

The Impact Of Telemedicine On Pediatric Emergency Care: Current Trends And Future Directions

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Background: Telemedicine consultations are bringing specialists virtually into emergency departments in the care of severely ill children that potentially reduce unnecessary transference by facilitating the pediatric professionals to virtually analyse the patients and making precise recommendations. The aim of the study is to analyse the impact of telemedicine on Pediatric emergency care concerning current trends and future directions. The first objective is to analyse the efficiency of telemedicine in pediatric emergency care considering current trends. The second objective of the study focuses on evaluating the challenges of telemedicine in pediatric emergency care. The third research objectives explore future innovations and directions of telemedicine in pediatric emergency care.

Methods: A mixed research approach has been used in the study. In this research, a systematic literature review has been conducted on 4 peer reviewed journals. Moreover, a semi-structured survey also has been conducted with 10 pediatricians provides emergency care. In addition, in pediatric emergency care, application of telemedicine is gaining immense prominence.

Results: From the thematic analysis, it is found that there are various benefits and challenges of considering telemedicine in pediatric emergency care. The survey revealed that telemedicine has been effective in enhancing efficiency in pediatric emergency care. The healthcare professionals and clinicians are confident in using telemedicine. It is recommended that improving technological infrastructure and increasing pediatric training for care providers in healthcare is essential for further betterment of telemedicine in pediatric emergency care.

Conclusion: Telemedicine interventions are found effective in terms of pediatric emergency care delivery. There are advantages with the application of this technology like safest and timely management, convenience, low cost and others. However, there have been critical challenges as well including lack of familiarity, lack of buy-in, technological glitches and others.

Introduction

Telemedicine is the extensive use of telecommunication technologies for perfect delivery of healthcare services. As of 2023, there are more than 116 million users of doctor consultations online across the world (Stewart, 2024). As depicted by Marcin *et al.* (2023), telemedicine consultations are bringing specialists virtually into emergency departments in the care of severely ill children that potentially reduce unnecessary transference by facilitating the pediatric professionals to virtually analyse the patients and making precise recommendations. With more than 80% of non-urgent care visits being relatable to feeding and sleep issues, telemedicine solves for the fragmented healthcare system and makes certain the smoothest journey for parents who necessitate medical advice beyond the primary pediatric care (Aquino, 2023). However, some of

the challenges in pediatric emergency telemedicine include technological glitches, lack of provider buy-in, credentialing, misaligned incentives and others (Uscher-Pines and Kahn, 2024). Further, it brings a significant level of interruption in the workflow in the busy emergency departments. In such a context, this research delved into examining the influence of telemedicine in pediatric emergency care facilities.

Research Aim

The research aim is to analyse the impact of telemedicine on Pediatric emergency care concerning current trends and future directions.

Objectives

- To analyse the efficiency of telemedicine in pediatric emergency care considering current trends
- To evaluate the challenges of telemedicine in pediatric emergency care
- To explore future innovations and directions of telemedicine in pediatric emergency care

Research Questions

Q1. What is the efficiency of telemedicine in pediatric emergency care considering current trends?

Q2. What are the challenges of telemedicine in pediatric emergency care?

Q3. What are the future innovations and directions of telemedicine in pediatric emergency care?

Methodology

Study Design

In this research, a mixed-method approach has been used for conducting the study concerning the impact of telemedicine in pediatric emergency cares. The mixed research approach has enabled the study to conduct both primary quantitative and secondary qualitative research methods. A descriptive research design has been adopted in the study to provide unique and key insights of the existing sources of knowledge and survey results. As per the ideas of Siedlecki (2020), a descriptive research design allows the study to describe individuals, conditions or events by studying them in their nature.

