# Assessing the Feasibility and Acceptability of a wearable Device for Early Detection and Monitoring of Pediatric sepsis among Healthcare Workers and Health Facility Managers in a Peri-Urban Hospital in Dhaka, Bangladesh: A Scenario-Based Exploration

"Final Report of Summative Learning Project (SLP) presented to BRAC James P Grant School of Public Health, BRAC University."


By:

FIONA PAURU LEVI

MPH 20th Batch

ID # 24167024

BRAC James P Grant School of Public Health, BRAC University

Email: fiona.pauru@g.bracu.ac.bd

**Supervisors:**

Mrittika Barua

Assistant Professor and Deputy Director

Center of Excellence for Science of Implementation and Scale-Up (SISU)

BRAC James P Grant School of Public Health

Email: mrittika@bracu.ac.bd

&

Humayra Binte Anwar

Lecturer, BRAC James P Grant School of Public Health

Email: humayra.anwar@bracu.ac.bd

**Mentor:**

Dr. Jannatul Saki

Research Associate

James P Grant School of Public Health

Email: Jannatul.saki@bracu.ac.bd



Purpose: "In partial fulfilment of the requirements for the degree of Masters in Public Health (MPH)"

5th January 2025

## Table of Contents

**Abstract**

**Background**: Sepsis remains a leading cause of morbidity and mortality in under-five children globally, particularly in low-resource settings, with early detection playing a critical role in improving outcomes. This study explores the feasibility and acceptability of a wearable device designed for early sepsis detection and monitoring in a peri-urban hospital setting in Bangladesh, where such technology is not yet widely used.

**Methods**: A qualitative approach was used involving key informant interviews (KII) with nurses and doctors working in the pediatric department and the health facility managers at Sajida Foundation Hospital. Participants were asked about their perceptions of the wearable device, its usability, and potential barriers to its acceptance. The study applied the Theoretical Framework of Acceptability (TFA) and the data was analyzed thematically to identify key themes.

**Results**: Participants highlighted the device's ease of use, remote monitoring capabilities, ability to provide real-time updates, and potential to improve workflow efficiency and neonatal sepsis management. Concerns include infection control, cost, and the need for comprehensive training. The device was perceived as a valuable tool, particularly in resource-limited settings, provided that these challenges were addressed. Suggestions for integration with existing hospital systems and pilot testing were emphasized.

**Conclusion**: The findings demonstrate that wearable device technology for under five children sepsis monitoring is feasible and acceptable. Recommendations include pilot testing, healthcare provider training, and public awareness efforts. With careful implementation and ongoing evaluation, this technology has the potential to significantly improve early sepsis detection and outcomes in pediatric care settings in low-resource environments.

**Acknowledgment**

I would like to express my sincere thanks to my supervisors Mrittika Barua and Humayra Binte Anwar for their constant guidance, patience, and encouragement throughout this study.

I am also extending my gratitude to my mentor Jannatul Saki and the rest of the mentors under the Center of Excellence for Science of Implementation Research and Scale-up (SISU) for providing me with valuable input, advice, and support. I would also like to thank my data collector and translator for assisting in data collection and translation.

Special thanks to the BRAC James P Grant School of Public Health under the leadership of Dean Dr. Laura Reichenbach and the MPH team for their constant support and encouragement.

Extending my appreciation to Sajida Hospital for allowing me to conduct my research in the hospital and the participants for their contribution to my research project.

## Introduction

Sepsis is a life-threatening condition where an infection disrupts normal organ function and potentially leads to severe complications or death if not treated quickly. Globally, sepsis claims around 11 million lives annually (Giordano et al., 2024). In 2017, an estimated 20.3 million cases of sepsis occurred in children under five, and another 4.9 million cases were reported in older children and teenagers (Rudd et al., 2018).

In Southeast Asia, sepsis and severe sepsis affected nearly half of the adult population (48%) and over half of children (56%) studied. Children under five especially in low and middle-income countries (LMICs) face the highest risk, with infants and those with chronic illnesses being particularly vulnerable to severe complications and long-term health impacts (Gan et al., 2022). In Bangladesh, sepsis contributes to 39% of deaths in children under five and 37% of newborn deaths (National Institute of Population Research and Training, 2013). One of the main reasons for the high death rates from sepsis is the difficulty in spotting early symptoms and starting the right treatment on time (Claxton et al., 2020). For patients with septic shock, every hour of delay in treatment raises the risk of death by 8% (McGregor, 2014).

In Bangladesh, where healthcare resources are limited and advanced diagnostic tools are often out of reach, sepsis poses an even greater challenge. This highlights the pressing need for practical ways to identify and manage this life-threatening condition effectively (Fleischmann et al, 2016). This gap in identification delays proper treatment with antibiotics and add to the high death rates from sepsis (Rhodes et al, 2017). Thus there's an urgent need for additional diagnostic tools to help identify and manage sepsis early. Furthermore, many LMICs lack resources for continuous monitoring which is standard in high-income countries, making even basic vital sign checks a significant burden for overstretched healthcare workers. The challenges become even harder in places where there aren't enough staff or proper tools for monitoring and diagnosing sepsis (Weiss et al., 2020). Regular and accurate checks of sepsis severity are essential for good patient care. They help doctors act quickly, choose the right treatments, and make the best use of limited resources, ultimately reducing illness and saving lives (Kaur et al., 2014). There is still limited research from low- and middle-income countries (LMICs) on the best ways to assess sepsis severity to prioritize care effectively.

Digital health solutions, such as wearable devices, mobile health (mHealth) tools, and artificial intelligence (AI), offer promising ways to address these challenges (Kiyasseh, 2022) by facilitating continuous monitoring and early detection of vital signs indicative of deterioration.

While many of these systems have been developed and tested primarily with stable patients in high-income countries, their small size, lightweight design, and affordability compared to traditional bedside monitors make them more acceptable for use in low- and middle-income countries. However, despite their potential benefits, there has been limited research on the use of wearable technology for critically ill patients in resource-limited healthcare environments (Ghiasi et al, 2022) leaving a gap in understanding the feasibility and acceptability of such innovations in low-middle-income countries (LMICs). Addressing this gap is crucial, as sepsis disproportionately impacts children below the age of five in these regions, where healthcare infrastructure is often inadequate to support early detection and intervention.

A recent study at ICDDR, B hospital in Dhaka tested a wearable monitoring system that effectively tracked vital signs of under five children with sepsis. This system detected advanced sepsis without lab tests or clinician screenings, showing potential for use in resource-limited settings (Garben et al, (2024). However, because the study was conducted in ICDDRB, a specialized urban hospital, further research is needed to test the devices' feasibility and acceptance in more diverse healthcare environments, especially in rural or underserved areas.

This study is justified by the pressing need for effective solutions to reduce neonatal sepsis mortality in peri-urban hospitals like Sajida Hospital in Dhaka. Investigating the feasibility and acceptability of the wearable device technology in this context could pave the way for broader adoption and improved clinical outcomes. By focusing on healthcare workers' and facility managers' perspectives, this research provides insights into the practical and cultural considerations essential for successful implementation.

Unlike the ICDDR, B, study, this research took a scenario-based approach. We presented the device to the healthcare providers and explored their insights about the device. We aimed to determine whether the device could be accepted and integrated into the health care system in such a context.

**Research question**

How feasible and acceptable is the wearable device technology for early detection and monitoring of children under five with sepsis among healthcare workers and facility managers at a peri-urban hospital in Dhaka?

