Approaching Pediatric Resuscitation through Telemedicine – Methodological Analysis of a Telemedicine Program using the EPIS Framework

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List of Abbreviations

CLF	ChildLife Foundation
ER	Emergency Room
ED	Emergency Department
TMSC	Telemedicine Satellite Center

EXECUTIVE SUMMARY

In 2011, ChildLife Foundation was created to help manage a struggling pediatric emergency room at one of Pakistan's leading teaching hospitals, Dr. Ruth KM Pfau Civil Hospital Karachi. Through the generosity of multiple Pakistani donors, Civil Hospital Karachi has now become a shining example of what emergency pediatric medicine could look like for the rest of the country. Through the use of novel technologies such as telemedicine, as well as strategic organizational design, ChildLife Foundation offers hope to achieving a vision of providing all children within Pakistan with access to life-saving quality emergency care.

In its twelve years of operations, ChildLife Foundation now helps to manage twelve government-run pediatric emergency rooms and 118 telemedicine satellite centers across the provinces of Sindh, Balochistan, Punjab and Islamabad providing 24/7 medical services completely free of charge. It has completed almost 5 million patients encounters and oversees a staff of over 1,500 across Pakistan. Additionally, it has gained the political and financial commitment of both Sindh and Balochistan governments to fully support financing and operations of the ChildLife Foundation pediatric ER's and telemedicine satellite centers within those provinces.

ChildLife Foundation initiated the first provider-to-provider telemedicine service in Pakistan for pediatrics. It has experienced rapid expansion and gained the attention of the healthcare community throughout Pakistan. Its telemedicine satellite centers are located in remote areas and connected to specialized physicians located in a major city at a telemedicine control room. These telemedicine physicians work 24/7 to save lives and add value to patient treatment through Virtual Rounds, Incoming/Outcoming teleconsultant calls, Expert Opinions and Systems Checklists. This model has evolved as a virtual bridge shrinking distance of miles to a single audio-visual call.

Key success factors include ownership by the government with a shared vision of every child having access to life-saving care within 30 minutes, as well as local management of administrators at Hubs and the relationship with the government and administrative support of staff deployed at each site.

This methodological analysis aims to provide readers with insight into the implementation process undertaken by ChildLife Foundation. It organizes the implementation process using the EPIS Framework (Exploration, Preparation, Implementation, Sustainment) which explores the unique success and challenges faced by ChildLife Foundation across the different phases of implementation.

This analysis was written in collaboration between ChildLife Foundation and Weill Cornell Medicine with the goal to provide readers with a roadmap into how they can leverage ChildLife Foundation's telemedicine model to advance their own goals of creating a positive impact on the health of their communities.

BACKGROUND:

In 2015, the United Nations published the 2030 Agenda for Sustainable Development with 17 Sustainable Development Goals (SDG) to improve the health and equity of the world.[1] Amongst these goals is SDG 3.2 which focuses on decreasing preventable deaths of newborns and children under 5.[1] SDG 3.2 aims to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to as low

> **Why**:
>
> Provide all children in Pakistan with **access** to life-saving care with quality specialists

as 25 per 1,000 live births.[1] Pakistan has made headways in reaching this goal, however there is still room for improvement. Two-thirds of Pakistanis are still living in rural areas that do not have access to specialist doctors and 1.7x children in rural areas die versus children in urban areas.[2] Additionally, out-of-pocket expenditures in healthcare serve as barriers to care where 1.9x children from poor households die vs children from rich households.[2] Telemedicine has emerged as a possible solution to addressing child mortality in low- and middle- income countries.[3] It has the potential to address the lack of access to specialty-trained doctors as well as costs associated with travel to seek tertiary care.[4]

ChildLife Foundation is a non-profit organization based in Karachi, Pakistan that provides emergency medical care to pediatric and neonatal patients at 12 emergency rooms and delivers telemedicine for pediatric care in healthcare facilities throughout Pakistan. The organization started its telemedicine services with a telemedicine control room with teleconsultants specialized in pediatrics located in Karachi, Pakistan and has since expanded with the addition of a telemedicine control room in Lahore, Pakistan.

ChildLife Foundation operates in two distinct clinical settings: pediatric emergency rooms (ER) and remote health sites, also known as telemedicine satellite centers (TMSC). Currently, ChildLife Foundation operates the TMSC's only in the provinces of Sindh and Balochistan. Teleconsultants located at the central hubs provide telemedicine consultations to all clinical sites.

The pediatric ER's are located at government teaching hospitals and fully managed by ChildLife Foundation and government staff which includes post-graduate trainees. ChildLife Foundation provides for infrastructure development, clinical and non-clinical staffing, medical supplies, equipment, medications and pharmacy services to the pediatric ER. On-site physicians in a ChildLife Foundation pediatric ER can call the central hub for teleconsultation with a specialist.

TMSC's operate independently as a government health center and has access to telemedicine consultations with a specialist. ChildLife Foundation provides the TMSC with internet connectivity and telemedicine equipment but does not provide infrastructure renovations. A ChildLife Foundation nurse is staffed at a TMSC to assist in teleconsultations as well as clinical duties.

Since its inception in 2011, ChildLife Foundation has treated almost 5 million children at its pediatric ER's and TMSC's. It has provided almost 200,000 teleconsultations from its TMSC's alone. The organization has expanded its presence to 12 other government pediatric emergency

rooms and established 118 telemedicine satellite centers throughout Pakistan, all receiving telemedicine consultations from specialists located in Karachi or Lahore. This methodology paper is intended to help inform future designers and implementors of the potential challenges and facilitators to implementing this kind of technology solution to assist with resuscitation of critical patients remotely.

VISION:

Children in Pakistan at an imminent risk of life will have access to quality care

MISSION:

- Facilitate rapid access to quality urgent medical care
- Identify high-risk children:
    - Malnourished
    - Unimmunized
    - Poor access to basic health
- Intervene with established cost-effective preventive measures

VALUES:

- Teamwork
- Competence
- Compliance
- Compassion
- Humility

GOALS:
- Short-term: Cover 100+ hospitals in Pakistan by the end of 2022
- Medium-term: Establish TMSC's in all tehsils of Sindh by June 2023
- Long-term:
    - Implement our healthcare model in all 500+ government hospitals of Pakistan
    - Play our part in achieving UN's Sustainable Development Goal 3.2 as Pakistan's leading pediatric emergency healthcare provider

METHODOLOGY:

The Exploration, Preparation, Implementation, Sustainment (EPIS) Framework was utilized to characterize the implementation of telemedicine services by ChildLife Foundation.[5] This Framework provides a comprehensive construct that helps to reveal potential challenges and opportunities in implementation. In turn, lessons learned can be leveraged for the design and implementation of future telemedicine innovations for the care of critical patients.

