Health Informatics Meets eHealth
G. Schreier and D. Hayn (Eds.)

doi:10.3233/978-1-61499-858-7-148

Telemedicine in Diagnosis, Treatment and Management of Diseases in Children

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Abstract. The purpose of this study was to review different telemedicine services in diagnosis, treatment and management of various children diseases and providing an overview of systematic reviews conducted in this regard. We searched English articles published in peer-reviewed journals between 2000 to 2016. We found that tele-pediatric services have been reported in various areas such as cardiology, burn, diabetes, obesity, emergency medicine, speech and hearing loss, Ear, Nose and Throat, psychology and psychiatry, radiology, oncology, home healthcare, asthma, genetics and dentistry. These studies mainly reported positive results. However, systematic reviews in tele-pediatric showed that these studies have not proven the clinical effectiveness or suggested further studies to assess the clinical outcomes of services provided through telemedicine technologies.

Keywords. telemedicine, telehealth, child, pediatrics

1. Introduction

According to American Telemedicine Association, telemedicine is “the use of medical information exchanged from one site to another via electronic communications to improve a patient’s clinical health status” [1]. Tele-pediatric (application of telemedicine for children) is used in the areas of medicine in which the distance is an issue, and includes services such as diagnosis, treatment, prevention of diseases, care providers’/patients' education, research and care evaluation [2]. Pediatric services typically include care provided to children from birth to 18 years of age [3]. The purpose of this study was to review and introduce different tele-pediatric services and the consequences of using this type of services and providing an overview of systematic reviews conducted in this regard.

2. Method

A combination of keywords such as “children”, “child”, “pediatric”, “telehealth”, “telecare”, “telemedicine”, “tele”, “review” and “systematic review” were searched in different databases including “PubMed/Medline”, “Science Direct”, “Web of Science” and “Cochrane library”. In addition, we searched specialized journals in the field of telemedicine and considered the related references in selected articles. The inclusion

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criteria were: 1) published English papers in peer-reviewed journals between 2000 to 2016, 2) papers reported a telemedicine service for children only or parents of children. In addition, the exclusion criteria were: 1) Articles focused on both children and adults, unless the findings were reported separately in the article or more than 50% of participations were children. 2) Infant and newborn community. After screening the titles and abstracts and removing the unrelated papers, full text of included papers were reviewed. The review has been done by two independent reviewers. If there were disagreements, a discussion was conducted to reach a consensus. We classified articles according to the medical domains and discussed these areas by proving some examples of studies and relevant reported outcomes. We defined telemedicine as any healthcare services provided remotely through synchronous or asynchronous communication by any modalities and technologies to children or their parents.

3. Results and discussion

Telemedicine is used in various clinical domains for children. In the following sections, each of these areas and related literature and outcomes are discussed.

Cardiology: Pediatric tele-cardiology has been applied in different age groups. It was found that tele-echocardiography increases efficiency and the quality of care, reduces unnecessary patient transport, improves sonographer skills, saves cost, reduces the length of stay in the Coronary Care Unit (CCU) and increases physicians' and patients' satisfaction [4]. Pediatricians perceived this type of services practical and cost-effective [5]. Appropriate exchange of information between hospitals, better use of equipment, improved distance learning in terms of clinicians' perspectives and rapid diagnosis, reduced costs and access to children heart tele-consultation from the perspective of the patients have also been reported [6].

Burn: In tele-burn projects for children, store and forward and videoconferencing modes are used [7-8]. According to studies, tele-burn services for children leads to cost savings of patient travel and patients' convenient access to specialized services [9]. The quality of information collected through videoconferencing was the same as the in-person visits and agreement in consultation between these two methods was reported 84% [10].

Diabetes: According to the studies, telemedicine was in accordance with the in person visits, and reduces the time and cost as well as improves rural children's access to diabetic care [11]. Telephone consultation, videoconferencing between school nurses, child and clinical team [12], messaging [13] and web portal [14] are some of telemedicine services for diabetic children that can improve clinical outcomes (reduced Hemoglobin A1c (HbA_{1c})) [12-14], reduce unnecessary calls to care centers, reduce visits in Emergency Department (ED) and hospital admissions [12].