**Objectives**

1. To identify the current practice of sepsis management and control in the peri-urban hospital.
2. To identify anticipated barriers to implementing wearable device technology for sepsis detection among healthcare providers and facility managers in Sajida Hospital.
3. To identify the anticipated facilitators for using wearable technologies for sepsis detection among healthcare providers and facility managers in Sajida Hospital.

**Conceptual Framework**

This study used the Theoretical framework of Acceptability (TFA). The TFA assisted us in understanding the experiences of the implementers regarding the device by exploring their thoughts, concerns, and potential challenges they might face. Knowing these factors early could help us make adjustments so that the device fits better into user's daily lives which then leads to the acceptability and adoption of the device.

The TFA developed by Sekhon et al., (2017) consists of seven domains: affective attitude, perceived burden, ethicality, intervention coherence, opportunity costs, perceived effectiveness, and self-efficacy. Each of these domains plays a critical role in understanding the implementers' acceptance of the device.

In our study, Affective attitude was defined as how the healthcare providers feel about the device. Perceived burden was defined as perceived amount of effort that the health care providers have to put when using the device in their daily schedule. Ethicality here referred to how well the wearable device aligns with an individual's personal value system. Intervention coherence referred to an individual's understanding of how well the components of the wearable device align with its planned purpose and needs. For opportunity cost, we defined it as the degree to which engaging in the wearable device will require sacrificing or trading off between the resources (eg, time, money,

effort). Perceived effectiveness here was defined as the degree to which the wearable device is believed to be capable of fulfilling its purpose such as improving health outcomes or providing useful data. Self-efficacy was defined as the participant's belief in their ability to use the device effectively and confidently. All these definitions were adopted and contextualized for this study based on the work of Sekhon et al. (2017).

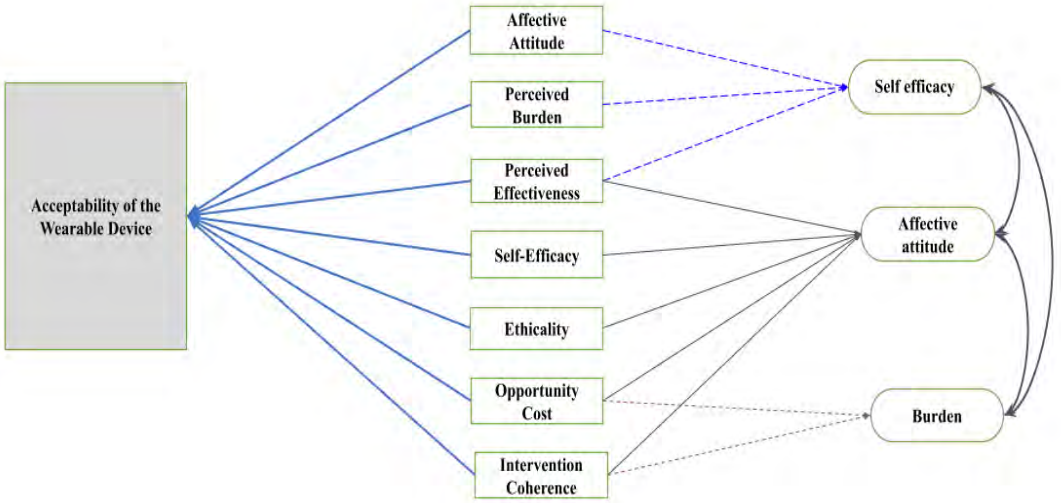


*Figure 1: Theoretical Framework of acceptability diagram illustrating the conceptual framework. The relationships between constructs are shown in the diagram with arrows indicating influences.*

This conceptual framework highlights the interactions between the seven domains that influence the acceptability of the wearable device for early sepsis detection in the hospital. For example, arrows from affective attitude, perceived burden, and perceived effectiveness to self-efficacy show that difficult to use may lower healthcare providers' confidence in using them effectively. Similarly, the arrows pointing to affective attitude represents the factors that influence healthcare provider's emotional responses to the wearable device. In the context of hospital adoption, opportunity cost influences the perception of burden. Further, intervention coherence plays a

critical role in shaping the burden. A device that seamlessly fits into healthcare providers' routines and aligns with hospital goals is likely to be perceived as less burdensome, increasing its overall acceptability.

## Methodology

### Study design and approach

The study used an exploratory qualitative approach to explore healthcare providers' perceptions of the pediatric wearable device in terms of affective attitude, perceived burden, perceived effectiveness, self-efficacy, ethicality, intervention coherence, and opportunity cost.

### Study site

The study was conducted in the Sajida Foundation Hospital which is a non-governmental organization (NGO) in a peri-urban area in the community of Keraniganj.

### Study population

The study population consisted of health facility managers, nurses, and doctors who are working in the pediatric department.

Inclusion Criteria:

- Health facility manager
- Pediatric Doctors
- Pediatric Nurses

Exclusion Criteria:

- Doctors who are working in the other department
- Nurses who are working in the other department
- Participants who were not willing to participate in the study

### Sampling Technique and sample size

We used convenient and purposive sampling technique in our study to explore the perception of the healthcare providers ensuring that participants have relevant experience with pediatric sepsis care and are available. We included 8 participants in our study and conducted key informant

interviews (KII) with them. Among the participants, two were health facilities managers, three doctors (two pediatric general doctors and one pediatric consultant), and three nurses (one nursing supervisor, one pediatric ward in charge, and one Neonatal Intensive Care Unit (NICU) in charge).

**Tool Development**

For data collection, a guideline was developed through an extensive literature review following the theoretical Framework of Acceptability (TFA) by Sekhon et al, (2017). The finalization of the guideline was done through several meetings with the supervisors, providing valuable inputs to refine the requirements effectively.

The tools were translated into the local language (Bangla) to ensure participants' comprehension. The tools were finalized after thorough review and revision, ensuring they were clear, relevant, and aligned with the study objectives. Ethical approval was obtained for their use in data collection.

**Data Collection Procedure**

After receiving ethical permission from the Institutional Board of BJPGSPH, we approached for permission for data collection at Sajida Hospital. After getting the permission we approached for the data collection. First, we contacted a health facility coordinator of Sajida Hospital and had a meeting regarding the procedure of data collection, the total duration of data collection, and the participants, and then finalized a schedule for data collection. A data collector was recruited full-time for the data collection and was trained properly. Data was collected through key informant interviews (KII). After the completion of each day's interviews, we fixed the participants for the next day's interviews ensuring the time and date. The interviews were done individually and in a private room to ensure confidentiality. Before the data collection procedure began, we obtained the signatures in the written informed consent form from each participant. Data was collected using a semi-structured guideline. We collected the data for five days (from Saturday 23$^{rd}$ November to Wednesday 27$^{th}$ November).

After obtaining their consent we introduced each participant to the device and explained how the monitoring process works. We describe how the patch is attached to the child to track key vital signs including heart activity (ECG), heart rate, respiratory rate and body temperature.

The device is connects to a mobile phone via Bluetooth, allowing the healthcare providers to view the readings anytime from anywhere. Additionally, the data can be synced to a central monitoring

system or computer for a broader overview. We explained that alerts will be sent automatically if any abnormalities are detected, ensuring prompt action can be taken quickly.