Participants and Sampling

A simple random sampling technique has been used in the research which has allowed the study to select research participants on a random basis without considering any including criteria. According to the opinion of Bhardwaj (2019), the main purpose of a simple random sampling technique is that it helps a researcher to eliminate potential biases. The participants of the semi-structured survey were 10 pediatric emergency care service providers

Data Collection

1. Literature Review: A systematic literature review has been conducted with 4 peer reviewed articles or journals in order to collect secondary qualitative data. The inclusion criteria for selecting these secondary sources has been a specific time frame between 2019 to 2024. Moreover, the research has also made sure to collect data only from those sources which contain the research topic keywords such as telemedicine, pediatric care, emergency care, telemedicine trends and future aspects of telemedicine and published in English language.

2. Semi-Structured Survey: A semi-structured survey has been conducted in the study with 10 nurses who are specialized in providing pediatric emergency care. For the semi-structured survey, 7 close-ended questions have been used as a research instrument to gather primary quantitative data.

Q1: What is your age?

Q2: What is your work experience as a pediatric emergency care service provider?

Q3: Do you agree with the fact that telemedicine has contributed to increasing the efficiency of pediatric emergency care?

Q4: Do you feel confident enough to utilise telemedicine tools while providing care to pediatric patients?

Q5: As a pediatric care attendant, to what extent do you agree that telemedicine has reduced the work pressure on you?

Q6: How far do you agree or disagree with the fact that telemedicine can continue to play effective roles in the future of pediatric emergency care?

Data Analysis: Thematic analysis has been conducted in this research to analyse and interpret secondary qualitative data from the systematic literature review. According to the opinions of Vaismoradi and Snelgrove (2019), a thematic analysis helps a study to generate themes by identifying common codes and observing common patterns throughout the data. Besides that, for the data analysis of primary quantitative data, graphical representation of data has been provided.

Ethical Considerations: The UK Data protection act has been considered for research ethics. According to the UK Data protection act, data has to be used in a transparent, lawful and ethical manner (Gov, 2024). Moreover, a consent form and participation information sheet also has been provided to the research participants to consider their contents and inform them of the purpose & significance of the study.

Results

Primary Quantitative Analysis

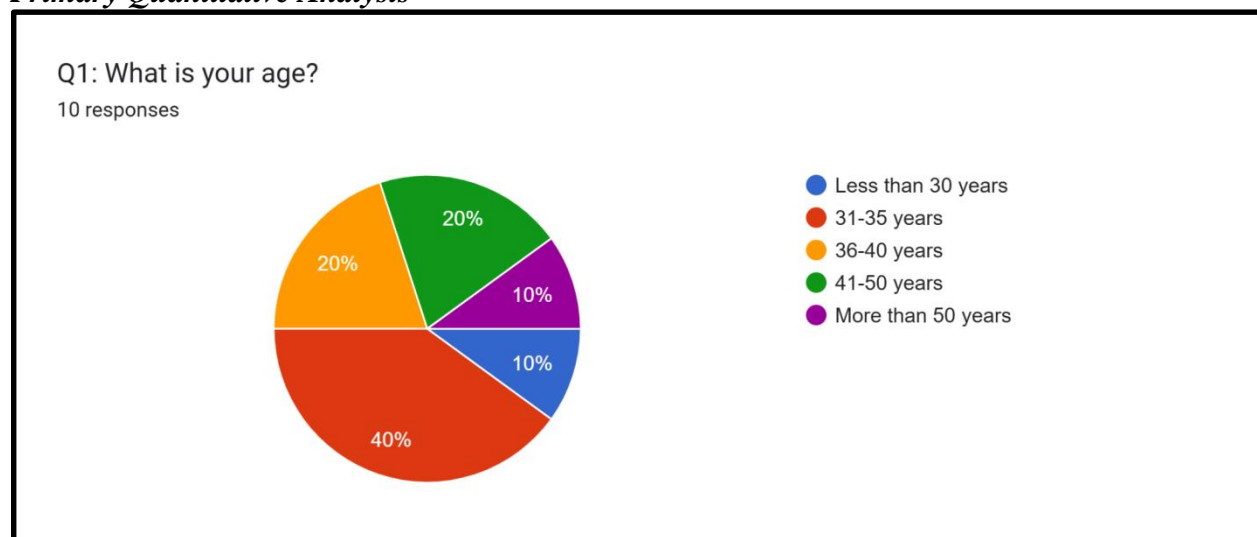


Figure 1: Age of research participants

(Source: Google Forms)

The above figure represents the age of the research participants. Almost 20% of the research participants are between the age of 36 to 40 years old and 41 to 50 years old. Only 10% of the research participants are less than the age of 30 years old. Besides that, 40% of the research participants are in the age group of 31 to 35 years.

