



THE READING PERCEPTION OF MEDICAL STAFF ABOUT THE USE OF PREHOSPITAL ULTRASOUND

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Abstract:

This study was a focus on the use of pre-hospital ultrasound in Saudi Arabia. Generally, ultrasound is used in a high frequency by health care providers in different countries within hospitals or pre-hospital. The main point of using the ultrasound was to reduce the time of diagnosis at the hospital and decrease the rate of mortality and morbidity. The study was a cross-sectional study and was used to assess the perception of medical staff about the use of pre-hospital ultrasound. This survey study had 130 participants, and 80 of them were agreed to involve in this study. It was conducted in King Abdulaziz Hospital of National Guards, Al Ahsa and College of Applied Medical Sciences, King Saud Bin Abdul Aziz University for Health Sciences, Al Ahsa Campus, Saudi Arabia. ATLAST ti 8 was used for systematic literature review and SPSS v23 obviously for data analysis. This was a new and novel study as the Pre-hospital ultrasound was not used before in the pre-hospital. On the other hand, the findings showed that the participants displayed a high level of interest in improving their knowledge and skills of using ultrasound during its application in the pre-hospital setting. It was also recommended to have more research in future on the subject.

Keywords: pre-hospital ultrasound, diagnosis, mortality, morbidity, cross-sectional study

1. Introduction

Pre-hospital ultrasound (Ultrasonography) is a modern technology tool used by health care providers in the emergency field. The researchers' goals were to know how medical staff thinks about using ultrasound in pre-hospital care, and to improve the patients' treatment outcomes and whether they believe the use of ultrasound in pre-hospital makes any benefit to the paramedic judgments on the patients' ongoing health care. However, the goals were met on the completion of this research study.

2. Literature Review

As shown in figure 1, the output creation of ATLAS ti 8 reveals the semantic relationship among systematic year-wise literature review from 2004 to 2018. Ultrasound is a device

that can examine the body sonography and can detect internal organs' dysfunction and other abnormalities (Colon, R. M., & Chilstrom, M. L. et al., 2015). It can help to diagnose trauma and medical cases such as fractures, internal bleeding (Chaudery, & Clark, 2015), pneumothorax (Quick, Uhlich, 2015), hemothorax, pneumohemothorax, ectopic pregnancy (Galinski, Petrovic, 2010), pulmonary embolism, pulmonary edema, stroke, pericarditis, precardiac tamponade, congenital heart disease, dissection, myocardial infarction, aneurysm, diaphragmatic injury, and the procedure. For example, it can also identify the placement of the needle decompression, tracheostomy (Blaivas et al., 2008), gastric tube placement, peripheral IV access (Doniger, Ishimine, et al. (2009), pericardiocentesis, cardiac resuscitation quality to ensure the diagnosis for the paramedic of PEA and Asystole (Aichinger, Zechner, et al. (2012), and intubation placement (Bailitz, Gottlieb, Russell, et al. (2013).