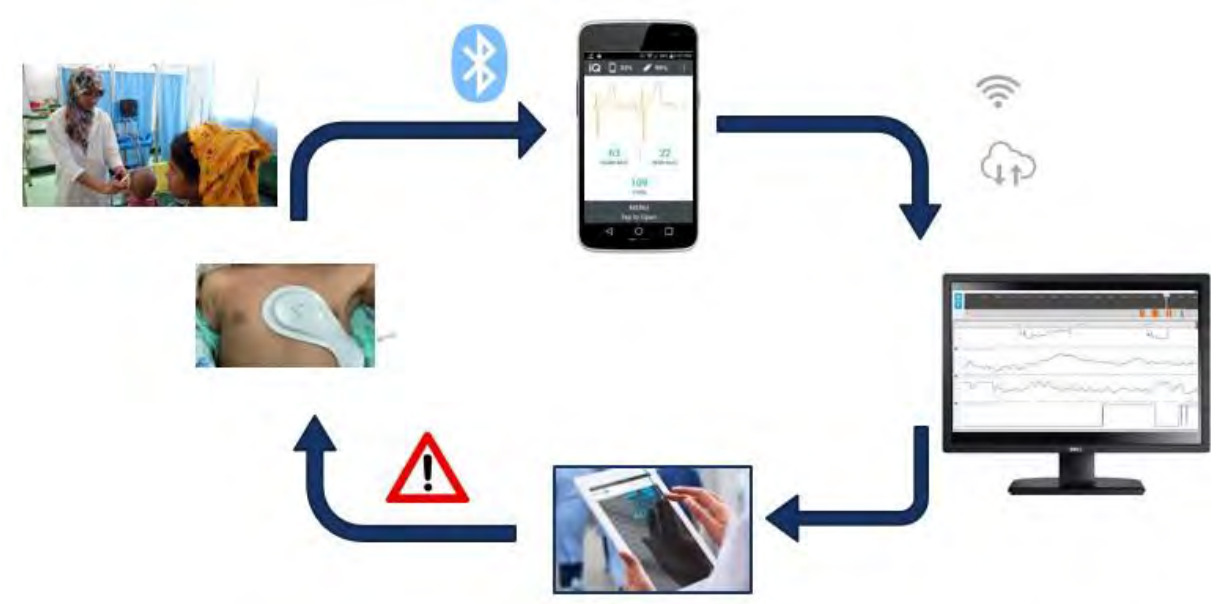

*Figure 2: Wearable-enabled Mobile health device used for children under five for early sepsis care and monitoring.*

**Data Analysis**

When data collection has been completed, translated and transcription from the record was done. Data familiarization was done by repeatedly reading the transcript. Then coding was done with priori code/thematic code, sub-theme, and emerging theme. A codebook was made and color coding was done. During coding intra coding reliability and inter coding reliability was checked. After that clustering and compiling of the data were done to make data display tables. Then the results were compared with existing literature.

**Ethical considerations**

We have taken ethical permission from the institutional review board of James P Grant School of Public Health. Permissions were also taken in Sajida Foundation Hospital before data collection. Written Informed Consent was taken for the respondents. The purpose of the study and its benefits

were explained to them. Confidentiality of the respondents has been maintained. Participants were voluntary and participants were allowed to skip any questions they didn't want to answer.

## Findings

The findings of the study are presented under these headings: socio-demographic information of the participants and the acceptability of the wearable device intervention using the TFA domains which include: affective attitude, intervention characteristics, self-efficacy, and ethicality.

## Socio-demographic information

In our study, we included a total of 8 participants for conducting Key Informant Interviews. Among them, 7 were females and 1 male, ages 30-50 years. We interviewed 2 facility managers, 3 nurses, and 3 doctors.

*Table 1: Socio-demographic profile of the participants*

| | |
|---|---|
| Total number of respondents | 08 |
| Sex | 7 Females, 1 male |
| Age group | 30 - 55 |
| Marital Status | All are married |
| Educational Level | College and University Graduate |
| Designation | 2 facility managers, 3 nurses, and 3 doctors |
| Years of Experience | Ranging from 6 - 18 years |

## Affective attitude

### *Ease of use*

Participants appreciated how easy the device was to use. They liked that it didn't require complicated steps. They valued the device's straightforward operation making it easy to use and its ability to provide continuous monitoring. This simplicity aligns with their readiness to adopt new technologies, emphasizing how ease of use reduces the cognitive burden associated with

integrating the device into the clinical practice. One participant notes, *"Of course, the device is good because it is easy to use. I am getting the signal if the child gets deteriorated. I will be updated continuously by myself, then it's a great benefit. It's my idea that it would help in my diagnosis."* (KII 1)

Another added, *"The way you showed me the device, I think it will be easy to operate."* (KII 2)

***Access to remote monitoring***

The ability to access remote monitoring, allowed them to stay informed about patient conditions even when they weren't physically present.

The participants emphasized the convenience of remote monitoring, which helps them stay informed even when they are not physically present. This capability reflects their willingness to embrace tools that complement their workflow and improve patient outcomes. One explained, *Suppose, if I am out, I would be able to see the child's condition.* (KII 2)

Another participant highlighted, *"I can use the device via my phone, and send messages to the doctor immediately, and the doctor can also message me with instructions."* (KII 8)

***Ability to overcome existing NICU challenges***

The device's potential to aid in tackling sepsis in under-five children was particularly appreciated, aligning with the healthcare workers' recognition of its value in addressing critical clinical needs. This optimism reflects their commitment to leveraging innovation tools to overcome existing challenges. A NICU staff member expressed; *"If the device comes that will help me in doing any work even a little, it will definitely be helpful for our NICU. I am hopeful that this initiative of yours, since ICDDRB has been using it for a long time, almost a year, we can also try it. I am positive that it will help us at least a little"* (KII 7).

***Concerns about Patient-provider relationship***

While participants generally welcomed the device, they also acknowledged potential challenges, such as the misperception among caregivers about the availability of healthcare staff. These concerns highlight the empathetic traits of healthcare workers who prioritized clear communication and relationship-building with caregivers.

A participant shared; *"My thoughts, my feelings are good. To say, better than good. Then again, there are also bad ones. For example, I may be able to see everything from here. But the patient party will not understand this. They will think that the nurses or doctors are not coming to see my patient…they will think we are not looking after them. I want to say that it is good to launch the device. In this era, everyone wants this high-quality treatment."* (KII 5)

***Limitations and Existing Systems***

Some participants felt that the device might not add much value in the NICU, where advanced systems already monitor vital signs like heart rate and oxygen levels. One participant explained, "*It's not like it will provide very much. Because these tasks, these monitoring are already being conducted by us. And we have good machinery" (KII 7).*

However, they saw the potential for the device in areas with fewer resources: *"If you go to the pediatric ward, you will see that it is very big. There are fewer facilities for monitoring there. If we bring the device, maybe we can do it a little better." (KII 7).* Highlighting the need to demonstrate how the device could address specific gaps or improve care in ways existing systems cannot.

**Perceived effectiveness**

***Ability to take immediate actions***

Participants highlighted the devices' potential to enhance care through continuous monitoring of key health indicators like temperature, respiratory rate, and heart rate. One participant noted the positive impact of tracking multiple vital signs, stating, *"I think certainly there will be a positive effect as it is maintaining three indicators like temperature, respiratory rate, or heart rate. So, it's a positive thing."* (KII 1).

