

Ultrasonographic Inferior Venacava Diameter Assessment for Volume Status in Paediatric Shock

Chandan Kr Abhishek¹, Mayank Kumar², Navneet Kumar³, B. P. Jaiswal⁴

¹Senior Resident, Dept. of Pediatrics, N.M.C.H, Patna, Bihar, India

²Senior Resident, Dept. of Pediatrics, N.M.C.H, Patna, Bihar, India

³Senior Resident, Dept. of Pediatrics, N.M.C.H, Patna, Bihar, India

⁴Professor & H.O.D., Dept. of Pediatrics, N.M.C.H, Patna, Bihar, India

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Corresponding author: Dr. Chandan Kr Abhishek

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Abstract

Background: Shock is a pathophysiologic state characterized by significant systemic reduction in tissue perfusion resulting in decreased oxygen delivery. Accurate estimation of volume status in patients with shock is important to estimate volume repletion and monitor adverse consequences of volume overload.

Aims and Objectives: For the objective measurement of intravascular volume status in children, obtaining and evaluating the data on IVC diameter by ultrasonography.

Materials and Methods: Hospital based prospective, observational study. Patients between 1 month to 18 years admitted to pediatric emergency, PICU and emergency department of Nalanda Medical College and Hospital with shock and age matched euvoletic controls admitted in paediatric ward. Maximum sagittal IVC diameter was measured in the two groups and compared.

Results: Total of 60 pairs of cases and controls were enrolled. Mean sagittal IVC diameter in shock group was 0.99 ± 0.447 cms as compared to controls which was 1.46 ± 0.523 cms (p-value < 0.001).

Conclusion: The maximum sagittal IVC diameter measured by bedside ultrasound is lower in children with shock as compared to euvoletic controls.

Keywords: Pediatric Shock; IVC; Bedside Ultrasound.

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Introduction

India is the most populous country in the world. Emergency medical services are not easily accessible to patients, due to distance and transportation. Telemedicine services have applications in triaging, Emergency Care, Virtual rounds, consultation and for patient follow-up. National Medical Council has issued Telemedicine Practice Guidelines (Enabling Registered Medical Practitioners to Provide Healthcare using Telemedicine) which provides a legal framework for Telemedicine in India.[1]

The authors have defined Telehealth as 'The delivery and facilitation of health and health-related services including medical care, provider and patient education, health information services, and self-care via telecommunications and digital communication technologies'. Kia AS et al have shown the effectiveness of Telemedicine in the Emergency Department.[2] The authors concluded that real-time video conferencing was the best method of delivery, while many studies showed found cost reduction as an outcome of

implementing these systems, and many studies found technical and infrastructure issues as a challenge when implementing telemedicine for Emergency Departments.[2] Brainard J S et al reported significant reductions in unplanned emergency care use. Reductions were associated with preventative medicine, telemedicine and targeting chronic illnesses. Cost savings were also reported for some telehealth interventions.[3] Gattu R et al reported that Telemedicine has a potential role in pediatric emergency medicine for real-time decision making to improve quality of care for children.

The challenges included Logistics and legal challenges.[4] Kelton DK et al reported that Applications of this technology that are currently being studied include support for minor treatment centres, patient transfer decision-making, management of acutely ill patients and scheduled teleconsultations.[5] Kimmel HJ et al concluded that Real-time electronic notifications of ED providers regarding patients at high risk of ED

recidivism are feasible. They may help reduce resource utilization and costs. [6]

The benefits of Telemedicine included cost reduction, improved quality of care, decreased patient transfer rate from rural centres to major centres, reduced mortality rate, reduced patient treatment time, reduced time between first contact and treatment, cost effectiveness, medical staff practice and training, quick access to specialist, reduced Emergency Department overcrowding, improved capability of rural centres, on-site diagnosis and prescription, reduced return visits for unnecessary cases, providing remote specialist care, preventing medication side effects and medical error, better management of emergency conditions. [3-19]

A study has been published about the effectiveness using a basic Ask-My-Nurse (AMN) Phone line in a Emergency Department setting. [20] Another similar study has been conducted using the Emergency Talk Application and comparing the effects and applications of telemedicine for different specialities in emergency medicine. [21] Studies have shown the effectiveness of Telehealth follow-up using Telehealth systems. [22, 23]

In India, there are few studies available on the applications of Telehealth for follow-up of patients in Emergency Medicine.

I have designed, developed and implemented a workable and cost-effective Telehealth Mobile application which works on Android Smartphones, and can be downloaded from Google play. I have designed and developed a Telemedicine Mobile application 'Dr Look' for purpose of patient Follow-up in Emergency Medicine. The aim of the present study was to assess the patient satisfaction towards the Telemedicine Mobile Application.

Materials and Methods

The Multimodality Mobile Telehealth Application "Dr Look" was developed and designed by the author along with the help of an IT consultant. The Multimodality Mobile Telehealth Application had 3 separate Interfaces, one for the Patient End, One for the doctor end, and one for the IT Administrator end. The Mobile Apps were made for Android mobile phones and available for download from Google Play. The Mobile App had features for Video-conferencing, Consultation, and Uploading of reports and Prescription. The Patients were trained to download the App from Google Play and trained to use the App before discharge from the Emergency Medicine Department. Patients, who visited the Emergency Medicine Department of The Oxford Medical College Hospital & Research Centre, were followed up sequentially after 7 days,

1 month, 3 months and 6 months by using the Telemedicine Application.