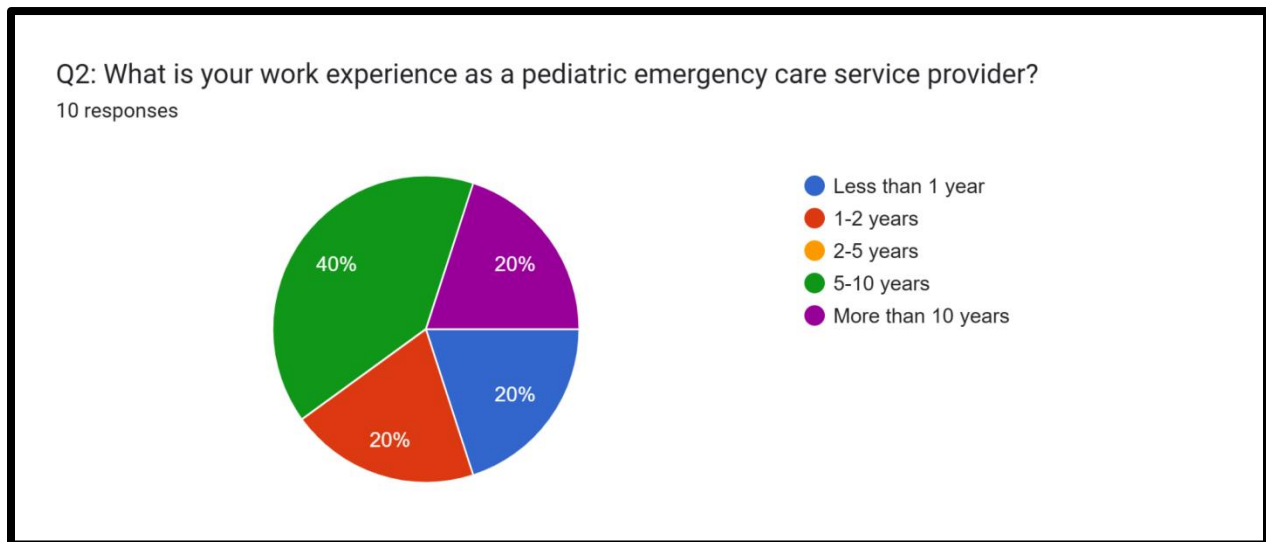


Figure 2: Working Experience of the research participants
(Source: Google Forms)

The above statistics represent the working experience of the research participants. As observed only 40% of the research participants have 5 to 10 years of working experience as pediatric emergency care service providers. Moreover, 20% of the research participants have almost 1 to 2 years of working experience, whereas, other 20% of them have more than 10 years of experience.