The advantage of continuous monitoring, particularly in busy hospital environments, was also emphasized. Participants appreciated the ability to take immediate action during emergencies. As one said, *" If it shows me that child number three has dropped out of any rate, then I can immediately take an emergency measurement."* (KII 7)

***Belief in reputed institute like ICDDRB***

The reputation of ICDDR, B significantly influenced participants' confidence in the device. One participant expressed trust in the institutions' involvement, stating, "*But of course, as the ICDDR,*

*B is working on it, it will certainly be a positive thing*" (KII 1). This confidence stemmed from ICDDR, B's strong focus on patient care and healthcare delivery. As the participant noted, emphasizing the institution's focus on patient care. "*Of course, it's related. It's related to treatment. So, our focus itself is treating the patients, providing healthcare."* (KII 1)

***Improving workflow efficiency in emergencies***

Participants recognized the devices' potential to improve workflow efficiency, particularly during emergencies. One participant noted its values when managing multiple critical patients, stating, *"I thought it would be most beneficial when we have multiple emergency patients…If I am managing an emergency and they make an alarm, it would be easier* (KII 3).

***Accuracy and reliability***

Accuracy and reliability were central to participants' concerns about the device's performance. One Participant emphasized, *"When I check vitals manually, accuracy is always the priority."* When checking vital signs, reflecting the high standard for precision in clinical settings. Another noted the importance of striking a balance between speed and accuracy, stating, *"Devices can give faster readings, but for me, accuracy is just as important."* (KII 4).

These comments highlighted that while quick readings are useful, they cannot come at the expense of reliability. Accuracy is a fundamental requirement in healthcare, as errors can lead to incorrect diagnosis or treatment plans.

The concerns of accuracy was also seen among participants agreeing that reliable readings would make the device highly valuable, especially in NICU. They highlighted the importance of accurate readings: *"I think it will be very good if the reading is accurate,"* they concluded that the device would be valuable for their NICU; *"I think it will be worth using in our NICU."* (KII7)

Concerns were also raised about the device's compatibility with existing hospital equipment, with one participant asking, *"Does it adjust with the warmer or heater that we already use?"* (KII 8), reflecting a desire for the device to integrate smoothly into current hospital workflows.

***Concerns about infection Control***

Participants expressed significant concerns regarding infection control, safety and the overall suitability of the wearable device, especially on vulnerable infants in Neonatal Intensive Care Units (NICUs). Their concerns revolved around the device's materials, sterilization processes,

impact on the skin, and its ability to maintain patient safety over prolonged use especially when used on fragile newborns.

Participants raised questions about the materials used in the device's constructions, particularly the outer shell and its sterilization process. As one participant noted, *"If it is in the child's body, will it create any source of infection?"* and further questioned, *"What material is used to make the device? What is the outer shell made of?"* (KII 7). These queries highlight the need for thorough information about the device's design to ensure it does not introduce any risks of infection. Another crucial concern raised by the participant was the safety of the wearable device on delicate newborn skin, particularly for preterm or low birth weight babies. Neonatal skin is so much more fragile than that of older children, and even minimal contact or pressure can result in irritation or peeling off of skin. One participant emphasized, *"Handling such small babies is extremely risky for me because their skin can peel off even with minimal contact."* (KII 8) This concern emphasizes the importance of designing the device to be gentle on infants' skin, minimizing the risk of any skin damage from the device's use.

Additionally, they noted the importance of a device design that minimizes infection risks, particularly for neonates with underdeveloped immune systems. As one participant explained, "Young babies have lower immunity compared to other babies. And the immunity of a sick baby is even lower" (KII 7).

***Concerns about Usage duration and patient safety***

Moreover, participants expressed uncertainty about how long the device could remain in contact with the baby's skin without causing harm. One healthcare provider referred to their existing practices saying, *"If I insert a cannula, I remove it after 72 hours even if it's functioning perfectly, just to maintain infection control."* (KII8). This statement reflects the desire for clarity on the devices recommended usage period, which would help ensure it does not pose risks to the infant's skin or overall health.

Participants emphasized that the wearable device must demonstrate safety and efficacy in NICU settings before broader adoption can be considered. Infants in NICU often weigh less than 1 kilogram, with some as low as 800-900 grams making device suitability critical. As one participant noted, "*What is safe for you or a five-year-old child is not safe for a one-day-old or two-day-old*

*child". (KII 7).* This supports the need for rigorous testing and validation to ensure the device's compatibility with the delicate physiology of neonates.

One participant stated: "*for the acceptance of this machine to us, it has to do good work in the NICU. And after getting good feedback in the NICU, we can accept it."* (KII 7). Feedback from NICU trials would not only provide insights into the device's practical application but also build trust among healthcare providers. Positive outcomes in NICUs could pave the way for broader implementation in pediatric care settings, as they would demonstrate the device's ability to function effectively in the most challenging environments.

***Need for Collaboration and endorsement***

To successfully implement the wearable device, collaboration with various external stakeholders is crucial. This collaboration ensures that all necessary approvals are obtained, that any misinformation is avoided, and that the device is correctly understood and supported. External stakeholders including government health authorities, local administrators, political figures, and the press, all of whom play an important role in both providing necessary approvals and promoting accurate information about the device.

As highlighted by a participant, it's essential to proactively engage with these groups: *"We let them know if we do something like this... so that any misinformation does not get to them." (KII 6)*. Such engagement minimizes the risks of misunderstandings and helps establish the project. Open communication with these stakeholders can ensure proper licensing, making the device compliant with regulations and facilitating broader support from health systems and the public, which is critical for successful implementation.

Collaboration between organizations like BRAC and ICDDR, B is also identified as key to the project's success. These organizations often have extensive networks, experience and resources that can aid in the promotion and implementation of the device. One participant emphasized that organizations involved should actively promote the project, suggesting: *"You guys are not low-profile people or the organization... promotion should be more." (KII 7).*

## Perceived Burden

### *Potential to reduce workload*

The device offers several benefits in terms of reducing the physical workload of healthcare providers, which is highly valued by medical staff. One of the key advantages of the device is its ability to monitor patients remotely. This means the healthcare provider no longer needs to perform frequent in-person checks to assess the condition of patients, particularly in busy hospital settings where time and resources are limited. *"If it was here, then I could know about the other patient's condition quickly."* (KII3). The ability to quickly assess a patient's status remotely reduces the need for constant bedside visits, which in turn allows healthcare workers to focus on more critical tasks and optimize their time.

Another significant benefit identified by participants is the device's capacity to maintain patient records automatically. One healthcare provider appreciated this feature, noting: *"It will give me a record that I will have less physical work."* (KII 3). By automatically generating and storing records, that minimizes the need for Manuel data entry, reducing the administrative burden on healthcare staff. This contributes to a more efficient workflow, as medical professionals can easily access and review patient data without needing to spend additional time compiling or searching for information.

The device also enhances communication among healthcare providers, which is a critical factor in improving patient care. One participant emphasized how the device simplifies communication with consultants: *"If I want to tell or share anything with the consultant over the phone, I can say that."* (KII 3). By allowing healthcare workers to share real-time patient data remotely, the device streamlines communication with specialists, facilitating faster decision-making and more coordinated care. This ease of communication further improves the overall efficiency of patient management, as it reduces delays in seeking expert input or discussing treatment plans.

The convenience of the device and its ability to simplify tasks were central to participants' positive feedback. Many participants noted how it allows them to reduce their physical workload and focus on providing higher-quality care. One participant expressed that the device's utility lies in reducing the need for repeated physical visits to patients. *"The advantage for us, the doctors and nurses, is that we don't have to go to the child again and again."* (KII 5). This not only reduces the physical

effort involved in monitoring patients but also helps prevent burnout among staff by easing the repetitive nature of their work.