The EPIS framework examines implementation across four phases. In the Exploration phase, stakeholders come together to decide which evidence-based practice (EBP) to pursue. For ChildLife Foundation, we will describe the decision-making processes that led stakeholders to select telemedicine as the EBP to address disparities in pediatric I

In the Preparation phase, intervention developers plan for the integration of the EBP into the existing infrastructure while considering the potential challenges that may arise. We will describe the various activities and challenges faced by ChildLife Foundation in planning for telemedicine integration at its pediatric ER's and TMSC's including hiring, training, and infrastructure development.

The Implementation phase consists of activities involved in the daily functions of the EBP. We will describe the telemedicine operations and activities put in place by ChildLife Foundation at its pediatric ER's and TMSC's. We will also examine the different factors that affected the performance of ongoing telemedicine activities including site issues, human resource challenges and the unique considerations between pediatric ER's and TMSC's.

The Sustainment phase involves maintenance and expansion of the program. We will examine how ChildLife Foundation has maintained ongoing operations post-implementation and its strategies and considerations for expanding services to additional pediatric ER's, rural health sites and additional provinces.

Each of the phases can be examined through multiple contextual factors, described as outer and inner contexts. The outer contexts examine factors outside of the organization that influence each stage in implementation such as sociopolitical factors, funding and outside collaborations. Inner contexts describe the characteristics inside the organization that affect implementation such as the organization structure, culture, and attitudes of both ChildLife Foundation and its clinical sites.

Stage 1: Exploration

The Exploration phase at ChildLife Foundation explores why stakeholders selected telemedicine as the evidence-based practice to improve outcomes for pediatric care.

Outer Context:

Sociopolitical Context
The need for intervention to address pediatric resuscitation in Pakistan arose from community recognition that Pakistan lacked the resources needed to adequately address the medical needs of its children. Existing healthcare structures lacked appropriate infrastructure, staffing and equipment. Health facilities in remote areas only functioned primarily in the daytime with staffing was mostly absent during the nights.

In August 2010, chief medical correspondent for CNN, Dr. Sanjay Gupta, traveled to Pakistan to report on the recent floods. He brought public awareness to the crumbling state of Pakistan's largest hospital teaching hospitals, Civil Hospital Karachi, and his story ultimately inspired a group of private donors to invest in the renovations of Civil Hospital Karachi. This effort led to the creation of ChildLife Foundation.

Over the next few years, ChildLife Foundation worked with the government to collaboratively manage additional pediatric ER's. However it became clear that more was needed in order to provide support to all of Sindh's health facilities. Telemedicine became the key to answering this problem. It would allow ChildLife Foundation to provide clinical support to remote health facilities throughout Sindh without having to be there physically.

In 2016, a pilot program was launched at Civil Hospital in Karachi, Pakistan in collaboration with Johns Hopkins University to provide teleconsultation to patients who required immediate medical care. The teleconsultation platform involved a two-way video call between the on-site physician and patient with a teleconsultant. The teleconsultants were then able to provide clinical recommendations to the on-site physician.

The teleconsultation pilot programs helped government officials and hospitals to recognize telemedicine's potential for addressing the health disparities of their communities. As a result, ChildLife Foundation was able to gain the political support it needed to develop formal telemedicine services for pediatric resuscitation in pediatric ER's and rural health sites.

Funding
ChildLife Foundation was formed with initial financial support from private donors. Initial funding for the pilot program was provided by private donors. Subsequent funding to start implementation was provided by the government or private donors, depending on the province.

Interorganizational Networks
ChildLife Foundation collaborated organizations such as Johns Hopkins University which had extensive expertise using telemedicine in its Emergency Department. Working with such organizations provided ChildLife Foundation with access to subject matter experts in the

telemedicine domain. Access to these organizations provided ChildLife Foundation with the knowledge and expertise to fully utilize telemedicine as the solution for addressing the community's needs.

Inner Context:

Organizational Characteristics
Telemedicine was a fitting solution to meet the needs of the community because it addressed the issues of transport, cost, and access to specialists. Pediatric ER's and TMSC sites often did not have access to senior doctors, were poorly staffed at nights, and did not have the means to care for complex patients. Telemedicine would allow for on-site physicians to gain access to specialist recommendations and seek second opinions without having to transfer the patient to a tertiary hospital. This had the potential to save the patient time, reduce costs of travel, and receive improved quality of care.

Stage 2: Preparation

The Preparation phase describes the planning and preparation process of implementing telemedicine to the pediatric ER or TMSC. This includes all activities prior to "go-live" of telemedicine such as infrastructure development, procurement of medications and supplies, hiring and training.

Outer Context:

Sociopolitical Context
Following the success of the pilot program, ChildLife Program was approached by hospital administration and government officials for formal telemedicine implementation. A Memorandum of Understanding (MOU) was signed between the Sindh government and ChildLife Foundation to integrate telemedicine in its pediatric ER's and subsequently at its rural health sites (TMSC). Additional MOU's were signed with the Balochistan government for similar implementation. In areas of political instability, MOU's were signed directly with the individual hospitals that approach ChildLife Foundation such as the case for hospitals in Lahore and Islamabad. The existence of a signed MOU helped quell any resistance from hospital staff regarding telemedicine implementation including installation of video cameras in the patient areas.

Once a government or hospital expressed interest to work with ChildLife Foundation, a member of ChildLife Foundation administration would meet with the Medical Superintendent (MS) of the hospital to discuss telemedicine implementation. Letters of appreciation from the Ministry of Health or Provincial government were provided to the MS's and government doctors to help nurture a strong working relationship.

Funding
Financial support for the preparation activities were provided in two ways: government and donors. Provincial governments that signed an MOU with ChildLife Foundation provided ChildLife Foundation with an annual budget to help manage its pediatric ER's (Sindh and Balochistan). Hospitals that signed an individual MOU with ChildLife Foundation (Lahore and Islamabad) are currently still being funded by private donors.

Inner Context:

Organizational Characteristics
A leading factor that accounted for ChildLife Foundation's success was its growth in subject matter expertise within the telemedicine domain. Each successful implementation added to its institutional knowledge. This repository of expertise exponentiated ChildLife Foundation's probability of success with each new implementation.

Leadership
Implementation at a pediatric ER versus a TMSC posed unique implementation challenges. Because ChildLife Foundation helps to manage the operations of its pediatric ER's, it has more

decision-making authority regarding operational and staffing choices. Since TMSC's are fully run by the government facility, ChildLife Foundation is only able to manage the ChildLife Foundation nurse that is stationed at the site. On-site physicians are fully autonomous and not required to report to ChildLife Foundation in any capacity. Greater efforts and sensitivity were needed to encourage and incentivize the doctors and staff at these sites to use the teleconsultation services.

A tailored organizational structure was put in place to address the complexities of the various functions at ChildLife Foundation sites. Oversight was required for both the pediatric ER and TMSC's and this could not be maintained remotely at ChildLife Foundation head office. Instead, a hub and spoke model was utilized to provide tailored leadership support for the different ChildLife Foundation sites. Each Pediatric ER works as a Hub with an administrator to manage the ER and the nearby TMSC's through nursing supervisors. Usually, a Hub is connected to 15-20 TMSC's which are called Spokes for that particular Hub.