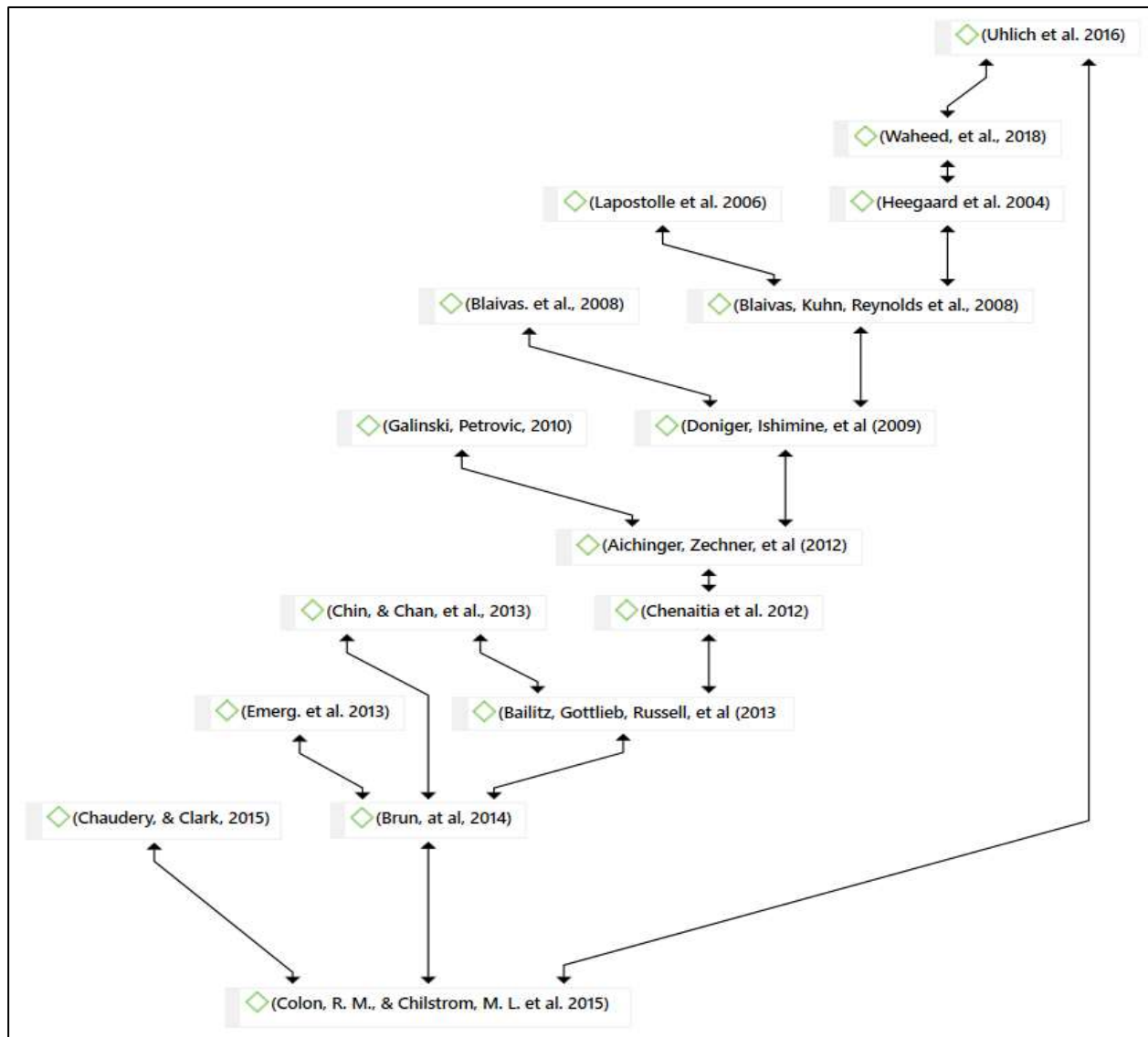


Figure 1: Year-wise systematic literature review

Some studies have found benefits to use ultrasound in the pre-hospital setting and showed a higher advantage of making a diagnosis in prehospital cases (Chin, & Chan, et al., 2013).