The ability to perform tasks remotely from the centralized location was another aspect that participants found beneficial. One participant highlighted: *"It would be good for me. Because my workload is decreasing."* (KII 5). The convenience of being able to perform tasks from a single location, without needing to be physically present with each patient, was perceived as a major time saver: "*If I can do everything sitting in one place, what greater advantage is there than that?"* (KII 5). This ability to streamline tasks and centralize responsibilities can improve workflow efficiency and contribute to a better work-life balance for healthcare workers.

***Optimized Time Management***

The device offered a significant advantage in optimizing time management for healthcare providers, a benefit that was highly appreciated by participants. In fast-paced hospital settings, time is one of the most valuable resources, and the ability to allocate it more effectively can directly impact the quality of patient care.

Participants highlighted how the device allows them to make better use of their time by streamlining patient monitoring and reducing the need for repetitive tasks. One participant explained: *"If through this, the time that I give to one patient, if I could give the same time to two patients, then it is easy for me."* (KII 3). This demonstrates how the device can help healthcare workers manage their workloads more efficiently by enabling them to monitor multiple patients simultaneously without compromising the quality of care provided to each individual. By freeing up time typically spent on routine physical checks and manual record-keeping, healthcare workers can focus on critical tasks such as diagnosing complex cases, providing hands- on care or attending to emergency situations.

***Cost Sensitivity and Affordability***

Cost sensitivity and affordability emerged as significant concerns among participants for the successful implementation of the wearable device, especially in resource limited settings. Participants highlighted challenges related to budget constraints, financial justifications and pricing strategies that align with the economic realities of healthcare settings in such contexts.

One Participant explained that budget limitations could require additional efforts to justify the devices inclusion: which may limit implementation *"The budget gets revised. We've done a revision once this year. If it goes out of budget, then I have to convince the higher authority."* (KII 6). This give emphasis to the importance of aligning the devices costs with existing financial resources to avoid potential delays or rejections during the approval process. In many healthcare facilities, budgets are planned precisely, and any deviation requires significant justification to higher management, which can be lengthy and uncertain process.

The concern about affordability extends beyond initial procurement to encompass the costs of implementation, maintenance, training, and ongoing technical support. Participants were likely aware that while the device might offer long-term benefits, its upfront costs and associated expenses could pose challenges. For instance, if the cost of the device is perceived as too high relative to the institutions financial capacity, it may not be prioritized over other critical expenditures.

Participants emphasized the importance of aligning the device's pricing with the economic realities of low-resource settings. A participant highlighted this need, saying, "*If you target this area, the price should be according to the area. This area people will of course, think about the price right?"* (KII 1). This emphasized that pricing strategies must be context-specific, taking into account the economic challenges faced by healthcare systems in resource-limited areas. Offering the device at a price point that aligns with local budgets increase its accessibility and ensures that it can be realistically adopted by hospitals and clinics.

Another participant drew attention to the disparity in affordability between developing and developed countries, stating: "*We are a third country. Our affordability would not be the same as developed countries. If it is free or cheap, then it's beneficial for us."* This perspective highlights the economic inequalities that influence the adoption medical technologies. While the develop countries may have the resources to invest in advanced healthcare tools, low resource settings require solutions that are either heavily subsidized or priced at a significantly lower rate to be viable. Providing the device free of charge or at a highly subsidized cost could greatly enhance its acceptance and implementation in these settings.

From an administrative standpoint, affordability also plays a central role in decision-making. One participant pointed out the challenges of balancing cost considerations with procurement needs:

*"The price is very important for me as I'm into administrative and procurements" (KII 6).* Administrators responsible for purchasing medical equipment often have to navigate strict budget constraints and prioritize expenditures based on available resources. If the device's cost exceeds these constraints, it could face significant hurdles in gaining approval, regardless of its potential benefits.

**Ethicality**

***Cultural and ethical concerns***

Cultural and ethical concerns play a significant role in the acceptance and use of a new healthcare technologies. Participants noted that some families might resist the device due to deeply rooted cultural values or ethical considerations. These concerns highlight the importance of addressing societal attitudes and beliefs when introducing new medical innovations.

In many cultures, hands on care by healthcare providers is considered the gold standard of patient care. This approach emphasizes direct, physical interaction between medical professionals and patients which can foster trust, reassurance and a sense of personalized attention. One participant reflected on this preference, explaining: *"The patient party will have ethical issues whether they will allow this device to use or not."* (KII 1). This indicated that some families might view technology-based interventions as impersonal or as a departure from traditional caregiving practices. Such perceptions could lead to hesitation or refusal to allow the device to be used on their child.

***Need for Consent from caregivers***

Obtaining informed consent from caregivers is a critical and practical component in implementing wearable devices for monitoring pediatric sepsis. Participants highlighted the importance of ensuring parents fully understand the device's purpose, functionality and potential risks before consenting to its use.

Participants emphasized that parental consent is non-negotiable and aligns with established hospital practices. One participant noted, *"We will use it on the patient whose parents will give us consent." (KII 1).* This reflects the ethical principle of autonomy, which ensures that parents have the ultimate authority to decide whether to permit the use of the device on their child. The process mirrors consent requirements for other medical interventions, such as administering IV fluids: *"I*

*have to take their permission before attaching the device as well. I can't apply the device until we receive the consent"* (KII 2). This underscores the centrality of informed consent in pediatric healthcare settings, where parents act as the decision makers on behalf of their children.

Participants highlighted differences in how consent is approached across health acre contexts. For example, one participant noted, *"In government hospitals, the inpatient* themselves *would tell you, 'Do whatever you like to do for your better treatment.' But here, you'll have to make parents understand so many things"* (KII 1). This distinction reflects varying levels of trust and autonomy in different hospital environments. In government hospitals, patients or families may exhibit a higher degree of trust in healthcare providers and grant consent more readily. In contrast, private or semi-private settings may require more detailed explanations and reassurance to secure consent.

**Intervention Coherence**

The successful implementation of the wearable device for early sepsis detection relies on initial training, ongoing technical support, and repeated training sessions to ensure that the device integrates seamlessly into the hospital's established practices. Both of these elements are essential for achieving intervention coherence, where the new technology is seen as a natural extension of existing workflows.

***Introduction of intervention***

When introducing a new technology or intervention in a hospital, the new tool or method must fit within the existing workflows and practices. Initial and ongoing training sessions were repeated given emphasis to as crucial as one participant mentioned: *"There should be an introductory session on the device first. This is one step."* (KII 1). By providing an introductory session, the wearable device is positioned within the context of the hospital's current procedures. The training helps hospital staff understand how the device will complement or enhance their existing practices, making it more likely to be accepted and integrated smoothly into routine hospital procedures.

Initial engagement with the key technical personnel involved in the device's development is necessary to ensure its effective use in the hospital setting. One participant stressed the importance of the main technicians' presence to facilitate communications between the device developers and healthcare providers: "The main technician of the device needs to come. They need to talk to the doctors, nurses, and paramedics." (KII 7)

***Training and counseling support***

Comprehensive training and counseling support are critical to the successful implementation. Participants highlighted the importance of equipping healthcare staff with the knowledge and confidence to use the device effectively. Participants consistently emphasized that training is a fundamental step in ensuring the devices' effective use. One participant explained, *"We must be trained on this. If we don't, we won't be able to understand or learn."* (KII 5). Participants strongly emphasized the importance of proper training to effectively use the device, viewing it as an essential part of their professional development. One participant noted, *"If you guys give us time, we will of course give training. It's a must."* (KII 6), suggesting that adequate preparation is needed to integrate the device, but also about fostering confidence in staff, which ultimately improves their performance in patient care.