Staff

TMSC: Only the ChildLife nurse is paid by ChildLife at TMSC. The nurse reports to the nursing supervisor of its designated pediatric ER (Hub). The nursing supervisor visits all TMSC sites and reports to the hub administrator.

Pediatric ER: Once ChildLife Foundation has renovated a pediatric ER, the organization is responsible for hiring all clinical and non-clinical staff consisting of doctors, nurses, pharmacists, administrative officers, patient support staff, outpatient department coordinators, housekeeping, security, facility maintenance and an administrator to manage the ER and the staff (Appendix A). The previous staff working in the ER fill staffing vacancies in other pediatric areas of the hospital. The redistribution of existing staff allows the hospital to address the staffing shortage experienced in other pediatric areas of the hospital without having to spend extra time and money on hiring new staff.

The hub administrator is in charge of all personnel at the pediatric ER, the nursing supervisor and the ChildLife Foundation nurse at TMSC sites. The nursing supervisor is located at the hub and provides supervision of ChildLife Foundation nurses at nearby associated TMSC's. One unique feature of the ER is the presence of qualified pharmacists 24/7 and a Pharmacy In charge to oversee the pharmacists.

Patient Support Staff

Each pediatric ER has a cadre of patient support staff to assist its patients in navigating through the pediatric ER. This unique model includes assistant unit managers, administrative officers, outpatient coordinators, and patient coordinators who are responsible for facilitating the patient's care, helping with coordination and communication of the patient's needs, and improving patient satisfaction. Assistant Unit Managers and Admin Officers are responsible for managing the daily operations of the pediatric ER.

Telemedicine Control Room: In addition to the teleconsultants, a telemedicine physician-in-charge was hired to oversee the activities of the teleconsultants. This person reports to the Medical Director for clinical reporting and the hub administrator for functional reporting.

Hiring Requirements

Hub administrators: Hub administrators are required to have a master's in business administration (MBA) and to have at least ten years of work experience in management and hospital/medical administration. They are responsible for managing the emergency rooms and the nursing supervisor and oversee approximately 15-20 TMSC's.

Teleconsultants: ChildLife Foundation teleconsultants are required hold an MBBS degree, to have completed residency training in pediatrics and hold the title of Specialist or Consultant. In addition, they are required to have credentialing in Basic Life Support (BLS) and Pediatric Advanced Life Support (PALS), and meet cultural competency and telemedicine floor ethics requirements.

TMSC/ ChildLife Foundation Nurse: A ChildLife Foundation nurse must be a registered nurse and is required to have training in BLS and PALS. The nurse works at the site six hours a day for six days a week and is responsible for identifying appropriate pediatric patients for teleconsultation. ChildLife Foundation contracts with a third-party staffing organization to identify the nurse and coordinate the nurse's salary.

Nursing supervisor: Nursing supervisors are required to have at least two years of pediatric and neonatal experience. They are generally from the community and have professional ties within the community.

ER Pharmacist:
The ER pharmacists are required to hold a Masters degree in pharmacy. They are responsible for the preparation and dispensing of all medications provided in the pediatric ER. In addition, ER pharmacists monitor medications for dosing errors and identify high-alert medications to the doctors and nurses. The presence of the ER pharmacists provides another layer of patient safety for the ER.

A pharmacist-in-charge oversees the team and works 8 hours a day 6 days a week and ensures roster management, monthly reports on Prescription Errors and Adverse Drug Reactions. The pharmacist-in-charge takes care of inventory management to prevent stock outs, ensures compliance on policies and procedures including infection control, antimicrobial stewardship, high alert medications, lookalike and soundalike medicines, medicine storage in a temperature-controlled environment, etc.

Patient Support Staff
Assistant Unit Managers and Admin Officers are required to have a Master of Business. Outpatient coordinators are required to hold a bachelor's degree.

Training

Training programs and certificates are offered to all doctors and nurses at identified ChildLife Foundation sites. All staff are required to complete orientation training to become familiar with the operations, workflow and technology at ChildLife Foundation. Doctors from nearby hospitals or TMSC's are invited to attend free optional medical training with certificates provided after taking an exam.

Training is required from ChildLife Foundation nurses and optional for government-paid nurses. These training include BLS and PALS with optional additional courses offered (Appendix B). Pharmacists hired at the pediatric ER's are also required to complete pharmacy-specific training. Optional trainings are incentivized with a training allowance given only if the course is passed. All nurses, teleconsultants and pharmacists undergo a 3-month probationary period prior to full employment. Full employment is only offered to those who are able to pass the required trainings within three attempts during the probationary period.

Employment Benefits

All full-time employees are eligible for sick leave, medical insurance, life insurance and salary matching. Each employee receives days for annual leave, casual leave and sick leave. Upon full employment, ChildLife Foundation provides all employees the opportunity to participate in the Provident Fund. The Provident Fund allows employees to have a percentage deduction in their salary accompanied by the organization's match of that percentage. The total amount of the deductions and matches are made available to the employee when s/he leaves the organization.

Infrastructure

Pediatric ER: Pediatric ERs usually require full renovations when ChildLife Foundation starts operations at each site. The existing ERs are redesigned and rebuilt by third-party consultants and contractors hired by ChildLife Foundation. Separate triage and resuscitation areas are allocated. A free-standing pharmacy dedicated only for the pediatric ER is also implemented. Additional areas include a Fast Track OPD, Resuscitation Room, Stepdown, Pediatric Observation, Neonatal Observation, Pantry and changing room for staff. Layout for the pediatric ER is approved by ChildLife Foundation with the agreement of all major stakeholders including the Medical Superintendent and Head of Pediatrics. On average, renovations generally take about six months.

TMSC: No infrastructure changes are made to the TMSC sites as ChildLife Foundation does not manage the operations at those sites.

Equipment and Supplies

Pediatric ER: All equipment including lifesaving medical equipment (cardiac monitors, defibrillators, infusion pumps, crash carts, infant warmers, phototherapy machines), patient beds, Electronic Queue Management System, computer on wheels, Electronic Medical Record System, supplies and medications are purchased and provided for by ChildLife Foundation using the

funds allocated to ChildLife Foundation. The pediatric pharmacy is stocked with a pre-determined list of medications based on the estimated patient footfall and disease spectrum received from the existing ER setup, and provided by ChildLife Foundation.

TMSC: Prior to implementation, TMSC sites are expected to meet a minimum set of requirements such as a resuscitation room or pediatric ward. General upkeep such as a freshly painted facility and provision of a back-up generator is required. The TMSC site must also keep a stock of a pre-set list of medications (Appendix C) and equipment (Appendix D) as determined by ChildLife Foundation. ChildLife Foundation assists in provision of internet connectivity and telemedicine equipment, maintenance and repair of equipment only.

Technology
High-resolution video cameras, internet and phones are installed at both ChildLife Foundation ER's and TMSC's resuscitation areas. Two-way video capability was discontinued after the pilot program in order to maintain privacy of the teleconsultants. ChildLife Foundation uses a third-party provider to assess internet connectivity, install internet connection, WIFI router, IP phone and camera equipment at each site. ChildLife Foundation retains ownership and ongoing maintenance of the equipment after initial installation.