Obesity: The use of sensors to assess physical activity and dietary habits [15], tele-consultation services [16], and tele-monitoring [17] are some of the telemedicine services in this domain. It was shown that both methods of telemedicine and telephone interventions are acceptable, feasible and effective in providing obesity treatment to children regarding outcomes (BMI, diet and quality of life) [18]. In addition, no difference was observed in parents' satisfaction with telemedicine vs. in person consultation [16] and telemedicine vs. telephone consultation [18].

Emergency medicine: A study showed that tele-consultation for children living in rural areas resulted in fewer medication errors than telephone consultation [19].

Telemedicine also resulted in a reduction in travel costs and emergency care costs [20]. Improving care quality, diagnosis and treatment, patients' and provider's satisfaction [21-22] have also been reported for tele-pediatrics in emergency services. Additionally, a study showed 98% and 92.5% agreement in treatment and diagnosis between in person and telemedicine services for emergency [23].

Speech and hearing loss: Tele-interventions have been used for deaf or hard-of-hearing children [24] in cases of children with stuttering problems [25] and training parents in the early stages of autism [26]. According to an RCT on deaf children, telehealth services increased cost savings [27]. Furthermore, effectiveness of videoconference services for students with speech problems and their improvement were similar to in person services [28]. The studies on students, families, speech therapy pathologists and school principals also showed a high satisfaction with telehealth services [29]. A review showed that the use of telehealth had a positive effect on children's speech-language but the evidence in this area is still low and not enough to influence clinical practices and policy development [30].

Ear, Nose, Throat (ENT): Agreement on synchronous [31] and asynchronous methods [32] for assessment of paediatric ENT conditions were equivalent to in person method, and the agreement rate on synchronous mode is better [31]. The same result has been reported for tele-screening of hearing problems of primary school children [33]. Some studies also suggest the effectiveness of videoconference services in assessing ENT status [34]. The reduced average waiting time of referral (73 to 29 days) and the more economical nature of videoconference-based tele-ENT consultation has been also reported [35].

Psychiatry and psychology: Diagnostic outcomes and psychology problem assessment for children via videoconference, telephone and email was effective [36]. Reduced cost in rural centers by tele-psychiatry [37] and high parents' and children's satisfaction with tele-psychiatry has been reported [38]. An RCT on the effectiveness of videoconferencing on training skills of parents of children with attention deficit hyperactivity disorder showed that the treatment and parents' education was similar to in person method [39]. Additionally, mobile services to treat anxiety [40] and interactive video services for the treatment of depression [41] indicated the success of these methods.

Radiology: The use of tele-radiology has been reported in education of physicians, students and radiologists through web-based videoconferencing [42-43], and the detection of radiological images with Smartphone [44]. In a study, diagnostic accuracy of CT and MRI images of children by a mobile was 97.52% [44]. Improved access, avoid unnecessary travels, saving costs and improving outcomes due to rapid reporting and intervention have been reported in children tele-radiology [44-45].

Oncology: Services such as psychology interventions and stress reduction for children with cancer [46-47], neuro-oncology consultation via email, requesting for visual communication, answering neuro-oncology questions [48], videoconference for the diagnosis of brain tumors [49] have been reported. Tele-support services after discharge has brought families' high satisfaction [50]. Furthermore, the agreement between diagnosis via telemedicine and the routine method was 90.6% [51]. Implementation of home care after discharge with telephone consultation had a major effect on meeting the needs of children with cancer and reduced unplanned hospitalizations [52].

Home care: These services have been used in the areas such as consultation for palliative care [53-54], web-based telemedicine to reduce hospitalizations and sudden death in children with heart problems [55], telemedicine-based robotic rehabilitation

services for children with joint damage and cerebral palsy [56]. Implementation of palliative care at home with internet and telephone consultation showed that this service was feasible and acceptable and reduced imposed responsibilities on families. Satisfaction and quality of life was similar to the control group [53]. A videoconference-based home care program for children with cancer showed parents' satisfaction and reduced the level of children concern with no effect on increased costs [57].