Participants also emphasized the necessity of ongoing training to adapt to the learning curve associated with new technology. One healthcare provider explained, *"We need the training because it's a new device we don't know much about this. If there is any orientation, then it will be helpful for everyone".* (KII 3). Repeated training sessions were suggested to allow staff to refine their skills, resolve uncertainties, and stay updated on advancements or troubleshooting techniques. A culture of continuous learning, as highlighted by another participant, ensures staff competency: *"Making mistakes is normal. But we have the opportunity for training. It's actually our priority."* The participant continued by saying *"An employee has to take at least two trainings. And maximum number might be so many. It would be much more if it is a clinical subject."* (KII 6). Establishing a culture of continuous learning ensures that staff feel supported and competent in using the device, ultimately leading to better patient outcomes.

Counseling was seen as a key strategy. Healthcare providers emphasized the need for continuous engagement and empathy to foster acceptance among the caregivers: "*You have to keep on making them understand. We have to do a lot of counseling, making them understanding and promoting this."* They acknowledge resistance to new technology: *"No one will accept a new thing suddenly. It may gradually get accepted by the people, but not at once*." (KII 2) *"I can counsel them and explain the benefits, but I can't force anyone." "If they agree and are happy with it, I suggest it, but I won't pressure poor patients." "I explain that it helps me get updates about the child, but it's always their choice."* (KII 3). Participants emphasized the importance of addressing potential

patient concerns about costs and intentions behind the device. Transparent communication is key to building trust. *"We have to make them understand that it's for the betterment of your children, it's not meant to earn money, it's for the treatment." (KII 2)* Cost remains a significant barrier for many patients. While some may prioritize their child's health over costs, others may hesitate due to financial constraints.

***Integration with existing systems and support***

Participants highlighted the importance of ensuring that the wearable device for sepsis monitoring integrates seamlessly with existing hospital systems. This integration is key to maintaining coherence in the workflow and enhancing its utility without disrupting established practices.

Participants pointed out that the new device compatibility with current monitoring systems is critical for acceptance and usability. One participant explained, "*We already have monitoring machines that show temperature, blood pressure, and other readings. This device could be connected to those monitors to display additional information."* (KII 8). This reflects a practical approach to innovation leveraging existing infrastructure to enhance the device's value without requiring a complete refit of hospital equipment.

However, the most critical aspect of successful implementation is gaining the approval and trust of senior medical professionals, especially pediatric consultants. These professionals hold significant decision-making authority within their respective departments, and their endorsement is seen as essential for moving forward. One participant explained that pediatric consultants' opinions are vital to ensure the device's credibility: *"Yes, our consultants who work in the pediatric department if they think it is applicable considering all the pros and cons. We don't have any problem." (KII 2).* If the consultants believe the device is useful and beneficial, it will be adopted. Another participant reiterated this, stating that the senior consultants are the key to building trust and acceptance: *"if senior consultants recommend this, they will give it. In this regard, our word might not work here." (KII 3).* Therefore gaining their support is essential for securing approval and proceeding with administrative and managerial steps.

## Self-efficacy

### *Opportunity to enhance skills*

The introduction of a new digital device for sepsis monitoring is seen by participants as an opportunity to enhance their professional skills and increase their confidence in using technology. This willingness to learn and adapt highlights an openness to innovation and a recognition of the importance of technological advancements in healthcare.

Many participants expressed that working with a new digital device would allow them to develop new skills and increase their overall competency. One participant remarked, *"If a new digital device comes in, we will get to know about that. So, our skills will be developed as we will work with a new device."* (KII 2). This shows that the introduction of new technology is seen not just as a tool to improve patient care, but also as a way for healthcare providers to grow professionally. The opportunity to work with new technology is seen as an avenue to enhance their expertise, which in turn can boost their confidence in performing their duties.

The ability to operate new technology is acknowledged as a crucial part of patient care. Participants recognized that, while practical skills are essential, they also need a thorough understanding of the technology to effectively use it. One participant said, *"My personal skills are mine. But if I use a device, I think it can be very helpful."* (KII 3). This reflects a broader recognition that technological skills complement and enhance the practical skills required in healthcare.

Another participant added, *"I can't do anything without knowing something about it. I have to work on it with understanding,"* (KII 5), which emphasizes that healthcare provider's need adequate knowledge before they can effectively use any device. This illustrates the critical role that training and familiarity with new devices play in ensuring their proper application in clinical practice.

Participants also expressed the belief that learning new technology would enhance their overall skill set. *"Learning a new thing never reduces skills." (*KII 6) was a sentiment shared by multiple participants, emphasizing that learning and adapting to new devices or systems strengthens their capabilities rather than diminishing them. This reflects an eagerness to embrace technological advancements and the positive view of technology as a tool for personal and professional growth.

The metaphor of the Wright brother's perseverance in the face of failure highlights the participants understanding that innovation often requires time, trial and persistence. One participant stated, *"How many times Wright brothers failed? It's not so easy."* (KII 6). This perspective illustrates that they are aware of the challenges that might arise when integrating new technologies but are nonetheless optimistic about the benefits. They recognize that the initial implementation may face difficulties but believe that, with time, the technology will prove valuable. This mentality is reflected in the statement, *"If we stay with it at the first step, I think it's a great thing."* (KII 6) highlighting their readiness to overcome early challenges for long term success. Overall, the participants demonstrated a readiness to embrace new technology, provided they received the proper training and support.

**Discussion**

The current research assessed the feasibility and acceptability of scaling up the wearable device technology for early sepsis detection and monitoring among nurses, doctors, and health facility managers at Sajida Hospital in a peri-urban area in Dhaka, using the Theoretical framework of acceptability (TFA). By applying the TFA, the current research provides a more comprehensive evaluation of the intervention compared to general acceptability assessments. The TFA focuses on both perceptive and emotional responses, offering a deeper understanding of how the wearable device is perceived by those involved in delivering it. This multi-faceted approach is essential for determining whether the intervention can be effectively expanded (Pavlova et al. 2020)

The results indicated that healthcare professionals generally viewed the device positively, with perceptions of low burden, high potential effectiveness, and good alignment with existing hospital practices. However, some concerns regarding the device's integration and sustainability were also noted.

One of the most striking findings was the positive reception of the device in terms of ease of use and perceived utility. Healthcare professionals found the device to be a helpful tool in detecting sepsis early, and the majority felt that it would be easy to incorporate into their daily routines. This finding aligns with previous studies that suggest healthcare workers are more likely to adopt technologies they perceive as user-friendly and beneficial to their workflow (Kim et al., 2024). The ease of use was likely influenced by the device's intuitive design and the familiarity of healthcare professionals with similar technologies. However, if such perceptions of ease were not

maintained throughout the implementation, user engagement might decline, which could affect the intervention's success. Ensuring ongoing training and support could mitigate this risk and maintain a high level of engagement over time. This finding resonates with studies in low-resource settings highlighting the role of education in facilitating the adoption of new medical technologies to ensure effective device utilization where Labrique et al (2018), mentioned that one of the five critical success factors of digital health is engaging all stakeholders ensuring they are well-trained, motivated, and prepared to embrace the new initiative.