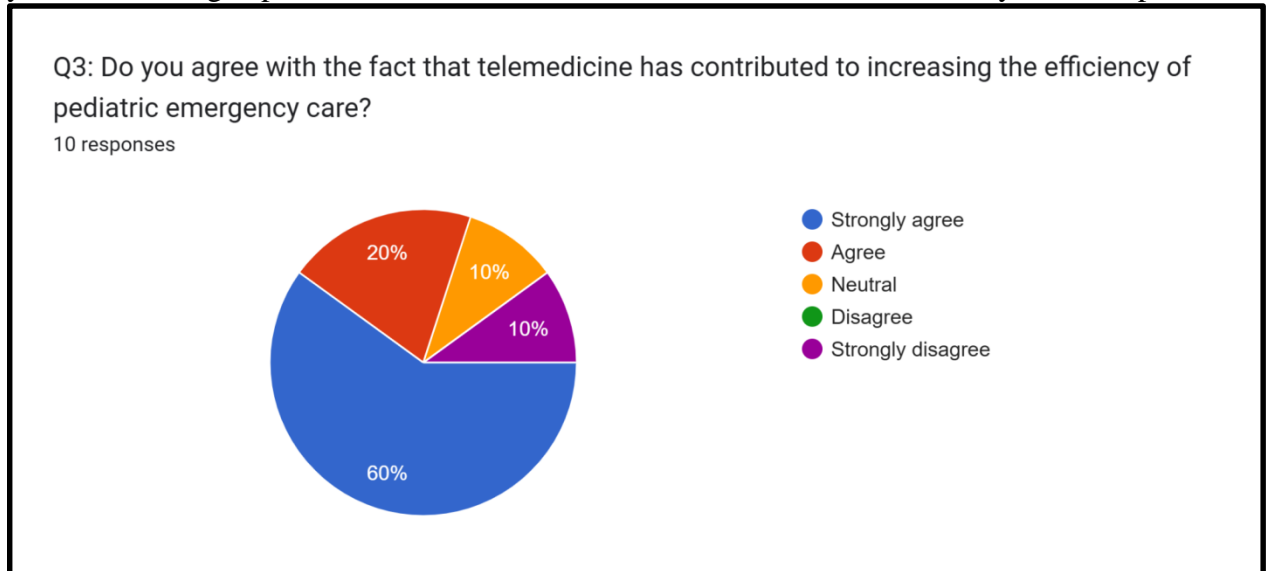


Figure 3: Contribution of telemedicine to efficient pediatric emergency care
(Source: Google Forms)

From the above statistical representation, it has been observed that 60% of the research participants have strongly agreed that telemedicine has significantly contributed in increasing the efficiency of pediatric emergency care. In addition to this, 20% of the research participants agreed to the contribution of telemedicine whereas 10% of them gave neutral responses. On the other hand, 10% of the research participants also disagreed with the question.