Data Management and Security: All high-resolution cameras and telemedicine equipment located in ChildLife Foundation sites including the central hubs are monitored separately by CCTV cameras installed by ChildLife Foundation. The hospital holds the main responsibility for the security of the telemedicine equipment. ChildLife Foundation maintains the video data recorded by CCTV cameras for 15 days only and is only accessible by the hub administrators. High-resolution telemedicine cameras do not record teleconsultation interactions. There have been no issues with theft or vandalism to date.

Electronic Medical Record: All patients at a ChildLife Foundation pediatric ER or patients who receive telemedicine consults at the TMSC's have a patient medical record stored in an electronic medical record (EMR) system managed by ChildLife Foundation. This EMR is a custom-built cloud-based system designed to meet the unique telemedicine requirements of ChildLife Foundation. The cloud-based design allows for teleconsultants and pediatric ER's to easily access patient information across all facilities to streamline care. Patient's data safety and security ensured by following means:

Network protection:
- Firewall. Firewalls control incoming and outgoing traffic on networks, with predetermined security rules
- Network Segmentation
- Remote Access VPN
- Email Security
- Data Loss Prevention (DLP)

Application/DB Server Level Security: ChildLife's application is hosted on Azure cloud. Azure provides data protection through encryption at rest aligned with 256-bit AES standard and encryption in transit through TLS 1.2.

Manage with secure workstations: End point security is ensured; workstations have privileged access to the network.

Access Control & Policies: Access control policies for people or groups and the devices that have access to network applications and systems. These policies ensure the person and device are authorized access to the asset.

Stage 3: Implementation

This phase in implementation describes the activities and challenges associated with utilization of the telemedicine services by ChildLife Foundation pediatric ER's and TMSC's.

Outer Context:

Functions:

- Incoming calls
- Outgoing calls
- Virtual Rounds
- Systems Check
- Credentialing

Sociopolitical Context and Funding
The establishment of MOUs prior to implementation provided operational and financial security for ChildLife Foundation. Regardless of political turnover, the MOU's protects ChildLife Foundation from abrupt changes at each political cycle. Being announced as part of the government annual budget also ensured that operations could continue throughout the year without interruption.

Additionally, costs for all services provided to patients are free of charge.

Costs associated with telemedicine implementation varied depending on the clinical setting.

Pediatric ER: If indicated, ChildLife Foundation renovates the pediatric ER's prior to starting clinical operations. Capital expenses include a one-time cost to renovate the infrastructure, install telemedicine equipment, establish a pharmacy, triage area, separate pediatric / neonatal areas and separate resuscitations rooms, purchase medical equipment and supplies (cardiac monitors, crash cards, infusion pumps, warmers, incubators) and purchase a three-month supply of medicine stock. Capital expenses are estimated at 100 million PKR and takes approximately six months.

Operating expenses include clinical and non-clinical staff salaries, medical supplies and medicines, administrative costs, and ongoing training. Salaries account for approximately 40% of the annual budget and 60% is allocated for operating costs. Operating cost at each pediatric ER for six months is estimated at 100 million PKR.

First year costs is estimated at approximately 200 million PKR (six months of capital expense and six months operating expenses. Second year costs is estimated at approximately 200 million PKR (twelve months of operating expenses at 100 million PKR every six months).

TMSC: Approximately 250,000 PKR is required for capital expenses at a TMSC which includes the cost of telemedicine installation, maintenance and repair. Ongoing costs associated with a TMSC includes telemedicine equipment maintenance and the salaries of ChildLife Foundation nurses and hub administrator. Operating costs at each TMSC are estimated at 1.2 million PKR.

Inner Context:

Organizational Characteristics:

Organizational Structure

The organizational structure of ChildLife Foundation comprises of departments for Clinical Affairs, Operations, Human Resources, Communications, Finance, and Planning & Services. Additionally, an audit committee reports to the Board of Trustees. The organization is externally audited by PwC, an internationally recognized independent outside organization.

Telemedicine Control Room: A minimum of two teleconsultants per 12-hour shift are required to provide 24/7 support for one ChildLife Foundation pediatric ER containing one resuscitation room and 3 TMSC's. Two IT personnel are required (one per 12-hour shift) to maintain 24/7 IT support.

Pediatric ER: Each pediatric ER manages approximately 100 clinical and non-clinical staff depending on the size of the ER. Every pediatric ER staffs at least two certified pharmacists per 12-hour shift. In total, eight pharmacists and one pharmacist-in-charge is required to provide 24/7 pharmacy coverage.

TMSC: One ChildLife Foundation nurse supports each TMSC. One nurse supervisor is able to support 5-8 TMSCs and Hub Administrators supervises all TMSC's (Spokes) and ER (Hub) in his/her region.

Readiness for Change, Receptive Context
Initial implementation of telemedicine at TMSC sites were met with resistance from physicians on the ground who had never used telemedicine in the past. On-site physicians questioned why they needed to consult any doctor for treatment of their patients. Use of the telemedicine platform was not seen as a priority and remained underutilized at the start of implementation. The TMSC's did not appear ready for change.

In response to the lack of utilization, the ChildLife Foundation nurse was hired and posted at each TMSC site to facilitate responsibility of telemedicine consultations. On-site physicians were still able to utilize the telemedicine consult system if they wanted to. Considerations were made to hire a ChildLife Foundation physician; however, it was too difficult to recruit and post a physician at a remote area where the TMSC's were located.

At the start of each shift, the ChildLife Foundation nurse was responsible for identifying Priority 1 (patients with life threatening emergencies) and Priority 2 (patients who were sick and require urgent medical attention within 15 minutes) pediatric patients in the TMSC site. Once identified the nurse entered the patient's demographic details and presenting complaint into ChildLife Foundation's EMR using a phone app. She brought the patient into the teleconsultation room, fixed the camera onto the patient, then called the teleconsultant at the central hub. The teleconsultant had the ability to access patient information on the EMR and adjust the camera on the patient. Afterwards, the teleconsultant discussed the case with the nurse, made diagnoses and recommendations. The ChildLife Foundation nurse then delivered the consultation recommendations to the on-site physician who had the option to accept the recommendation by signing the associated nursing or medication orders for the patient. In this way, the patient care liability remained with the on-site physician.

If the patient required higher level of care, the hub and spoke model was activated and the family would be asked to transport the child to the nearby ChildLife Foundation pediatric ER. The teleconsultant would call the nearby ChildLife Foundation pediatric ER to provide patient hand-off to the ER provider and a team would be ready to receive the patient. Once consultations were completed, the ChildLife Foundation nurse would spend the rest of her shift assisting the TMSC with clinical duties.