A study that has examined the advantages of using portable ultrasound has found that 67 patient examinations in which ultrasound was performed, 81% (54) demonstrated anomalous discoveries affected restorative consideration for the patients (Blaivas, Kuhn, Reynolds et al., 2008). In another study in Saudi Arabia with 105 patients for the use of focus assessment with sonography for trauma (FAST) for blunt abdominal trauma, it has been found that there was an accurate discovery of intraperitoneal fluid, which was 76.1%. Also, research has shown specificity 84.2% and accuracy 79% (Waheed et al., 2018). Further, a planned investigation of 100 patients transported utilizing a helicopter by EMS inner self-started enough picture to catch the correct upper quadrant seen in 90% of cases, with an affectability of 60% and explicitness of 93% for that single view (Heegaard et al. 2004). In this investigation, 202 patients were surveyed in the field, and the regular quick test was finished in less than 3 min. The pre-hospital Quick test was observed to be 93% sensitive and 99% obviously contrasted, and judgments were made in the goal of emergency division. Doctors filtering 302 patients in the field found their demonstrative exactness improved in 67% of the cases. However, they are, and in 90% of situations where there was starting analytic vulnerability (Lapostolle et al., 2006), the location of pneumothorax in-flight exhibits open access for reducing death rates. A 15-months instant investigation surveyed the utilization of pre- 4 hospital ultrasound (US) by flight teams in distinguishing pneumothorax and lost endotracheal tubes (ETTs). The demonstrative precision was 91% for the US performed by the aeromedical team contrasting with 98% for the ultrasound (US) showed by specialists (Uhlich et al., 2016).

In another investigation, ultrasound (US) was robust and reliable in precisely affirming GT arrangement with 98.3% effective ability, 100% explicitness, 100% PPV, and 85.7% NPV (Chenaitia et al., 2012). The advantages for the team amid single and mass loss occasions were not restricted to injury. Two cases were analyzed in the intense stomach aortic aneurysm (AAA) in the prehospital setting. One of them performed by a primary consideration recovery group in the field, and the other was analyzed at 20,000 feet in a lord plane (Emerg et al., 2013). Using ultrasound in prehospital settings was recommended more than thirty years prior, yet the gadgets of that time were not fit for the out-of-clinic condition (Brun, at al., 2014). Improved gear permitted pre-hospital ultrasound (PHUS) to be presented. The ultrasound was now implemented for paramedics on longtime travel cases and air ambulance in different countries. The main point of using the ultrasound is to reduce the time of diagnosis at the hospital and decrease the rate of mortality and morbidity. The uses of the (sonography) device can determine both cardiac and non-cardiac diseases. Some characteristics compared to ultrasound from other methods are that it is harmless, lightweight and portable. Also, ultrasound is faster than x-rays and the essential feature of ultrasound is that it doesn't transmit radiation. In pre-hospital care, there is a percentage of misdiagnosis cases, and

sometimes there is a percentage of undetected injuries or injuries that hard to be detected even with professional paramedic team, which may result in the transportation of the patients to a wrong healthcare center.

3. Material and Methods

The study was conducted in the Emergency Department of the King Abdulaziz Hospital (KAH), Ministry of National Guard, Al Ahsa (MNGHA). Regarding study subjects, the inclusion criteria had all health care providers who were working in the emergency department and emergency services (EMS) trainees in KAH, EMS fourth years and EMS third years in King Saud bin Abdul Aziz University for Health Sciences (KSAU-HS).

The study had Descriptive Cross-Sectional Design (DCSD), which was used to assess the reading perception of medical staff about the use of prehospital ultrasound as the researchers adopted convenience sampling so they took sample size from King Abdulaziz Hospital, which was nurses (25) doctors (25), EMS (7), Emergency Medical Training (EMT) (5), EMS intern students (28), EMS fourth years (28), and EMS third years (19). The sampling technique was non-probability (Non-Random) sampling methods so that the researchers of this scientific study applied convenience sampling, and snowball sampling because the participants were asked in this study to give the researchers access to similar participants.

The study was quantitative, descriptive, and based on a questionnaire. The questionnaire was an online found survey that was distributed by electronic tools "Monkey Survey." The questionnaire items were related to the health care providers' perception of the use of pre-hospital ultrasound.

A pilot study sample was applied to test the validity of the questionnaire. The general reliability of the instrument was 0.76. Usually, 0.7 is considered a reliable tool in the medical science of the health professions. The target population in this research was: 1- ER Physicians. 2- ER nurses. 3- Pre-hospital EMS. 4- Pre-hospital EMT. 5- EMS students. 6- EMS interns.

