Currently, there are standards that govern the phlebotomy practice, and many phlebotomists are required by law to achieve certification in their particular field. However, many of the rules that are provided in these certification courses are routinely ignored by everyday practitioners. In some of these cases, the phlebotomist can unknowingly run the risk of causing harm to patients. For example, if a phlebotomist chooses to use a basilica vein when there is a median antecubital vein or cephalic vein that is acceptable for blood draw, the patient could suffer a 'nick' to an artery or a nerve. If this were to happen, the patient could sustain bleeding into the interior portion of the arm and/or possibly lose arm movement on some level. These problems can be monumental, especially when legal action is taken against a healthcare worker by the patient or physician. Another example is a phlebotomist performing a blood draw in a foot without a physician order. If complications arise as a result of this action, certain legal action will follow with zero chance for a viable defense. Other errors might include attempting to draw blood from the wrist area, which is strictly against protocol in most institutions. Hitting a radial nerve can quite possibly result in temporary or permanent nerve damage and could potentially cause a loss of hand function.

These potential complications are especially problematic not only in outpatient and inpatient health care settings, but also in the blood donation centers of the world. Blood centers are in the business of accessing veins for blood collection. They have trained technicians that access veins on numerous occasions everyday. As a result, these centers are certainly prone to potential mistakes when drawing blood.

The most basic problem that phlebology specialists face is based in the mere expectation of not only finding a vein, but having the ability to access it successfully on the first attempt. This problem is why many Americans dread having their blood drawn and also why many refuse to donate blood under any circumstances. “Needle-phobia,” as it is coined, is a fear of needles. It has been documented time and again that one of the primary reasons people refuse to donate blood is because of the fear of being “stuck” repeatedly. This could be due to those specific individuals having difficult veins or a general distrust of the skills of the phlebotomist. DVA (difficult venous access) has yet to be properly defined in clinical practice and is commonly of unknown etiology, but causes those who are inflicted with it severe problems not only physically, but also psychologically. Whatever the reason, this phobia and the associated physical stress and emotional anxiety faced by those who need their blood drawn is a major issue that needs to be addressed.

Phlebotomists primarily utilize their sense of touch coupled with a basic understanding of anatomy when assessing what vein(s) to use when drawing or collecting blood. If the addition of sight could be added into realm of their practice, it stands to reason that their success would most certainly increase. Additionally, if one were able to “see” viable veins for access, it could potentially increase the confidence of both practitioner and patient, along with decreasing the number of attempts needed for successful venipuncture.

Near-infrared (NIR) imaging technologies has recently emerged as an adjunct to the science of locating veins for health care purposes. NIR may be able to provide that “roadmap” for health care practitioners to use for successful venipuncture. The VeinViewer imaging system uses NIR to depict an image of superficial vasculature on a patient’s skin. This study was designed to determine whether or not the VeinViewer technology would aid in the detection of viable veins and assist the practitioner in obtaining successful venipuncture.

IMPORTANCE

The use of NIR imaging technology may improve several variables with respect to the art of venipuncture. First, it may improve the rate of successful venipuncture in patients who suffer from DVA. This could not only provide greater throughput in the health care setting, but also a tremendous upswing in patient satisfaction. One of the largest and most experienced consulting organizations that specialize in measuring patient perceptions of care is Press Ganey Associates. Press Ganey retains a database of performance evaluation material from nearly 1,500 health care organizations (reference). Most areas of health care have seen increases in patient satisfaction scores over the last several decades. One such area is accommodations for visitors. Figure 1 depicts the average scores for this particular segment of the clinical setting[2]. The scores are based on a scale in which higher scores reflect greater patient satisfaction as opposed to lower scores that depict greater dissatisfaction. Another example of increases in patient satisfaction ratings is adequacy of visiting hours. Figure 2 shows the average increase in ratings over the same five-year period depicted in Figure 1[2]. These figures are quite common in most areas of health care. These areas of health care and others have certainly seen upward shifts with respect to patient satisfaction. These upward shifts are certainly good news for hospitals and clinics; however, these areas are generally regarded as patient perceptions in the area of ”non-medical” areas of concerns. These areas of concern are easily enhanced with upgrades in facilities and an overall positive attitude toward patients and their respective families. Other areas of health care that are not necessarily as successful at garnering the approval of patients are associated with health care procedures. One of the only areas of health care that continues to see declines in patient satisfaction ratings is the area concerned with needlesticks. Needlesticks, as defined within the context of this paper, is the puncture of the skin with a sterilized instrument, such as a syringe or vaccutainer needle for the purpose of initiating intravenous therapy and/or phlebotomy tests. The needlestick is also referred to as a venipuncture. The needlestick is considered one of the most feared invasive procedures in modern health care. In addition, it is the most prevalent and frequent of invasive procedures in health care organizations in this era of modern medicine. According to Press Ganey, venipuncture services suffer the most consistent and dramatic decreases in patient satisfaction ratings of care among most areas of medicine. The consistent declines in