An online survey was conducted with a self-prepared questionnaire with a sample size of 440 patients for period of one year from December 2022 to November 2023. The questionnaire was prepared and the patients were asked after the Consultation after 6 months. Descriptive statistics analysis was carried out including frequency and percentage. The results of the study were tabulated.

The present study was conducted from December 2022 to November 2023. The study was designed using a patient satisfaction survey after the end of six months using a simple questionnaire of whether or not they were satisfied with the follow-up. The Sample size was estimated to be 385 at 95 % confidence levels.

The minimum sample size was kept at 385 but a total of 440 patients participated in this study.

Inclusion Criteria

Adult Patients of age more than 18 years who visited the Emergency Medicine Department of The Oxford Medical College Hospital & Research Centre from December 2022 to November 2023 with Smartphone .

Exclusion Criteria

Patients less than 18 years of age

The questionnaire was structured based on patient satisfaction. It consisted of Simple questions of whether or not they were satisfied with the Telehealth follow-up at the end of six months of follow-up. Participants were given a short introduction about the purpose of the study. The questionnaire comprised of whether or not they were satisfied with the follow-up.

Procedure: The questionnaire was prepared on Excel and the Data analysis was done in Excel.

Statistical Analysis: Data was collected, coded and fed in Excel for statistical analysis. Descriptive statistics analysis was carried out including frequency and percentage. The results of the study were tabulated.

Results

Among the 440 patients of the survey, 27.27 % (120) were 18 - 24 years old, 25 % (110) were 25 - 30 years old, 18.8 % (80) were 31 - 45 years old and 29.54 % (130) were over 45 years of age. 22.7 % (100) of the patients were from semi urban areas, 25 % (110) were from urban areas and 52.27 % (230) were from rural areas. 36.26 % (160) of patients were male and 63.63 % (280) were female. [Table 1].

Table 1: Demographic Details of the Followup Patients

Variable		Frequency	Percentage
Age	18-24 years	120	27.27
	25 - 30 years	110	25
	31 - 45 years	80	18.8
	> 45 years	130	29.54
Geographical Area	Rural	230	52.27
	Semi-urban	100	22.7
	Urban	110	25
Gender	Male	160	36.26
	Female	280	63.63

According to the present study, 95 % of the participants were satisfied with the Telehealth Follow-up at the end of six months, while 5 % were not satisfied. [Table 2].

Table 2: Patient Satisfaction Survey

Variable		Frequency	Percentage
Patient Satisfaction	Satisfied with Telehealth follow-up	418	95
	Not Satisfied with Telehealth follow-up	22	5

Discussion

The Ministry of Health and Family Welfare, Government of India has provided guidelines for the Practice of Telemedicine in India.[1] Telehealth is being utilized in Emergency medicine for Tele-consultations, Video-consultations, Triaging and the telehealth followup services have been found to be cost-effective and innovative.[2]

Rogg J et al reported that Telemedicine is a technology that is increasingly used in the field of EM. Improving the use of telemedicine by using up-to date technology while allowing an integration of available technical and human resources is a challenge in the field of emergency medicine especially with its regional but also broad medical variety.[20]

O'Sullivan S et al compared effects and application of telemedicine for different specialties in emergency medicine using the Emergency Talk Application (U-Sim ETA Trial). [21]

Shah VV et al reported in an urban integrated health care system, those with telehealth follow-up visits after an ED encounter were more likely to return to the ED and be hospitalized than patients with in-person follow-up. [22]

Koziatek C et al reported the use of a telehealth follow-up system to facilitate treatment and discharge of emergency department patients with severe cellulitis. The telehealth follow-up system for discharged emergency department patients with cellulitis demonstrated high rates of engagement. In these patients who -may have otherwise required admission for intravenous antibiotics, telehealth-facilitated outpatient management resulted in a low ED return rate and no inpatient admissions for cellulitis.[23] In this study, patients who were discharged from Emergency Department were followed up with repeated telehealth follow-ups.

Patient satisfaction was 95% at the end of six months with telehealth follow-up. Telehealth follow-ups are not a substitute for in-person follow-ups to the various specialities.

The benefits of Telemedicine included cost reduction, improved quality of care, decreased patient transfer rate from rural centres to major centres, reduced mortality rate, reduced patient treatment time, reduced time between first contact and treatment, cost effectiveness, medical staff practice and training, quick access to specialist, reduced Emergency Department overcrowding, improved capability of rural centres, on-site diagnosis and prescription, reduced return visits for unnecessary cases, providing remote specialist care, preventing medication side effects and medical error, better management of emergency conditions.

Conclusion

The present study revealed that 95 % of the patients were satisfied with the Telehealth mobile application for follow-up with the Emergency Medicine Department. The use of Telehealth applications is effective to assist the patient in compliance with medications, and proper follow-up with the Emergency Department and Specialities. Telehealth follow-up in the Emergency Medicine Department is different since patients are presenting to the Department with variety of acute conditions from various broad specialities. The mobile telehealth application is effective in following up patients in rural places and is cost-effective in delivery.

Declarations

Ethics approval: The authors declare that this review was completed in compliance with ethical standards. This was a non-invasive observational

pilot study of an Novel Telemedicine Mobile Application.

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