Despite the hiring of a ChildLife Foundation nurse, under-utilization challenges remained at the TMSC sites. Some ChildLife Foundation nurses would only call the teleconsultant two or three times during a six-hour shift while others would simply mark attendance in the morning and leave. In order to address this new challenge, an incentivization plan was put in place and each nurse was incentivized to make at least ten consultations per day. Only one consultation could be performed at a time and patients would be verified against the EMR. If they met an average of ten consultations a day across the month (~240 patients per month), a financial incentive would be added to their salary. Implementation of this incentive greatly increased the number of consultations initiated by the ChildLife Foundation Nurses.

Culture/Climate
Some TMSC sites were not as welcoming of ChildLife Foundation nurses despite signed MOUs for telemedicine implementation. This made the job of the ChildLife Foundation nurses more difficult and resulted in the hiring of nursing supervisors. Nursing supervisors introduced the ChildLife Foundation Nurse to each TMSC site and checked on the well-being and performance of each of the nurses. Each day, the nursing supervisor would visit a nearby TMSC and report to the hub administrator at the end of the week to discuss challenges or issues experienced by the ChildLife Foundation nurses.

Innovation Values – Fit
Two challenges were observed at the start of telemedicine services. Teleconsultants did not share the same values for telemedicine service as the organization. Many did not take the job seriously and did not view the position as respected. They did not know anyone else or have social networks with experience working as telemedicine physicians. Several would work a teleconsultation shift while simultaneously being on-call for in-person clinical shifts. Many were found sleeping during shifts or not answering calls for teleconsultation. Some were observed to interact rudely over the phone with the on-site nurses and physicians.

In response to this behavior, CCTV cameras were installed in the central hub where teleconsultants received calls. Checklists (Appendix E, Appendix F, Appendix G) were implemented to encourage adherence to clinical processes by teleconsultants and clinical staff. Teleconsultants were observed for six months to ensure that they followed professional etiquette such as politeness over the phone and not eating, sleeping or using their personal devices during their shifts. Feedback was provided by the telemedicine-in-charge. Additionally, teleconsultants were given a financial incentive if they were able to provide at least six consultations per hour. A Certificate of Recognition was given to the teleconsultant with the greatest number of consultations each month. With these changes, professional behavior improved in addition to the number of teleconsultations conducted.

Stage 4: Sustainment

The Sustainment phase describes the maintenance and expansion phase of implementation where telemedicine activities are now integrated to everyday workflow. Operations now undergo ongoing monitoring and quality assurance, and the organization strategizes on how to expand its services to other sites.

Outer Context:

Sociopolitical
MOU's are renewed every 3-10 years between governments and/or individual hospitals to continue telemedicine operations at ChildLife Foundation sites. Additional sites (pediatric ER's or TMSC's) are added based upon government or hospital invitations.

> **Impact:**
> - Community
>   - Hub-and-Spoke Model
>   - Halting the Poverty Cycle
>   - Serving the Community
> - Healthcare Sector
>   - Access to senior physicians and specialists
>   - Virtual Rounds
>   - Good Catches/Near Misses
>   - Compliance Checklists
>   - Continuing Medical Education Trainings

ChildLife Foundation has been able to foster continued support from provincial governments to increase expansion of sites and secure funding. Successful soft launch of Telemedicine services at Pediatric Emergency Civil Hospital Karachi resulted in expansion of telemedicine services to nine additions government hospital Pediatric ERs supported by ChildLife Foundation and 87 TMSCs in Sindh. Balochistan now has one ChildLife Foundation pediatric ER and 32 TMSC's.

Funding
Funding for ongoing telemedicine services continues to be secured through the government's annual budget or from donors. ChildLife Foundation maintains operations in Sindh and Balochistan through government funding. Each year, the CEO office shares the financial requirements with the Health Secretary of the respective province. The Health Secretary reports these needs to the Chief Minister of the province who then reports to the Health Minister for approval of the budget. Once approved, financial requirements are announced in the annual budget. ChildLife Foundation sites in Punjab and Islamabad continue to be financed through private donors. The overall annual budget for ChildLife Foundation is 3 billion Pakistani Rupees, approximately $12 million USD.

Public-academic collaboration
ChildLife Foundation partners with academic institutions and outside organizations in order to continuously improve the quality of its services. These collaborations help to provide an outside perspective on how the organization is doing and ways to improve its operations. These partnerships also help to increase awareness and expansion of the telemedicine services, as well as continually add value to the community.

Inner Context:

Fidelity Monitoring/Supporting
ChildLife Foundation maintains excellence in its clinical services through a number of methods. Teleconsultants are able to document "Good Catches / Near Misses" when providing teleconsultations to ChildLife Foundation nurses or on-site physicians. "Good Catches / Near Misses" are defined as intervening actions performed by the teleconsultant or clinical staff that prevented a potential adverse event in a patient. For example, putting up the side rails for a seizure patient or identification of error in medication dosing. Case reviews are performed by the telemedicine-in-charge who audits a selection of 30 cases each month. Cases are evaluated to check if the teleconsultant, nurses, physicians and/or pharmacists followed appropriate protocols and provided appropriate care. Monthly reports are shared with the Medical Director. Monthly Morbidity and Mortality (M&M) reviews are performed by the physician-in-charge and clinical instructors to reduce the number of preventable deaths. Action items derived from the reviews assigned to relevant stakeholders for implementation. Finally, teleconsultants and pediatric ER physicians are evaluated monthly on a set of Key Performance Indicators (KPI's) (Appendix H) focused on competence, compassion and compliance. Annual raises in salary are based in part on meeting these KPI's.

Staffing
ChildLife Foundation has now established a second central hub in Lahore, Pakistan where more specialty-trained physicians are available to hire as teleconsultants. The Karachi central hub (Team 1) and Lahore central hub (Team 2) operate together as one integrated hub to provide teleconsultations across the country. Lahore central hub currently provides services for 8 hours a day and specifically takes calls from TMSC's. In total, there are about approximately 30+ teleconsultants across both teams giving around 1000+ consults a days across . In total, ChildLife Foundation staffs approximately 1,500 employees to provide support for all its clinical sites.

Expansion Development
ChildLife Foundation continues to be approached by provincial governments and individual hospitals for telemedicine implementation. The addition of a second central hub in Lahore allows ChildLife Foundation to expand its services and meet its goals of working in pediatric emergency rooms in all public teaching hospitals, establish TMSC's in all public secondary hospitals, and provide a preventive health program for all children under five years of age.

There are now 12 ChildLife Foundation pediatric ER's across Pakistan (Sindh, Balochistan, Punjab, Islamabad), and 118 TMSC's. As of December 2022, approximately 200,000 teleconsultations for the TMSC's have been completed.

Partnerships

Functional
ChildLife Foundation is seeking to expand its services in partnership with Indus Hospital and Health Network, a non-profit healthcare network of primary, secondary, and tertiary healthcare facilities across Pakistan. Application of telemedicine for an entire hospital system has the

potential to meet ChildLife Foundation's vision of every child within 30 minutes to life-saving care.

Geographical
ChildLife Foundation is also seeking to expand its services across borders including in Kenya and Italy. It serves as a potential model for other countries to apply in their own implementations of telemedicine.