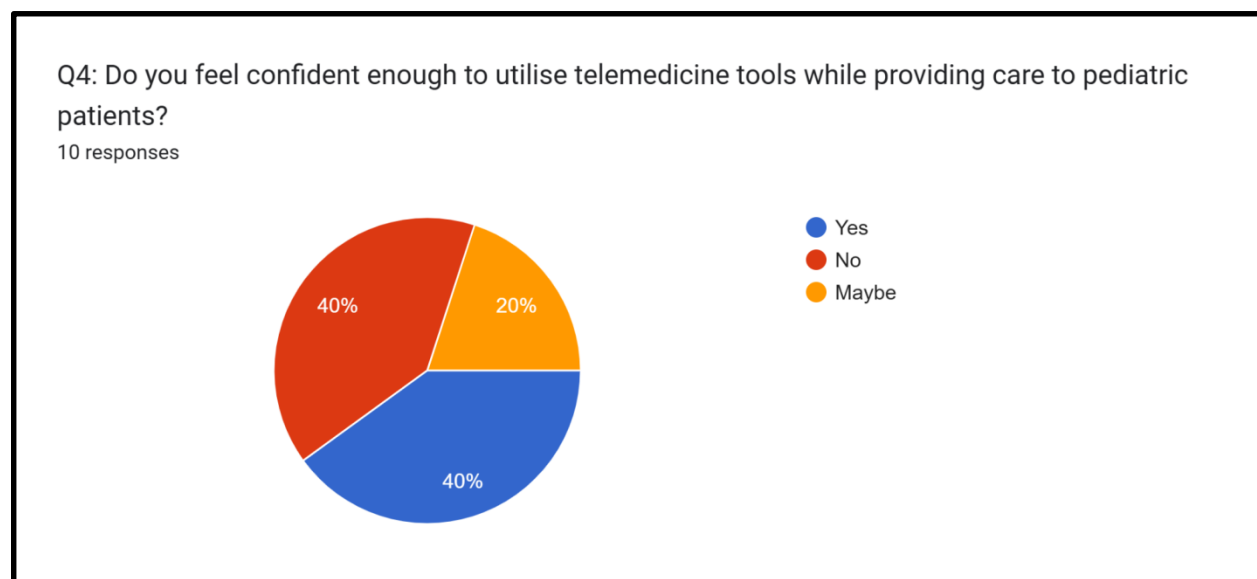


Figure 4: Responses Received Against Survey Question 4
(Source: Google Forms)

From Figure 4, it is evident that telemedicine tools are absolute choices for staff nurses working in the pediatric emergency care divisions to provide evidence-based care. This is the case as 40% of respondents agreed with the same. However, 20% of respondents are found to be still confused about the utility of telemedicine while another 40% have shown disagreement with the fact that they are confident users of telemedicine tools. This implies that certain drawbacks are also associated with these tools.

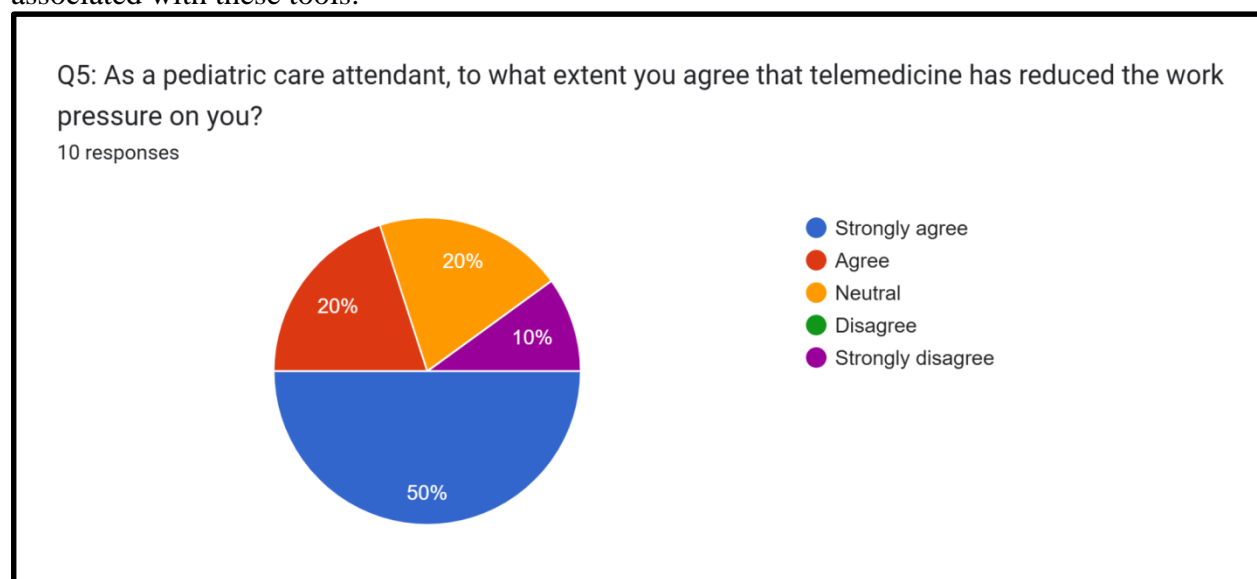


Figure 5: Responses Received Against Survey Question 5
(Source: Google Forms)

From the results obtained as per the above image, it is evident that the use of telemedicine tools is extremely suitable in pediatric emergency care since it can reduce workload and pressure from related caregiving professionals. This is in view of the fact that 50% of respondents strongly agreed with this while another 20% of respondents have shown agreement with the same. Only 10% of responses came with disagreement at all.