Asthma: Peak expiratory flows test, asthma control test, daily asthma diaries, adherence to treatment, and quality of life have been assessed [58-59]. An RCT on a web application of monitoring and education indicated improved self-management skills and children's quality of life [59]. A study on tele-monitoring at home and teaching children through a website showed that inhalation (94% vs. 89%), adherence to daily asthma diaries (35.4% vs. 20.8%) in telemedicine group was better than the control group [58].

Genetics: Using tele-genetics has been reported in the areas such as tele-consultation and remote education [60-63]. Although parents perceived tele-genetic consultations positive, they preferred face to face services [61]. Additionally, the most important challenge of tele-genetics is reimbursement and cost [63]. A review showed that in tele-genetics studies, costs have not been measured officially and most studies only have pointed out the effect of tele-genetics on saving travel cost and time [64].

Dentistry: Teledentistry can be used in online education, periodontics, oral pathology, oral medicine, orthodontics, detection of dental caries [65-66]. It's very common for dental caries treatments in childhood [67] and screening programs in schools [66]. Comparison between in-person examination and teledentistry showed positive results [68]. Also, this method is reliable versus in person screening [66, 69]. Overall, teledentistry resulted in saved time, money and travel [70], improved the care quality [65] and facilitated the timely treatment by early diagnosis [71].

Systematic reviews of telehealth in pediatrics: In many areas, no systematic review is conducted and the number of current systematic reviews is also limited. A systematic review and meta-analysis by reviewing 10 RCTs showed that telemedicine had no effect on the HbA_{1c} level, severe hypoglycemia or diabetic ketoacidosis in children with type 1 diabetes. Based on this review, limited data has been reported on patients' satisfaction, quality of life and cost. The authors concluded that telemedicine benefits may not be adequately reported [72]. Another review of 13 studies on the patient outcomes in the management of children obesity showed that the interventions are effective on increasing screening for BMI and weight management [73]. A review of the tele-pediatrics in ED showed that the positive effects of these interventions could not be supported because of little evidence [74]. A scoping review on 23 studies about the management of children with hearing problems showed that most studies have focused on hearing screening and these services improved access and coverage in rural and remote areas and less attention is paid to diagnostic interventions and rehabilitation services [29]. Another review of rehabilitation of children with hearing loss showed that the effect of the use of online technologies on promoting learning in deaf children is positive but only four studies were eligible [75].

A review of telemedicine in psychology showed that the studies have addressed feasibility, cost-effectiveness, and the patients'/providers' satisfaction and positive results were reported in all three domains. However, authors concluded that few studies have been conducted on clinical outcomes [76]. Another review on eight studies related to children with autism showed that telemedicine services were mainly implemented for behavioral and diagnostic assessment, training consultation, and monitoring behavioral interventions and telemedicine had positive effects on treating children with autism, but

more RCTs in real locations are needed [77]. Another review of 33 studies related to tele-home care showed that there were only six studies about children. This review showed that tele-home care has the ability to improve services and outcomes such as supportive roles for families, reduced stress, enhanced communication between physicians and families and reduced unplanned admissions [78]. A meta-analysis of nine studies on the effect of web or telephone-based self-care education of children with asthma suggested this intervention resulted in fewer school absences, reduced ED visits and hospitalizations [79]. In a systematic review, tele-genetics services in the field of children and adults showed that this service is suitable to provide consultation and follow-ups and has the capability of assessment and diagnosis of children suspected of genetic diseases [64]. Another review on teledentistry showed that education, diagnosis, consultation and treatment are common services in this domain [80]. Based on another review, teledentistry has an acceptable diagnostic performance in the detection of dental caries. However, more studies on effectiveness of teledentistry to caries detection are needed [81].

4. Conclusion

Studies have shown that the use of tele-pediatrics in most cases results in saving cost, reducing unnecessary travels, patients' and providers' satisfaction, and better patient self-management. Various results in terms of feasibility and acceptance, improvement of diagnosis quality and treatment outcomes, clinical effectiveness, improved accuracy of diagnosis, efficiency and quality of care have been reported. However, few systematic reviews were reported regarding tele-pediatrics, that most of them have shown some of these benefits. Most of original researches have shown positive clinical results; however, the results of systematic reviews except for limited cases have not confirmed positive clinical outcomes or suggested further studies to assess the clinical outcomes of tele-pediatric services. We aimed to introduce the application areas of telepediatrics and reported outcomes not conducting a systematic review to analyze these outcomes. Therefore, we have limitations in these regard. However, in short, we can conclude that there is little evidence about clinical outcomes and effectiveness of telemedicine services for children. Therefore, conducting further systematic reviews of the specific applications of tele-pediatrics is recommended. Also it is suggested that in order to thorough implementation and long-term usage, evaluation of telemedicine systems have been done in the real environment and with a large number of users.