Impact

ChildLife Foundation's innovative approach to telemedicine and pediatric resuscitation has made an incredible impact on the health and well-being of Pakistan's children. Not only has ChildLife Foundation provided access to life-saving care for children, but its activities have also positively impacted the families, community, healthcare industry as well as solidifying the country's commitment to medical care.

> **Boiler Plate:**
>
> - Hub & Spoke Network of 130 govt (free) hospitals.
> - 300K direct consults annually
> - Footfall 5 million (indirect)
> - Value Add 60% cases (Good Catch, near miss)

Community

Hub-and-Spoke Model
ChildLife Foundation utilizes a hub-and-spoke model to deliver care to even the most remote of areas. Each of the twelve pediatric ER's that ChildLife Foundation manages serves as a dedicated referral center, also known as a "hub", for the surrounding TMSC's, "spokes". The location of these TMSC's are strategically chosen so that no child is more than one hour away from a ChildLife Foundation pediatric ER. If a teleconsultant at a TMSC recognizes that a child requires higher level of care, the teleconsultant can recommend that the child is transferred to the affiliated ChildLife Foundation pediatric ER. The teleconsultant can inform the nurses and physicians at the ChildLife Foundation pediatric ER to expect the patient's arrival as well as provide details of the case ahead of time. The design of the hub-and-spoke model enables seamless transfer of patients to the nearest affiliated pediatric ER without interruptions in care.

Halting the Poverty Cycle
It is estimated that it costs a family 40,000-50,000 PKR just to travel to the city for care. This cost increases to 80,000 PKR if the patient is transported by fully equipped ambulance. This equates not only to transportation and housing costs, but also wages lost and incurred debt. ChildLife Foundation's telemedicine model combined with the hub-and-spoke strategy allows patients to access specialty care directly in their community without having to take out loans to travel to the city. This greatly reduces the equity gap and enables all communities to have access to appropriate care regardless of where they live.

Serving the Community
This model was especially poignant during the recent floods in the providence of Sindh. ChildLife Foundation's TMSC's allowed healthcare workers to gain access to communities that were cut off by the floods. TMSC's were able to continue its telemedicine operations and serve

as a communication point to the outside world so that children suffering from flood-related illness such as gastroenteritis, pneumonia, and malaria could still have access to life-saving medical care.

Healthcare Sector

In addition to providing patients with access to specialty care, ChildLife Foundation also plays a significant role in building the capacity of the healthcare sector. ChildLife Foundation integrates several components aimed at increasing the knowledge and skillset of the providers at its sites. On-site providers also have access to invaluable learning opportunities to advance their clinical expertise. By providing numerous opportunities for learning and education, ChildLife Foundation is able to make a significant indirect impact on patient care through its training and education capacity-building efforts.

Access to senior physicians and specialists 24/7

Nurses and physicians at the ChildLife Foundation pediatric ER's and TMSC's have 24/7 access to senior physicians and specialists. Oftentimes, the physicians posted at these sites are junior doctors with limited clinical experience. Telemedicine gives these doctors access to continued medical education by giving them opportunities to learn from teleconsultants who have more years of clinical experience. Telemedicine also plays a significant role in building the capacity of onsite doctors. Teleconsultants aid on-site physicians in their clinical assessment of patients. They work with on-site physicians to review vital indicators, develop differential diagnoses, form treatment plans, and prescribe medications to patients.

This has a significant direct impact on patient care and indirect impact on the capacity-building of the on-site doctors as they learn through every consultation. On average, each TMSC on-site physician cares for approximately 100 patients per shift and utilizes telemedicine for 10-20 patients per shift. The on-site physician is able to apply the knowledge gained from each of these teleconsultations to all his patients on the shift, representing an almost 10x indirect impact on patient care.

Virtual Rounds

Teleconsultants have the ability to monitor the clinical areas of its pediatric ER's and TMSC's. During each shift, teleconsultants are assigned specific sites to passively monitor. If they notice that something should be corrected or addressed at a clinical site, they are able to call the site directly and provide real-time feedback to the nurse or physician. Not only does this provide another layer of service for patients, but it also creates a learning opportunity for the nurse or physician to recognize clinical situations that could have easily been overlooked.

Good Catches and Near Misses

Teleconsultants are able to submit clinical cases that demonstrate a "Good Catch / Near Miss". Review of these cases gives the on-site nurses and physicians an opportunity to identify and correct clinical practices that could be detrimental to the patient.

Compliance Checklists
Nurses and physicians at a ChildLife Foundation pediatric ER undergo regular assessments of their clinical performance and patient care delivery. A Doctor Performance and a Systems Checklist are used by the teleconsultants to evaluate whether nurses and physicians followed the appropriate steps to providing patient care and resuscitation. These checklists help to provide quality assurance as well as feedback to the clinical team on what they can do to improve their clinical practice.

Continuing Medical Education Trainings
Physicians, nurses and pharmacists have access to trainings to further their clinical development. Trainings are offered throughout the year and free of charge.

Ambulance services
ChildLife Foundation is working to form partnerships with Emergency Medical Services (EMS) to provide transportation for patients at TMSC's (Spoke) who require higher level of care at a ChildLife Foundation pediatric ER (Hub). The aim is to create an integrated system between the pediatric ER's, TMSC's(Hub and Spoke Model) and ambulance services.

Political
ChildLife Foundation began its operations through the help of private donors. Each successful implementation gained political attention and support. ChildLife Foundation operations in the provinces of Sindh and Balochistan are now fully supported by public funds. This outstanding achievement reflects the strength of collaboration between ChildLife Foundation and the provincial governments. It also demonstrates the government's recognition of the healthcare sector and its commitment towards the health of its children.

CONCLUDING REMARKS:

Using the EPIS Framework, we have described the various challenges and considerations that needed to be addressed at each stage of telemedicine implementation. Certain aspects helped facilitate facility adoption of telemedicine such as sociopolitical and financial support while other aspects hindered progress such as teleconsultant and on-site provider attitudes towards telemedicine. It is our hope that this document will provide guidance to help organizations anticipate and plan for potential challenges associated with their own implementations of telemedicine.