The data was analyzed by using the (SPSS), and then the information for continuous variables were presented as mean (M) and standard deviation (SD) which was normally distributed otherwise the researchers could use median and interquartile range, data for categorical variables for presentation as frequencies and percentages, the appropriate statistical test was used to examine the association between X(exposure) and Y(outcome), a P-value less than 0.05 was considered statistically significant, figures and tables were used to represent the results.

Another tool was also used for a systematic literature review, which was ATLAS ti 8. Its outputs were used to produce figures in this research.

4. Results and Discussion

The number of participants who completed the questionnaire was 80 out of 130 and the response rate was 61.5%. The mean age of the participants was 25.59, the median 23 and mode 22 positively.

Table 1 shows an overview of frequencies and percentages for the genders of male and female participants. The frequency for the male was 50; however, it was 30 for female participants. Most participants were male who were 63.5%. On the other side, female participants were 37.50%.

Table 1: Comparison of Frequencies and Percentages for Male and Female Participants

Gender	Male	Female
Frequency	50	30
Percentages	62.50%	37.50%

Table 2 presents the frequencies and percentages of different educational specialties. Most of the specialization that participated in this study was the nursing profession by 46.30%. Unlike, very few who participated in the study were the Surgery profession by 1.30% only. Among the rest of the occupations, EMS students had 28.70%, EMS interns 11.30%, Paramedic 5%, and EMT 3.80% positively.

Table 2: Comparison of Education Specialities for Frequencies and Percentages

Education Speciality	Surgery	Emergency Doctor	Paramedic	EMT	Nurse	EMS Students	EMS Intern
Frequency	1	3	4	3	37	23	9
Percent	1.30%	3.80%	5%	3.80%	46.30%	28.70%	11.30%

Table 3 provides the percentage of results obtained from the survey questionnaire. It was a Likert Scale Survey Questionnaire (LSSQ). After asking the participants about their knowledge of using the pre-hospital ultrasound, 41.3% said they did not have any background about it. The participants were very much interested that 70% of them went to take courses and workshops in pre-hospital ultrasound. Whereas 50% of participants have some concerns about delaying time to provide definitive care, the ultrasound is used in pre-hospital. Most of the participants (43.8%) thought that the cost of ultrasound could be the barrier to its application. At this point, the partakers (80%) said if they use the ultrasound in the pre-hospital, they will have a high chance to determine the right healthcare facility that would be correct for the patients' situation. The researchers found a higher percentage of participants who may change their diagnosis, the decision if they use the ultrasound in pre-hospital and this percentage was 75%. And then, the participants (72.5%) said if they use the ultrasound in pre-hospital, that will reduce the rate of miss diagnosis decisions. Question regarding (if we apply pre-hospital ultrasound in Saudi Arabia, the dose could reduce the number of morbidity and mortality) 61.3% of

participants were agreed. 65% of participants thought yes about the question (If the ultrasound used in the pre-hospital could be useful to reduce the time of diagnostics and the decision). Followed by, the researchers asked the participants about some types of diagnoses and procedures, where the study needed to estimate their opinion: effectiveness of detecting pneumothorax, 51.2% were not sure that the use of ultrasound would be useful.

Meanwhile, 56.3% of participants were not agreed with the use of ultrasound in detecting hemothorax. A different view was that 53.8% of the participants disagreed for diagnoses of the prehospital on the abdominal aortic aneurysm. Next, diagnose the internal bleeding, 61.3% of the participants agreed with the diagnosis that it was useful. At this time, the question for diagnosing the pregnancy emergency, 51.2% said it was helpful to use in pre-hospital.

Conversely, 85% of the participants disagreed with the item (to determine the asystole and a pulseless electrical activity by ultrasound). However, the detection of right and left heart failure by ultrasound 71.3% of the participants disagreed. Simultaneously, for using ultrasound to detect which muscle of the heart has myocardial infarction, 72.5% of the participants were agreed. Also, using ultrasound in thoracentesis for hemothorax, 52.5% were agreed with it. Besides, for using the ultrasound to detect intercostal space easier for the use of needle decompression, 61.3% said it could not be useful.