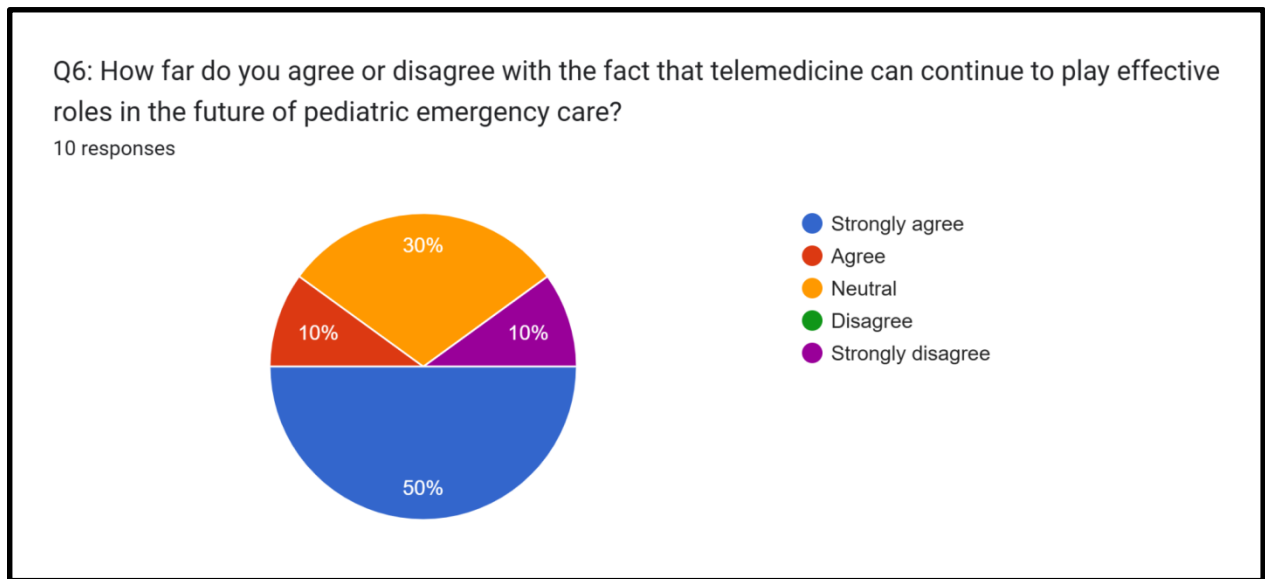


Figure 6: Responses Received Against Survey Question 6

(Source: Google Forms)

The result depicted above clearly insists on the fact that telemedicine is going to be the future of pediatric emergency care with immense potential and future opportunities. Such a prediction is derived from the survey findings where 50% of pediatric emergency care services providers surveyed strongly agreed with the fact that telemedicine tools can continue to play incredible roles in the future of pediatric emergency care while another 10% of respondents agreed in the same. Only 10% of total respondents strongly disagreed with this. However, a major 30% of respondents are found to be not confident of the potential future role-play by telemedicine tools in transforming pediatric emergency care services which further means that certain lack of understanding or skill gaps must be there working as barriers or obstacles to explore the full potential of this technological intervention to transform pediatric care provisions.