REFERENCES:

1. Lee, Bandy X., et al. "Transforming our world: implementing the 2030 agenda through sustainable development goal indicators." Journal of public health policy 37 (2016): 13-31.
2. Unicef. Committing to child survival: a promise renewed. eSocialSciences, 2015.
3. Mahmoud, Kareem, Catalina Jaramillo, and Sandra Barteit. "Telemedicine in low-and middle-income countries during the COVID-19 pandemic: a scoping review." Frontiers in Public Health 10 (2022).
4. Monaghesh, Elham, and Alireza Hajizadeh. "The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence." BMC public health 20 (2020): 1-9.
5. Moullin, J.C., Dickson, K.S., Stadnick, N.A. et al. Systematic review of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework. Implementation Sci 14, 1 (2019). https://doi.org/10.1186/s13012-018-0842-6
6. Guest, G., Bunce, A. & Johnson, L. How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. http://dx.doi.org/10.1177/1525822X05279903 18, 59–82 (2016).
7. Hagaman, A. K. & Wutich, A. How Many Interviews Are Enough to Identify Metathemes in Multisited and Cross-cultural Research? Another Perspective on Guest, Bunce, and Johnson's (2006) Landmark Study: http://dx.doi.org/10.1177/1525822X16640447 29, 23–41 (2016)

APPENDIX A:

Pediatric ER Organization Chart
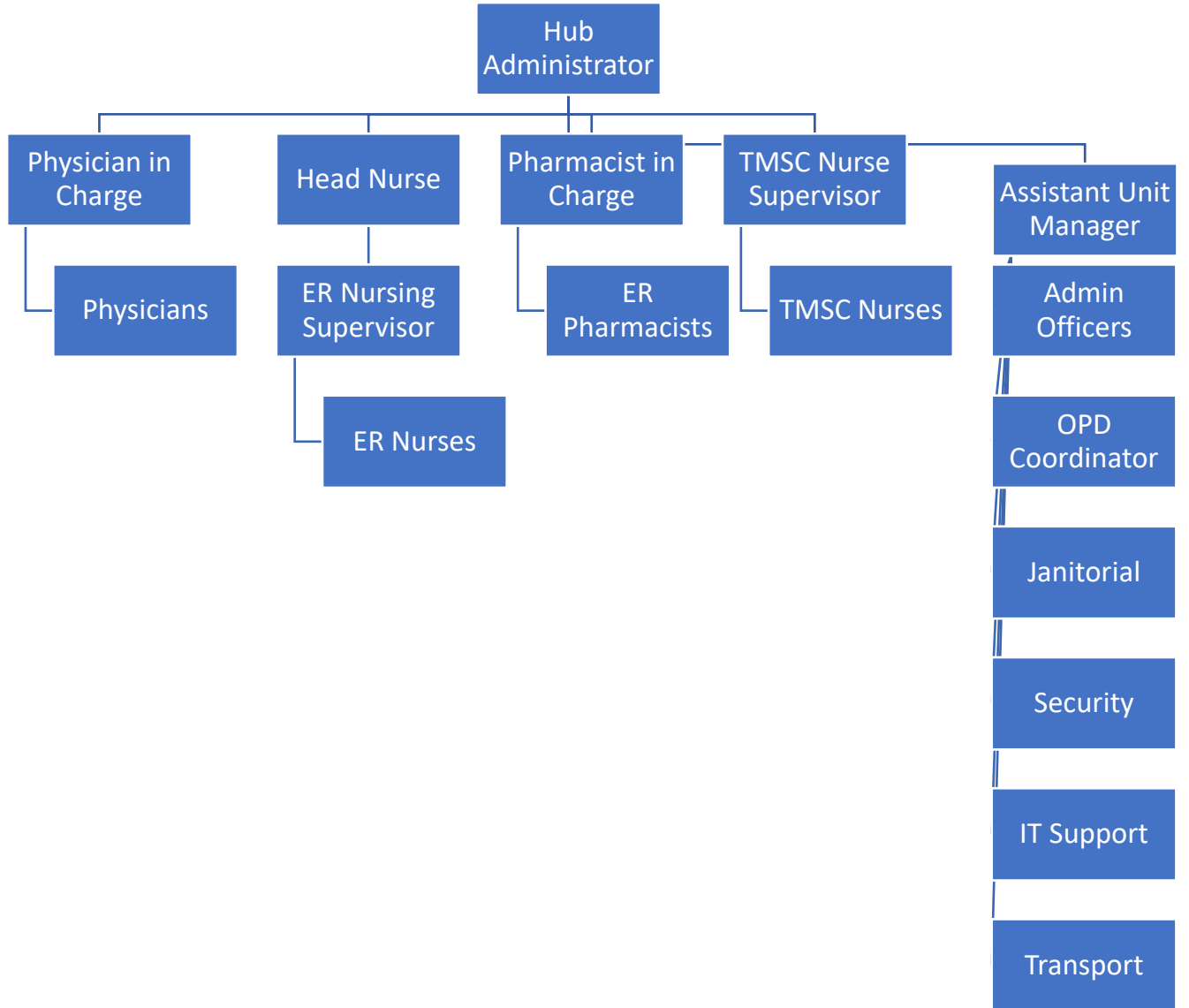
APPENDIX B:

Additional training offerings:
- BLS
- PELS
- PAM
- NELS
- E-PEMC
- A-PEMC
- E-PEMCN
- PEMO
- BLUS
- IPEM-MP
- PEMS
- PEMO-N

APPENDIX C:

List of Medicines and Disposables Required from TMSC sites:
- Pediatric IV chambers
- Drip sets
- Different fluids – 0.9% NS, 10% DW, 25% DW, 0.9% DS and 0.45% DS
- Inotropes – Dopamine, Epinephrine
- Crash cart medicines / disposables.
- Inj. Epinephrine
- Inj. Atropine
- Inj. Soda Bicarbonate
- Inj. KcL
- Inj. Calcium Gluconate
- Inj. Diazepam
- Inj. Dormicum
- Inj. Ketamine
- Inj. Phenytoin
- Inj. Phenobarbitone
- Inj. Lerace
- Inj. Tetavex
- Fluids as mentioned above
- Inj. Rocuronium / Atracurium
- Inj. Naloxone
- Inj. Lasix
- Inj. Hydrocortisone 100 / 250 mg
- Inj. Cefotaxime 500 mg
- Inj. Ceftriaxone 500 / 1 gram
- Inj. Amikacin 100 / 250 mg
- IV cannulas of sizes 22 and 24
- Heparin locks
- Salbutamol inhaler solution
- Ipratropium bromide inhaler solution
- LMA (Laryngeal Mask Airway sizes 0,1,1.5 and 2 and 2.5
- Laryngoscope with straight and curved blades of paediatric sizes
- Glucometer strips
- NRB (Non-Rebreather Mask)
- ETT sizes 2.5, 3, 3.5, 4, 4.5, 5, 5.5
- Ambo bag and mask with neonatal, infant, and adult sizes for each bag and mask
- Oxygen mask – infant and child sizes
- Nasal prongs – neonatal and infant sizes

APPENDIX D:

List of Equipment required from TMSC sites:
- Hospital Furniture & Medical Equipment:
- (2) Hospital Beds / Double Crank Stature with Side Grills
- (1) Emergency Crash Trolley
- (2) Infant Warmer Resuscitation Trolley
- Defibrillator
- At least 1 Cardiac Monitors with BP Cuffs of 3 pediatric sizes (neonate, infant, Child)
- (1) Infusion Pump
- (1) Glucometer with Strips
- Weight Scale Neonate
- Weight Scale Infant / Adults
- Breslow Tape
- ECG Electrodes
- Staff and Doctors workstation
- Chairs for Patient attendants