Nevertheless, to inshore the location of (ETT) endotracheal tube by ultrasound, 57.5% disagreed. Similarly, concerning the use of ultrasound can help to do the FAST examination, 53.8% of the participants disagreed. Then, questions about determine vascular access by ultrasound, 86.8% of the participants disagreed. On the other hand, most participants (62.5%) thought that the portable ultrasound was the new future of diagnosis. Summing up, most of the participants (72.5%) suggested that the ultrasound should be applied to a scoop of practice on emergency medical services.

Table 3: Percentage Results of Survey Questionnaire

Question	Yes (CI min - CI max)	No	Not much	Not sure	I already took before	There is no relationship
Do you have a background about the use of pre-hospital ultrasound (Ultrasonography)?	38.8% (0.281-0.503)	41.30%	20%			
Are you interested in taking courses or workshops in pre-hospital ultrasound (Ultrasonography)?	70% (0.587-0.797)	15%		12.50%	2.50%	
Do you have any concerns about delaying time to provide definitive care if you use pre-hospital ultrasound (Ultrasonography)?	50% (0.386-0.614)	28.70%		21.30%		
Do you think the cost of pre-hospital ultrasound (Ultrasonography) can be a barrier?	43.8% (0.327-0.553)	38.80%		17.50%		

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Do you think pre-hospital ultrasound (Ultrasonography) useful to determine the right health care centre?	80% (0.696-0.881)	10%		10%		
Do you think the pre-hospital ultrasound (Ultrasonography) can change your final decision of diagnosis?	75% (0.641-0.84)	13.80%		11.30%		
In Saudi Arabia, we have the highest number of car accidents and it causes a lot of morbidity and mortality. Do you think if we use pre-hospital ultrasound (Ultrasonography) can help to determine the right and fastest diagnosis for these patients?	61.3% ⁹ (0.497-0.719)	15%		12.50%		11.30%
Do you think the use of pre-hospital ultrasound (Ultrasonography) will reduce the diagnosis time?	65% (0.535-0.753)	20%		15%		
Detect pneumothorax.	48.8% (0.374-0.602)	51.20%				
Detect hemithorax.	43.8% (0.327-0.553)	56.30%				
Detect abdominal aortic aneurysm.	46.3% (0.35-0.578)	53.80%				
Detect internal bleeding.	61.3% (0.497-0.719)	38.80%				
Detect pregnancy emergency.	51.2% (0.398-0.626)	48.80%				
Detection of asystole and (PEA) pulseless electrical activity more accurately.	15% (0.08-0.247)	85%				
Detection of right and left heart failure.	28.7% (0.192-0.4)	71.30%				
Detect which muscle of the heart has a myocardial infarction.	27.5% (0.181-0.386)	72.50%				
Detect thoracentesis for hemithorax.	52.5% (0.41-0.638)	47.50%				
Detection of the intercostals space easier for the use of needle decompression.	38.8% (0.281-0.503)	61.30%				
The use of ultrasound can help you to inshore the location of (ETT) endotracheal tube	42.5% (0.315-0.541)	57.50%				
The use of ultrasound can help you to do the FAST examination?	46.3% (0.35-0.578)	53.80%				
Detect the vascular access.	31.3% (0.213-0.426)	68.80%				
Do you think the portable ultrasound will be the new future of diagnosis?	62.5% (0.51-0.731)	15%		22.50%		
Do you think the use of pre-hospital ultrasound (Ultrasonography) should be involved in the scope of practice for EMS?	72.5% (0.614-0.819)	12.50%		15%		

5. Discussion

The themes identified in the monkey survey responses are set out in Figure 2. The semantic links of the memos show the order they were expressed. No doubt, ATLAST ti