Secondary Qualitative Analysis

Articles Title	Methods	Key Findings
Alnasser, Y., Proaño, A., Loock, C., Chuo, J. and Gilman, R.H., 2024. Telemedicine and Pediatric Care in Rural and Remote Areas of Middle-and-Low-Income Countries: Narrative Review. <i>Journal of epidemiology and global health</i> , pp.1-8. https://doi.org/10.1007/s44197-024-00214-8	Alnasser <i>et al.</i> (2024), applied a narrative review method on pre-existing Spanish and English literature for assessing the role performed by telemedicine in supporting pediatric care in lower and middle-income countries.	Telemedicine is effective in lowering under-5 mortality by extending support to neonatal care, non-communicable diseases and various infectious illnesses.
Saidi Nejad, M., Barata, I., Foster, A., Ruttan, T.K., Waseem, M., Holtzman, D.K., Benjamin, L.S., Shahid, S., Berg, K., Wallin, D. and Atabaki, S.M., 2023. The role of telehealth in pediatric emergency care. <i>Journal of the American College of Emergency Physicians Open</i> , 4(3), p.e12952. https://doi.org/10.1002/emp2.12952	Saidi nejad <i>et al.</i> (2023), applied narrative review for providing an overview of applications of telehealth programs in emergency medicine for children and young adults.	Telehealth consultations are found effective in providing safest and timely management of numerous medical issues found in children and hence prevent numerous unnecessary and most often long transport to the pediatric care centre, avoiding delays in care processes for acute interventions and time sensitiveness. On the contrary, COVID-19 pandemic posed critical challenges in establishing, maintaining and adopting telehealth services effectively.
Sharifi Kia, A., Rafizadeh, M. and Shahmoradi, L., 2023. Telemedicine in the emergency department: an overview of systematic reviews. <i>Journal of Public Health</i> , 31(8), pp.1193-1207. https://doi.org/10.1007/s10389-021-01684-x	Sharifi Kia <i>et al.</i> (2023), performed a systematic literature review.	There is strong evidence that indicates the use of telemedicine is positively impacting patient care. Yet, challenges in implementation of telemedicine might impede the procedure or even influence patient safety.

<p>Tully, L., Case, L., Arthurs, N., Sorensen, J., Marcin, J.P. and O'Malley, G., 2021. Barriers and facilitators for implementing paediatric telemedicine: rapid review of user perspectives. <i>Frontiers in pediatrics</i>, 9, p.630365. doi: 10.3389/fped.2021.630365</p>	<p>Tully <i>et al.</i> (2021), applied rapid mixed methods evidence synthesis.</p>	<p>Challenges that inhibit effectiveness in telemedicine in pediatric emergency care include problems associated with ICT proficiency, connectivity issues, increased level of administrative burden, fear of incapability of conducting an in-depth examination depending on subjective illustrations, lack of confidence in reliability and quality of technology, etc.</p>
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Theme 1: Analysis of the efficiency of telemedicine in pediatric emergency care considering current trends

Considering recent trends it is found that as per the opinion of Alnasser *et al.* (2024), telemedicine has been the gateway for universal coverage of all children at the lowest cost possible. The author further exposed that scopes arise by integrating technology, smartphones, solar energy, instant messaging apps and low-width band internet. Moreover, Saidinejad *et al.* (2023), stated that telehealth can be effective in addressing specialist shortages by focusing on centralised assets for low resources and rural communities. Sharifi Kia *et al.* (2023), found that real-time video conferencing has been the best technique of care delivery in pediatric emergency care.

Theme 2: Evaluation of the challenges of telemedicine in pediatric emergency care

Saidinejad *et al.* (2023), stated that payers and various practices in every state are found to set age limits which is affecting telemedicine practice. Sharifi Kia *et al.* (2023), indicated that infrastructural and technical issues can be challenging while applying telemedicine technology for emergency departments. As opined by Tully *et al.* (2021), it is revealed that the challenges in pediatric care units are categorised in terms of intervention characteristics, outer settings, individual characteristics and processes.

Theme 3: Exploration of future innovations and directions of telemedicine in pediatric emergency care

Alnasser *et al.* (2024), discussed that governments should be involved in regulating telemedicine by proper issuance of policies and hence ensure high employment of local exports wherever possible for meeting cultural competency and local resources. Saidinejad *et al.* (2023), depicted that in the future, for making the telemedicine decisions to surpass pediatric care beyond 21 years, the agreement of the psychological, physical and family needs of the patients along with the capability of the pediatric telemedicine clinicians for meeting these necessities must be well considered. Sharifi Kia *et al.* (2023), opined that most feasible technology include real-time video conferencing, real-time audio conferencing, tele-monitoring and forward and store. The authors discussed that in future, telemedicine can be effective in managing heart conditions, chronic diseases and others.