Figure 1

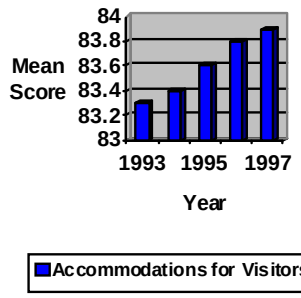
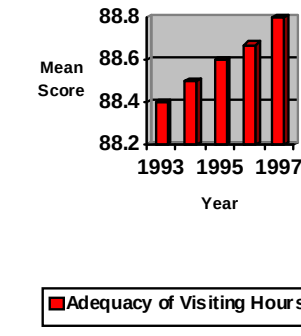


Figure 2



patient perceptions with respect to this area of health care are applicable to the rating subject of "how well the blood was taken." Figure 3 depicts the patient satisfaction ratings with respect to this category, spread out over the same five-year periods from Figures 1 and 2[2]. As is clearly indicated, the patient satisfaction scores in this category have declined and can be deemed rather dramatic. Many potential causes have been attributed to the reasoning behind this dramatic decrease in patient satisfaction. One reason may be due to the fact that many advances have been made with respect to topical anesthesia in other procedures that are performed in a hospital or clinic setting. As a result, many patients might be dissatisfied with having blood samples taken due to the lack of topical anesthesia being utilized in this specific invasive procedure. Additionally, the typical health care worker in today's clinical environment is multi-faceted in that they work in a decentralized core model. These workers are required to be specialists in more areas than ever before. As a result, these workers are less efficient overall in specific procedures as opposed to when there were specialists in these areas of concern. Another potential reason behind the problem is that in many clinical environments, health care workers are, in many cases, hurried to perform these procedures in a smaller amount of time. This rush associated with timeliness has occurred as a result of health care organizations downsizing the number of workers in the area of phlebotomy. Regardless of the ratings associated with phlebotomy, many areas have either remained unchanged or have realized dramatic increases in patient satisfaction ratings. It seems that the area of phlebotomy has a profound effect on the overall patient satisfaction ratings. Figure 4 depicts the patient satisfaction ratings with respect to the likelihood of recommending a specific hospital during the years of 1993-1999[2]. As was evident by the area of phlebotomy, the patient ratings for overall hospital recommendations have continued to decline. There is not necessarily a direct correlation between these criteria, but it certainly would seem that there is an evident link. Moreover, many health care organizations have taken this information and continue to look for quality systems to improve the perception of the initiation of intravenous lines along with the overall experience associated with having one's blood drawn. These quality initiatives include improving the skills of health care workers involved in these specific areas of medicine, in addition to incorporating new technologies that contribute to the efficiency associated with gaining venous access. It would seem apparent that any newer technology

Figure 3

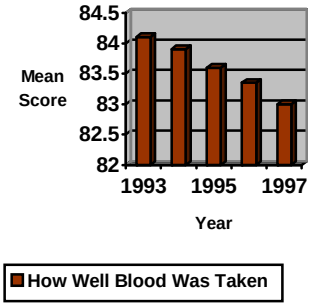
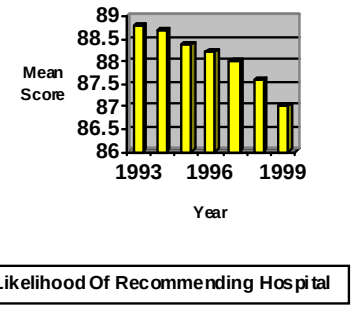


Figure 4



would indeed heighten the perception of patients with respect to this seemingly volatile area of patient concern.