8 memo outputs are the summary of the whole discussion for the responses of the participants. The result of the current study found that there was no use of ultrasound in the prehospital setting at all. There was a high interest from the participants to have more information and corsage to oblige NGOs on the ultrasound to any hospital. A comparison between this study with Americans, and Europeans studies, showed that they had more information and frequency of using it in every hospital. Mainly, they had more knowledge and rate of using it in the pre-hospital and with a high number of courses in Europe & US hospitals. This study also found a variation in the knowledge and the awareness from the participants compared with other healthcare providers in the US and Europe. Especially here in Saudi Arabia, the participants needed more information and courses helped apply the ultrasound in every hospital. This will make the healthcare providers and specifically the EMS services ready.

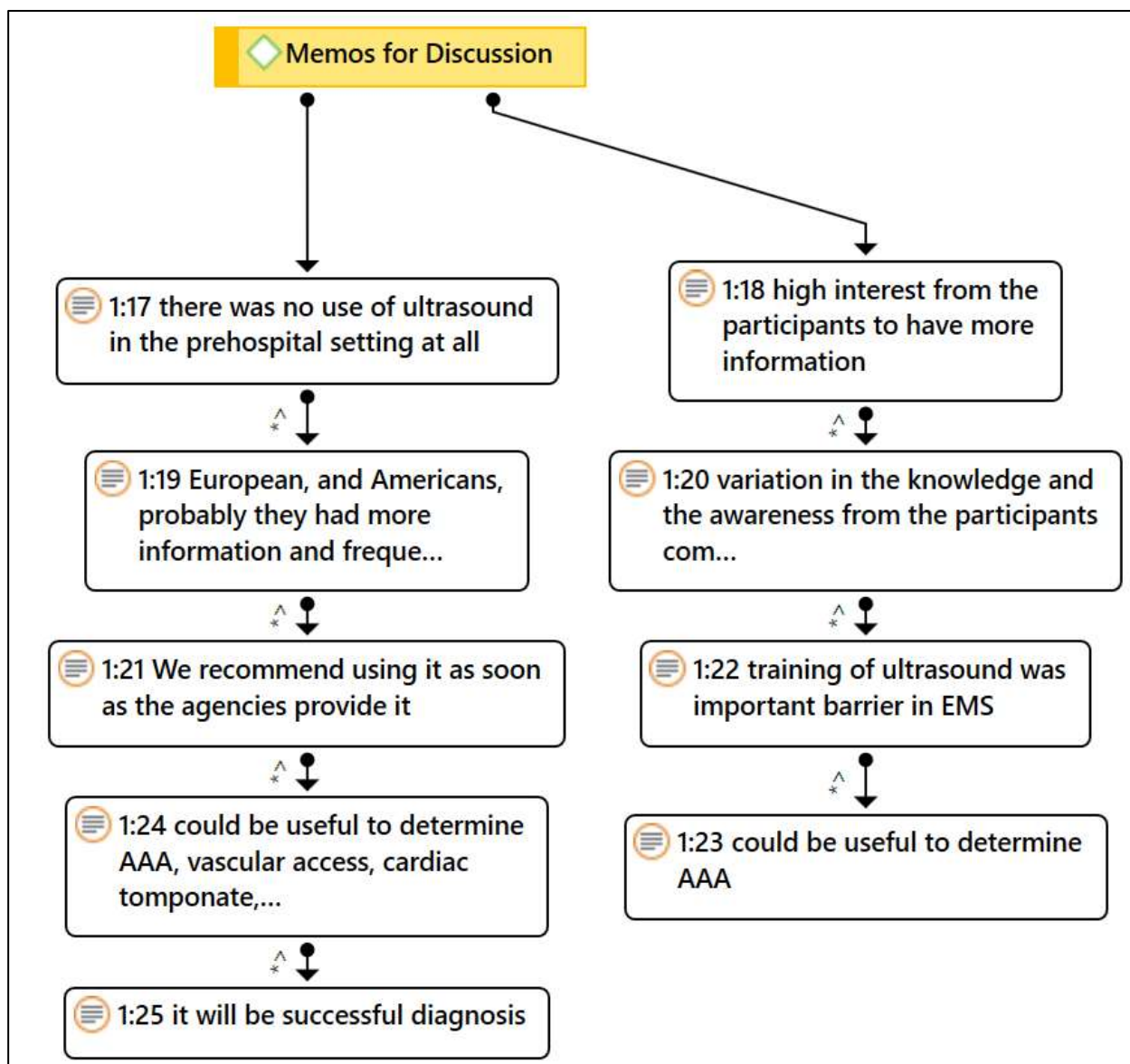


Figure 2: Output of Memos for Discussion

The researchers recommend using it as soon as the agencies provide it. In some studies, the EMS medical director found that the training of ultrasound was an important barrier in EMS. In this case, it was also identified that mostly its use was common in the FAST exam and PEA. Also, it could be useful to determine AAA, vascular access, cardiac tamponade, and pneumothorax imaging. One example of this is some physicians would like to see more evidence for a prehospital ultrasound to prove patient morbidity and mortality. Equally important, if they apply the prehospital ultrasound for EMS health care providers, then this will be a successful diagnosis. Eventually, during the distribution of the survey, this study also found some difficulty in communicating with health care providers. There can be distinct reasons for this difficulty. First, some of them were busy. Second, some of them took the survey and returned it without completing the answers to the survey that affected their ability to understand the purpose of our study. Third, this attitude leads them to have a low level of awareness. Therefore, the practice may affect EMS providers that lead us to have an incomplete number of participants and this reason was already stated.