Discussions

Key Findings and Implications

Accepting and welcoming technological interventions are now inevitable in nursing care and when the concern is providing evidence-based pediatric emergency care with a continued focus on improving the quality of care outcomes, telemedicine tools have come up as agents of revolutionising the same. The first objective of this study is relatable to this context as it intended

to analyse the efficiency of telemedicine in pediatric emergency care further putting considerations to current trends. In this context, both the primary and secondary studies have provided complementing and mutually supportive outcomes. 60% of respondents strongly agreed with the saying that telemedicine tools have the potential to increase the efficiency level of pediatric emergency care [Refer to Figure 3]. In this relevance, a similar finding is obtained from the systematic review of the literature sources where telemedicine tools are found to be effective enough in lowering the children's mortality rate by increasing the effectiveness of neonatal care, non-communicable disease care and contagious disease care (Alnasser *et al.* 2024). Thus, the implication of this finding is that to increase the efficiency level of pediatric care patterns, leveraging the benefits of telemedicine is an obvious choice. The second research objective has revolved around unveiling potential challenges with the applicability of telemedicine to emergency pediatric care. The results obtained from the survey question 4 and 6 are useful to enlighten this study area. Likely, 40% of respondents said that they are not enough confident when the concern is using telemedicine platforms. This implies that there may be certain complexities associated with such platforms leading to such lack of confidence in the end users [Refer to Figure 4]. On the other hand, another 30% of respondents are not confident of the potential future role-play by telemedicine tools in transforming pediatric emergency care services. This further means that certain lack of understanding or skill gaps must be there working as barriers or obstacles to explore the full potential of this technological intervention to transform pediatric care provisions [Refer to Figure 6]. A supportive finding is also obtained from the research by Sharifi Kia *et al.* (2023) according to which the complexity of implementing a telemedicine platform can hamper patient safety.

Comparison with Literature

As observed from Theme 1, telemedicine has been identified as the most cost-effective treatment for children. On the other hand, the survey results also reflected that 50% of the research participants strongly agreed telemedicine has been playing an effective role in the future of pediatric emergency care. In this regard, Sharifi Kia *et al.* (2023) have found that telemedicine platforms are supportive of organising real-time video conferencing leading to a betterment in pediatric care delivery. The sixth survey question has tried to find the potential of telemedicine in revolutionising the future of emergency pediatric care. However, 30% of respondents are not confident about the fact that it has enough potential to revolutionise. Theme 2 has provided a similar finding where Tully *et al.* (2021) mentioned that the complexities of these technological tools can undermine the utility of telemedicine in emergency pediatric care.

Strategies for Improvement

Recommendation 1: Improving technological infrastructure

It is essential to ensure telemedicine platforms are made highly user-friendly, highly compatible in different operating systems and easily accessible in multiple devices. Further, in the opinion of Boppana (2022), for enhancing effectiveness in pediatric assessment, it is essential to have high quality audio and video for better video resolution as well as stable connections to enhance diagnostic appropriateness as well as hence improve communication between families and care providers.

Recommendation 2: Raise pediatric training for care providers in healthcare

It is inevitable to provide effective training sessions to the clinicians for understanding the variances in pediatric against adult emergency care units in terms of assessing progress, development and usage of age specific approaches and languages. In the opinion of Owusu-Ansah *et al.* (2020), this is crucial as children might face critical hurdles in articulation of symptoms or following instructions.

Conclusion

While drawing the inferences, it is worthwhile to mention that telemedicine interventions are found effective in terms of pediatric emergency care delivery. There are favour with the application of this technology like safest and timely management, convenience, low cost and others. However, there have been critical challenges as well including lack of familiarity, lack of buy-in, technological glitches and others. It can be inferred that in the future telemedicine technology can be extended in treating or diagnosing various critical conditions in children and young adults. The research further revealed that policy intervention from the government's end is inevitable in future.

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