Another significant finding was the perceived low burden associated with using the wearable device. Participants reported that the device would not disrupt their clinical duties or add substantial extra work. This is an encouraging result, as many healthcare technologies fail to gain power when they are seen as burdensome or time-consuming. The low burden perception may stem from the device's function as an additional support tool rather than a standalone intervention. This aligns with studies by Watt et al. (2019), which found that healthcare workers are more likely to accept tools that complement their existing practices rather than replace them. If these low-burden perceptions hold true in a larger-scale implementation, it would increase the likelihood of the device's acceptance across various healthcare settings.

However, some participants expressed concerns about the long-term integration of the wearable device, particularly regarding maintenance and potential technical malfunctions. This concern points to a key challenge in scaling up the intervention. If the technical issues are not addressed, it could lead to frustration among users and hinder the long-term success of the device. The hospital's technical support system and regular maintenance schedules would be crucial to mitigate this risk. Other studies, such as those by Keyworth et al. (2018), have similarly highlighted the importance of technical support in ensuring the sustainability of healthcare technologies. Future efforts should focus on providing robust training for healthcare providers and establishing a reliable support system for addressing technical problems promptly.

A key finding in this study was the strong belief among healthcare professionals in the potential effectiveness of the wearable device for early sepsis detection. Participants felt that the device could significantly improve patient outcomes by providing timely alerts about deteriorating conditions, which could lead to faster intervention and treatment. This finding is consistent with similar research (Choi et al, 2022), which showed that healthcare professionals are more likely to

adopt interventions that they perceive as effective in improving patient care. The positive attitude toward the device's effectiveness could be attributed to the device's ability to provide real-time, actionable data, which complements the clinical decision-making process.

However, if the device's effectiveness is not consistently demonstrated across different patient populations, its perceived value could diminish. If the device is not able to detect sepsis reliably in all cases or provides false positives, it could undermine trust in the technology and discourage its use as some participants in our study kept stressing on the accuracy and reliability of the device as paramount. To address this, future studies should evaluate the device's effectiveness across a range of patient profiles and ensure that it meets the accuracy standards required in clinical settings. Studies like those by Dudarev et al. (2023) emphasize that continuous monitoring and evaluation of a device's clinical impact are essential for maintaining healthcare professionals' trust in its effectiveness.

Obtaining informed consent from caregivers was also identified as a critical aspect of ethicality. Participants emphasized the importance of ensuring that parents and caregivers fully understand the device's purpose, benefits, and potential risks before consenting to its use (Kakar et al. 2014). However, challenges may arise in environments where health literacy levels vary widely. Practical strategies, such as counseling and awareness may be helpful as evident in other research. For example, Patil et al. (2022) found that clear, culturally relevant consent processes significantly increased caregiver trust in neonatal monitoring technologies.

As per the current research findings, transparent communication and trust-building were emphasized as crucial for addressing skepticism regarding the device's intent, particularly in contexts where caregivers might question whether its introduction is profit-driven.

Overall, addressing ethical challenges requires a multifaceted approach that incorporates cultural sensitivity and clear communication. By prioritizing these elements, the introduction of the wearable device can align with ethical principles while fostering trust and acceptance among caregivers and healthcare providers alike.

Another significant theme that emerged was the high level of self-efficacy among healthcare professionals regarding the wearable device. Participants expressed confidence in their ability to use the device effectively, particularly due to their experience with similar healthcare technologies but non-digital. This high self-efficacy is crucial for the successful integration of new technologies

into clinical practice, as it is closely linked to the intention to adopt and use an intervention (Pekmezi et al., 2009). When healthcare providers feel capable of using the technology and believe that it will improve their practice, they are more likely to adopt it.

The high self-efficacy observed in this study can likely be attributed to the simplicity and user-friendly design of the wearable device. However, it's important to note that self-efficacy can be influenced by training and support. If the device is scaled up and implemented in other settings, healthcare professionals who are unfamiliar with the technology may experience lower self-efficacy, which could hinder adoption. To address this, it is crucial to offer comprehensive training and ongoing support to ensure that all healthcare providers feel confident using the device. Studies by Labrique et al. (2018) also highlight the importance of training in boosting self-efficacy and ensuring long-term engagement with new technologies.

**Limitations**

Despite the promising results, this study has several limitations. Firstly, as this is a master's thesis and there is limited time and funds this study focuses on theoretical perspectives due to lack of hands-on experience with the device. Secondly, the sample size was relatively small, and the study was conducted at a single hospital which is a privately run hospital, which may affect the generalizability of the findings. Additionally, potential biases may arise from the self-reported data collected during interviews. Thirdly, this study did not include the caregiver's perspectives, which are critical for understanding the broader acceptability of the device. Future studies should address this gap by incorporating diverse stakeholder viewpoints and aim to include a larger and more diverse population and governmental-run hospitals to validate these findings further.

**Recommendation**

As we know, sepsis is one of the most important causes behind under five mortalities. So, prevention to develop sepsis is must to prevent the mortalities. This new innovation will help the healthcare provider to identify the progress of developing sepsis, so that the healthcare providers can take immediate actions to halt the progress of sepsis. Policymakers should consider promoting the adoption of such technologies in clinical settings, especially in low- and middle-income countries where resources are scarce.

Hospital management and policymakers should consider subsidizing the devices' cost or integrating it into the existing healthcare budgets. Allocating funds for these devices, offering subsidies, or integrating them into existing budgets will make them more accessible, particularly in low-resource settings. By doing so, both patients and healthcare providers can benefit without financial strain.

Proper training for healthcare workers is another critical aspect. Organizing workshops and practical training sessions as well as ongoing training sessions will ensure that doctors and nurses are confident and skilled in using the device. This step will not only improve the technology's use but also help integrate it seamlessly into their daily routines.

Building trust with families and caregiver is equally important. Many families may initially hesitate to accept the device due to unfamiliarity or cultural concerns. Regular counseling sessions, open communication and demonstrations of the devices benefits can help address these concerns and foster acceptance.

Finally, future research should focus on large-scale trials to evaluate the long-term impact of the wearable device on sepsis outcomes and explore its adaptability in different healthcare contexts.

**Conclusion**

Using the TFA framework was helpful in assessing the acceptability and feasibility of the wearable device. This study demonstrates that the wearable device for early detection and monitoring of pediatric sepsis is both feasible and acceptable among healthcare workers and facility managers at Sajida Hospital in a peri-urban area in Dhaka. While the device shows promise in enhancing neonatal sepsis management through real time monitoring and workflow efficiency, its successful implementation requires addressing the recommendations given. Future research should explore caregivers' perspectives and assess the devices integration into diverse healthcare settings to validate its effectiveness and scalability.