5. Recommendations

Therefore, there is a need to do more research for more studies on the subject to collect more information about ultrasound. Additionally, the present study results can be a new future of diagnosis in the pre-hospital setting. Furthermore, the results of this study show that it can be an alternative of sathscope to diagnose.

6. Conclusion

The results of this investigation show that the Pre-hospital ultrasound was not being used at all in the pre-hospital setting. This research study found different barriers that could affect the application of ultrasound in the pre-hospital which were the low level of training and slight background. On the other hand, the most prominent finding to emerge from this study is that the participants showed a high level of interest in improving their knowledge and skills of using ultrasound and application in the pre-hospital setting. One of the more significant findings to emerge from this study is that this is a new and novel research as it was conducted first time in Saudi Arabia on the issue and can bring fruitful, positive and productive results by saving ultrasound time it can be the faster one in medical sciences as a new technology with fewer effects on the human body.

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References

- Aichinger, G., Zechner, P. M., Prause, G., Sacherer, F., Wildner, G., Anderson, C. L., . . . Fox, J. C. (2012). Cardiac movement identified on prehospital echocardiography predicts outcome in cardiac arrest patients. *Prehospital Emergency Care Prehosp Emerg Care*, 16(2), 251-255. doi:10.3109/10903127.2011.640414
- Bailitz, J., Gottlieb, M., Russell, F., Ehrman, R., Kishfe, B., Christian, E., . . . Ross, C. (2013). Accuracy of airway ultrasound for confirmation of endotracheal intubation by