Another potential benefit of NIR is that it may improve the chances of obtaining successful venipuncture on the first attempt, thus providing a cost-savings benefit in both time and materials. As a result of this technology increasing the chances of a successful venipuncture, it would seem that it would also decrease the incidence of phlebotomists seeking veins in areas of anatomy that are prone to potential complications. Finally, this technology may decrease the anxiety felt by both patients and practitioners, thus leading to a decrease in "needle-phobia." The implications of a perception of improved practice in the area of phlebotomy are immeasurable with respect to a population that attempts to avoid needlesticks at all costs.

MATERIALS AND METHODS

Study Design

The study was performed at the Lifeblood/Mid-South Regional Blood Center in Memphis, Tenn., and patients gave informed consent before entering the study. The patient population chosen for the study consisted of 30 adults who had previously been rejected as donors by Lifeblood/Mid-South Regional Blood Center due to a diagnosis of DVA (difficult venous access). DVA is an as of yet to be defined diagnosis consistent with patients who have difficult-to-find and/or difficult-to-access veins. It was thought before the study began that the VeinViewer by Luminetx might potentially give these people the ability to donate blood. Most of the donors in the sample claimed to have "rolling veins," which had made venous access extremely difficult. One donor noted that due to "multiple corrective surgeries for congenital limb deformations," venous access had required five or more sticks on every occasion.

All 30 donors were given information about the study, and all 30 donors gave informed consent before the VeinViewer was utilized to enhance the procedure. The VeinViewer was used to provide an image of the potential donor's vasculature for the Lifeblood staff before each access attempt. The Lifeblood staff experienced 100 percent success with regard to venous access in all of the potential donors. Additionally, the Lifeblood staff members obtained venous access on the first attempt with all of the potential donors.

DISCUSSION

It has been proven time and again that patient satisfaction ratings are highly determined by the experience of the patient in regard to the amount of discomfort associated with the needlestick endeavor. This single factor seems to hit the ratings the hardest on the negative side. As a result of the VeinViewer exhibiting the ability to decrease the number of needlesticks necessary to gain intravenous access in this study, one conclusion that could be made with ease is that the VeinViewer also exhibited the ability to decrease a measurable amount of the discomfort associated with this procedure. A direct correlation could be assumed; namely, if patients were more satisfied, these same patients might feel more comfortable returning to said medical facility or recommending the facility to friends and family. Additionally, the health care facility would be viewed as one that takes the necessary steps to ensure that up-to-date technologies are harnessed to decrease the complications associated with venipuncture.

The benefits realized by the health care facility would also include a greater efficiency affiliated with the time of the health care workers. Achieving successful venipuncture during the first attempt automatically rules out the need to perform multiple needlesticks in order to obtain a blood sample for testing or donation purposes. One study noted the average time to obtain venous access was 23 minutes per attempt (reference)[3]. If the VeinViewer could cut down the number of attempts needed to gain access, it would stand to reason that the decrease in time would be substantial. Moreover, by depicting an image of the vein patterns, the VeinViewer might prevent practitioners from hitting nerves that lie near the vein itself. The complications associated with puncturing nerves could be dramatically decreased if one were to puncture a vein that one could see via the VeinViewer image.

Facilities would also realize the benefits associated with material costs. Every time a blood draw is performed, whether it is on the same patient or not, certain sterile materials must be opened and utilized. Any decrease in the number of attempts would certainly correlate with a drop in the amount of materials needed to be successful.

As new innovations such as the VeinViewer emerge, health care facilities are taking advantage of the “draw” that these technologies invite. As patients become more aware of devices

that make medical care more convenient and comfortable, they will certainly be drawn to those facilities that embrace those advances in order to make their experience more pleasant. The results with regard to blood donation centers could be an increased number of donors with an associated increase in the pints of blood in circulation for distribution. The VeinViewer, if positioned correctly by facilities, could lead to an upswing in a number of resources that are desperately needed in health care today.

CONCLUSION

The VeinViewer by Luminetx is an innovative technology that has demonstrated the ability to provide quantifiable and un-quantifiable benefits to hospitals, clinics, health care workers and patients. As health care facilities begin to introduce the VeinViewer into their daily practice, they will find that the device is an all-encompassing tool with regard to achieving successful venipuncture. With the VeinViewer moving toward becoming the standard of care in medicine, the device will continue to demonstrate that it can be utilized to positively enhance the patient experience and thus the appeal, of health care facilities that embrace the technology.

Written by David Pennington, RN, BSN, MBA for Luminetx Corporation.

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