## References


Claxton, A., Papafilippou, L., Hadjidemetriou, M., Kostarelos, K., & Dark, P. (2020). The challenge of recognising sepsis: Future nanotechnology solutions. *Journal of the Intensive Care Society*, *21*(3), 241–246. https://doi.org/10.1177/1751143719896554

Choi, A., Chung, K., Chung, S. P., Lee, K., Hyun, H., & Kim, J. H. (2022). Advantage of Vital Sign Monitoring Using a Wireless Wearable Device for Predicting Septic Shock in Febrile Patients in the Emergency Department: A Machine Learning-Based Analysis. *Sensors*, *22*(18), 7054. https://doi.org/10.3390/s22187054

Dudarev, V., Barral, O., Zhang, C., Davis, G., Enns, J. T. (2023). On the Reliability of Wearable Technology: A Tutorial on Measuring Heart Rate and Heart Rate Variability in the Wild. *Sensors (Basel, Switzerland)*, *23*(13), 5863. https://doi.org/10.3390/s23135863

Fleischmann, C., Scherag, A., Adhikari, N. K., Hartog, C. S., Tsaganos, T., Schlattmann, P., Angus, D. C., Reinhart, K., International Forum of Acute Care Trialists (2016). Assessment of Global Incidence and Mortality of Hospital-treated Sepsis. Current Estimates and Limitations. *American journal of respiratory and critical care medicine*, *193*(3), 259–272. https://doi.org/10.1164/rccm.201504-0781OC

Gan, M. Y., Lee, W. L., Yap, B. J., Seethor, S. T. T., Greenberg, R. G., Pek, J. H., Tan, B., Hornik, C. P. V., Lee, J. H., & Chong, S. L. (2022). Contemporary Trends in Global Mortality of Sepsis Among Young Infants Less Than 90 Days: A Systematic Review and Meta-Analysis. *Frontiers in pediatrics*, *10*, 890767. https://doi.org/10.3389/fped.2022.890767

Garbern, S. C., Mamun, G. M. S., Shaima, S. N., Hakim, N., Wegerich, S., Alla, S., Sarmin, M., Afroze, F., Sekaric, J., Genisca, A., Kadakia, N., Shaw, K., Rahman, A. S. M. H., Gainey, M., Ahmed, T., Chisti, M. J., & Levine, A. C. (2024). A novel digital health approach to improving global pediatric sepsis care in Bangladesh using wearable technology and machine learning. *PLOS Digital Health,* *3*(10), e0000634. https://doi.org/10.1371/journal.pdig.0000634

Ghiasi, S., Zhu, T., Lu, P., Hagenah, J., Khanh, P. N. Q., Hao, N. V., Vital Consortium, Thwaites, L., & Clifton, D. A. (2022). Sepsis Mortality Prediction Using Wearable Monitoring in Low-Middle Income Countries. *Sensors (Basel, Switzerland)*, *22*(10), 3866. https://doi.org/10.3390/s22103866

Giordano, M., Dheman, K., & Magno, M. (2024). SepAI: Sepsis alerts on low power wearables with digital biomarkers and on-device tiny machine learning. *IEEE Sensors Journal*. https://doi.org/10.1109/JSEN.2024.3424655

Kakar, H., Gambhir, R. S., Singh, S., Kaur, A., & Nanda, T. (2014). Informed consent: corner stone in ethical medical and dental practice. *Journal of family medicine and primary care*, *3*(1), 68–71. https://doi.org/10.4103/2249-4863.130284

Kaur, G., Vinayak, N., Mittal, K., Kaushik, J. S., & Aamir, M. (2014). Clinical outcome and predictors of mortality in children with sepsis, severe sepsis, and septic shock from Rohtak, Haryana: A prospective observational study. *Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine*, *18*(7), 437–441. https://doi.org/10.4103/0972-5229.136072

Keyworth, C., Hart, J., Armitage, C.J., Tully, M, P. What maximizes the effectiveness and implementation of technology-based interventions to support healthcare professional practice? A systematic literature review. *BMC Med Inform Decis Mak* **18**, 93 (2018). https://doi.org/10.1186/s12911-018-0661-3

Kim, S., Zhong, Y., Wang, J., & Kim, H. -S. (2024). Exploring Technology Acceptance of Healthcare Devices: The Moderating Role of Device Type and Generation. *Sensors*, *24*(24), 7921. https://doi.org/10.3390/s24247921

Kiyasseh, D., Zhu, T., Clifton, D. (2022). The promise of clinical decision support systems targetting low-resource settings. *IEEE Reviews in Biomedical Engineering. (15):*354–71. https://doi.org/10.1109/ RBME.2020.3017868

Labrique, A, B., Wadhwani, C., Williams, K, A,. Lamptey, P., Hesp, C., Luk, R., Aerts, A. (2018). Best practices in scaling digital health in low and middle-income countries. *Globalization andHealth**14,***(103) https://globalizationandhealth.biomedcentral.com/articles/10.1186/s12992-018-0424-z#citeas

McGregor C. (2014). Improving time to antibiotics and implementing the "Sepsis 6". *BMJ quality improvement reports*, *2*(2), https://doi.org/10.1136/bmjquality.u202548.w1443

National Institute of Population Research and Training (NIPORT), Mitra and Associates, & ICF International. (2013). *Bangladesh Demographic and Health Survey 2011*. Dhaka, Bangladesh: NIPORT, Mitra and Associates, and ICF International.

Patil, V., Singhal, D. K., Naik, N., Hameed, B. M. Z., Shah, M. J., Ibrahim, S., Smriti, K., Chatterjee, G., Kale, A., Sharma, A., Paul, R., Chłosta, P., & Somani, B. K. (2022). Factors Affecting the Usage of Wearable Device Technology for Healthcare among Indian Adults: A Cross-Sectional Study. *Journal of clinical medicine*, *11*(23), 7019. https://doi.org/10.3390/jcm11237019

Pavlova, N., Teychenne, M., Olander, E. K. (2020). The Concurrent Acceptability of a Postnatal Walking Group: A Qualitative Study Using the Theoretical Framework of Acceptability. *International journal of environmental research and public health*, *17*(14), 5027. https://doi.org/10.3390/ijerph17145027

Pekmezi, D., Jennings, E., Marcus, B. H. (2009). EVALUATING AND ENHANCING SELF-EFFICACY FOR PHYSICAL ACTIVITY. *ACSM's health & fitness journal*, *13*(2), 16–21. https://doi.org/10.1249/FIT.0b013e3181996571

Rhodes, A., Evans, L. E., Alhazzani, W., Levy, M. M., Antonelli, M., Ferrer, R., Kumar, A., Sevransky, J. E., Sprung, C. L., Nunnally, M. E., Rochwerg, B., Rubenfeld, G. D., Angus, D. C., Annane, D., Beale, R. J., Bellinghan, G. J., Bernard, G. R., Chiche, J. D., Coopersmith, C., De Backer, D. P., Dellinger, R. P. (2017). Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive care medicine*, *43*(3), 304–377. https://doi.org/10.1007/s00134-017-4683-6

Rudd, K. E., Kissoon, N., Limmathurotsakul, D., Bory, S., Mutahunga, B., Seymour, C. W., Angus, D. C., & West, T. E. (2018). The global burden of sepsis: barriers and potential solutions. *Critical care (London, England)*, *22*(1), 232. https://doi.org/10.1186/s13054-018-2157-z)

Sekhon, M., Cartwright, M., Francis, J. J. (2017). Acceptability of healthcare interventions: an overview of reviews and development of a theoretical framework. BMC health services research, 17(1), 88. https://doi.org/10.1186/s12913-017-2031-8

Watt, A., Swainston, K., & Wilson, G. (2019). Health professionals' attitudes to patients' use of wearable technology. *Digital health*, *5*, 2055207619845544. https://doi.org/10.1177/2055207619845544

Weiss, S. L., Peters, M. J., Alhazzani, W., Agus, M. S. D., Flori, H. R., Inwald, D. P., Nadel, S., Schlapbach, L. J., Tasker, R. C., Argent, A. C., Brierley, J., Carcillo, J., Carrol, E. D., Carroll, C. L., Cheifetz, I. M., Choong, K., Cies, J. J., Cruz, A. T., De Luca, D., Deep, A., Tissieres, P. (2020). Surviving sepsis campaign international guidelines for the management of septic shock and sepsis-associated organ dysfunction in children. *Intensive care medicine*, *46*(Suppl 1), 10–67. https://doi.org/10.1007/s00134-019-05878-6