Doctor Performance checklist

S. No.	Name of Doctor (Doctors list):	Compliant		TM site help in correction	
1	Patient assessed as per PALS guidelines started from initial impression A B C	●	Yes		
		○	No		
		○	NA		
2	Primary & Secondary assessment (SAMPLE history) done within 1st 30 minutes of arrival that may not be applicable in OHCA where it will be deferred	○	Yes		
		○	No		
		○	NA		
3	Initial Diagnosis made was matching primary & secondary assessment in documentation of MR (medical records)	○	Yes	●	Done
		○	No	○	Pending
		○	NA	○	Not Req.
4	Focused relevant examination done (in medical records as well)	○	Yes	●	Done
		○	No	○	Pending
		○	NA	○	Not Req.
5	Treatment advised as per standard protocol for that condition / disease (in medical records as well)	○	Yes	○	Done
		○	No	○	Pending
		○	NA	○	Not Req.
6	Dosage of medicines were accurate with proper timing interval (documented in MR)	○	Yes	○	Done
		○	No	○	Pending
		○	NA	○	Not Req.
7	VBG , Electrolytes or other relevant labs / radiology done or advised if req (conditioned to availability in ER)	○	Yes	○	Done
		○	No	○	Pending
		○	NA	○	Not Req.
8	Bedside Lung Ultrasound initiated if req conditioned to his / her training done and availability in ER)	○	Yes	○	Done
		○	No	○	Pending
		○	NA	○	Not Req.
9	Patient reassessment - first within 1 hour of initial assessment and then subsequent (documented in Physician Notes of MR)	○	Yes	○	Done
		○	No	○	Pending
		○	NA	○	Not Req.
10	Compliance to Medical protocols (if anyone of the below applied in this case)	○	Yes	○	Done
		○	No	○	Pending
		○	NA	○	Not Req.
	a) Sepsis - antibiotics administered within an hour	○	Yes	○	Done
		○	No	○	Pending
		○	NA	○	Not Req.

	b) Septic Shock - Fluid bolus, antibiotics & inotropes initiated within an hour administered	Yes	Done
		No	Pending
		NA	Not Req.
	c) Acute Asthma - Nebulize 3 times and Steroids within an hour administered	Yes	Done
		No	Pending
		NA	Not Req.
	d) Pneumonia - Antibiotics administered within 4 hours of arrival	Yes	Done
		No	Pending
		NA	Not Req.
	e) Hypoglycemia- GIR done, and action done on it if req.	Yes	Done
		No	Pending
		NA	Not Req.
	f) CCP guideline followed in Malnourished with Severe Dehydration or Shock	Yes	Done
		No	Pending
		NA	Not Req.
	g) Myocarditis - inotropes initiated in time	Yes	Done
		No	Pending
		NA	Not Req.
	h) Meningitis - antibiotics in meningitic dose administered within 2 hours of arrival	Yes	Done
		No	Pending
		NA	Not Req.
	i) RSI- followed in case of elective intubation	Yes	Done
		No	Pending
		NA	Not Req.
	j) Acute Asthma - PRAM score done	Yes	Done
		No	Pending
		NA	Not Req.
	Compliant score in numbers	n=	
	% achieved total yes in compliant divided by all check boxes filled except NA	%	

APPENDIX F:

S. No.	System was compliant on following indicators through observation by TM physician:	Compliant		TM site help for correction	
1	Monitor was attached if available for that patient	◉			Done
			No	◉	Pending
			NA		Not Req.
2	Side rails were up to prevent risk of fall		Yes		Done
			No		Pending
			NA		Not Req.
3	Vitals checked within one hour of arrival like; HR, RR, BP, O2 Sat, Temp, RBS (all 6 mandatory) it will not be applicable for OHCA cases (that will be NA)				Done
			No		Pending
			NA		Not Req.
4	Compliant to PPE Personal Protective Equipment (face mask & gloves or hand sanitizer)		Yes		Done
			No		Pending
			NA		Not Req.
5	High Risk & Informed consent taken from parents / caregiver and documented				Done
			No		Pending
			NA		Not Req.
6	IV cannula and fluid was properly labelled				Done
			No		Pending
			NA		Not Req.
7	Airway of the child maintained properly (neutral sniffing position)				Done
			No		Pending
			NA		Not Req.
8	Appropriate size & device of oxygen was used				Done
			No		Pending
			NA		Not Req.
9	If on bubble CPAP, that was working properly (with pacifier in mouth, OG passed and marking in cms)		Yes		Done
			No		Pending
			NA		Not Req.

10	If on inotrope, that was attached with infusion pump (as per availability)	Yes	Done
		No	Pending
		NA	Not Req.
	Compliant score in numbers	n=	
	% achieved total yes in compliant divided by all check boxes filled except NA	%	

APPENDIX G:

	Telemedicine Physician Checklist		
	Grade: 0= Noncompliance; 1=Partial Compliance; 2 = Compliance		
Dr ABC Shift Morning			
S.No	TM Physician Shift Performance Variable	Score	Comments
1	Started shift on time (cushion time will be of 15 minutes)		
2	Meet & Greet with on site-physicians in first hour		
3	Take a bird eye view of all the sites		
4	Number of incoming calls received for expert opinion		
5	Number of outgoing calls for virtual rounds		
6	Used PALS approach during consultation		
7	Used Medical protocol/PEMC of resuscitation room		
8	Maintain the TM room etiquettes (not allowed to eat in TM room)		
9	Being humble during communication		
10	Motivating the team during communication		
13	Did she avail extra break and not on seat		
14	Did he marked the break time by informing PIC		
15	Allowed irrelevant person on TM room		
16	Is his data entering is adequate (complete P1 coverage)		
17	Is TM physician filling module completely without leaving fields blank		
18	Is TM physician note adequate		
19	Is he entering CPR observation		
20	Did he enter doctor improvement sheet		
21	Did he sign out on time		
22	Did he report connectivity to the manager in due time?		
	Total	0	

APPENDIX H:

Key Performance Indicators (KPIs)

Fundraising

Annual Donor Growth

Average Donation Growth

Bank & Thank within 48 hours (sending official receipt and thank you letter)

Donor Retention Rate

Active vs Inactive Donors

Donor Visits

Marketing & Communication

Website & Social Channels Reach/Views

Landing Page Views/Link clicks

Timely release of Newsletters & Emails

Email Open and Click-Through Rates

Timely planning, launch, execution of zakat & other campaigns

Program Delivery

Number of Beneficiaries Served

Patient Satisfaction Rate

Text Messages Sent under Preventive Healthcare Program

Number of Telemedicine Satellite Centers

Number of Telemedicine Consultations

HR

50% Senior doctors in attendance at all times

Full and final settlement in less than 30 days

Salary on time before the first of each month

Clinical

Case Reviews

Morbidity and Mortality Reviews

Safe Discharge Practices

Compliance of PPE

Compassion towards Patients and Team

Compliance

Competence

Finance

External, Internal and Grant Audit completion and compliance for transparent bookkeeping.

GAP analysis and formulation of SOPs for effective internal controls

Stable liquidity position and maximization of profits on investment

Governance (Legal and tax laws compliance)

Timely payments to vendors