- expert and novice emergency physicians. *Annals of Emergency Medicine*, 62(4). doi: 10.1016/j.annemergmed.2013.07.070
- Blaivas M., Kuhn W., Reynolds B., Brannam L. Change in differential diagnosis and patient management with the use of portable ultrasound in a remote setting. *Wilderness Environ Med*. 2008 Dec;27
- Blaivas, M. (2008). 342: Inadequate needle thoracostomy rate of the chest in the out-of-hospital setting for presumed pneumothorax, as documented on ultrasound. *Annals of Emergency Medicine*, 52(4). doi: 10.1016/j.annemergmed. 2008.06.368
- Chaudery, M., Clark, J., Wilson, M. H., Bew, D., Yang, G., & Darzi, A. (2015). Traumatic intra-abdominal hemorrhage control. *Journal of Trauma and Acute Care Surgery*, 78(1), 153-163. doi:10.1097/ta.0000000000000472
- Chenaitia H., Brun P. M., Querellou E., Leyral J., Bessereau J., Aimé C., et al. (2012). Ultrasound to confirm gastric tube placement in prehospital management. *Resuscitation.*; 83:447–51. [PubMed]
- Chin, E. J., Chan, C. H., Mortazavi, R., Anderson, C. L., Kahn, C. A., Summers, S., & Fox, J. C. (2013). A pilot study examining the viability of a prehospital assessment with ultrasound for emergencies (PAUSE) protocol. *The Journal of Emergency Medicine*, 44(1), 142-149. doi: 10.1016/j.jemermed.2012.02.032
- Colon, R. M., & Chilstrom, M. L. (2015). Diagnosis of an occult hip fracture by point-of-care ultrasound. *The Journal of Emergency Medicine*, 49(6), 916-919. doi: 10.1016/j.jemermed.2015.06.077 Determined pneumothorax on rehash US after needle decompression provoked the aeromedical group to straighten out the needle until air return was noted. In-flight ultrasound identification of pneumothorax.
- Doniger, S. J., Ishimine, P., Fox, J. C., & Kanegaye, J. T. (2009). Randomized controlled trial of ultrasound-guided peripheral intravenous catheter placement versus traditional techniques in difficult-access pediatric patients. *Pediatric Emergency Care*, 25(3), 154-159. doi:10.1097/pec.0b013e31819a8946
- Galinski, M., Petrovic, T., Rodrigues, A., Hermann, M., Catineau, J., Adnet, F., & Lapostolle, F. (2010). Out-of-hospital diagnosis of a ruptured ectopic pregnancy: Myometrial embryo implantation, an exceptional diagnosis. *Prehospital Emergency Care Prehosp Emerg Care*, 14(4), 496-498. doi:10.3109/10903127.2010.493984
- Heegaard W., Plummer D., Dries D. et al. (2004). Ultrasound for the air medical clinician. *Air Med J* 23(2):20–23 8
- Heegaard, W., Hildebrandt, D., Spear, D., Chason, K., Nelson, B., & Ho, J. (2010). Prehospital ultrasound by paramedics: Results of field trial. *Academic Emergency Medicine*, 17(6), 624-630. doi:10.1111/j.1553-2712.2010. 00755.x
- Lapostolle F., Petrovic T., Lenoir G. et al (2006). Usefulness of hand-held ultrasound devices in out-of-hospital diagnosis performed by emergency physicians. *Am J Emerg Med* 24:237–242.

- Quick, J. A., Uhlich, R. M., Ahmad, S., Barnes, S. L., & Coughenour, J. P. (2015). In-flight ultrasound identification of pneumothorax. *Emerg Radiol Emergency Radiology*, 23(1), 3-7. doi:10.1007/s10140-015-1348-z.
- Taylor, J., McLaughlin, K., McRae, A., Lang, E., & Anton, A. (2014). Use of prehospital ultrasound in North America: a survey of emergency medical services medical directors. *BMC emergency medicine*, 14(1), 6.
- Uhlich R. M., Ahmad S., Barnes S. L., Coughenour J. P. *Emerg Radiol*. 2016 Feb; 23(1):3-7.
- Waheed K. B., Baig A. A., Raza A., Ul Hassan M. Z., Khattab M. A., Raza U. (2018). Diagnostic accuracy of Focused Assessment with Sonography for Trauma for blunt abdominal trauma in the Eastern Region of Saudi Arabia. *Saudi Med J*. Jun;39(6):598-602. doi: 10.15537/smj.2018.6.22031.

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