References

[1] B.L. Burke, R.W. Hall, P.J. Dehnel, et al. Telemedicine: Pediatric applications, *Pediatrics* 136(1) (2015), e293-e308.
[2] R. Wootton, J. Batch, *Telepediatrics: Telemedicine and child health,* Royal Society of Medicine Press, 2005.
[3] B. McCrossan, F. Casey, *Telemedicine in the diagnosis and management of congenital heart disease*, Intech, 2011.
[4] A. Krishnan, M. Fuska, R. Dixon R, et al, The evolution of pediatric tele-echocardiography: 15-year experience of over 10,000 transmissions, *Telemed J E Health* 20(8) (2014), 681-686.
[5] B.A. McCrossan, N.N. Doherty, A.J. Sands, et al, Survey of paediatricians' opinions on a regional paediatric telecardiology service, *J Paediatr Child Health* 50(6) (2014), 482-486.

[6] L.V. Lapão, A. Correia, Improving access to pediatric cardiology in Cape Verde via a collaborative international telemedicine service, *Stud Health Technol Inform* (2015), 51-57.
[7] A.C. Smith, J.A. Kairl, R. Kimble, Post-acute care for a paediatric burns patient in regional Queensland, *J Telemed Telecare* 8(5) (2002), 302-304.
[8] A.C. Smith, K.Youngberry, J. Mill, et al, A review of three years experience using email and videoconferencing for the delivery of post-acute burns care to children in Queensland, *Burns* 30(3) (2004), 248-252.
[9] A.C. Smith, K. Youngberry, F. Christie, et al, The family costs of attending hospital outpatient appointments via videoconference and in person, *J Telemed Telecare* 9(2_suppl) (2003), S58-61.
[10] A.C. Smith, R. Kimble, J. Mill, et al. Diagnostic accuracy of and patient satisfaction with telemedicine for the follow-up of paediatric burns patients, *J Telemed Telecare* 10(4) (2004), 193-198.
[11] C.L. Wood, S.A. Clements, K. McFann, et al, Use of telemedicine to improve adherence to american diabetes association standards in pediatric type 1 diabetes, *Diabetes Technol Ther* 18(1) (2016), 7-14.
[12] R. Izquierdo, P.C. Morin, K. Bratt, et al, School-centered telemedicine for children with type 1 diabetes mellitus, *J Pediatr* 155(3) (2009), 374-379.
[13] B. Bin-Abbas, M. Jabbari, A. Al-Fares, et al, Effect of mobile phone short text messages on glycaemic control in children with type 1 diabetes, *J Telemed Telecare* 20(3) (2014), 153-156.
[14] J.E. Pinsker, C. Nguyen, S. Young S, et al, A pilot project for improving paediatric diabetes outcomes using a website: The Pediatric Diabetes Education Portal, *J Telemed Telecare* 17(5) (2011), 226-230.
[15] R. Schiel, A. Kaps, G. Bieber, et al, Identification of determinants for weight reduction in overweight and obese children and adolescents, *J Telemed Telecare* 16(7) (2010), 368-373.
[16] K.W. Mulgrew, U. Shaikh, J. Nettiksimmons, Comparison of parent satisfaction with care for childhood obesity delivered face-to-face and by telemedicine, *Telemed J E Health* 17(5) (2011), 383-387.
[17] M.B. Irby, K.A. Boles, C. Jordan, et al, TeleFIT: Adapting a multidisciplinary, tertiary-care pediatric obesity clinic to rural populations, *Telemed J E Health* 18(3) (2012), 247-249.
[18] A.M. Davis, M. Sampilo, K.S. Gallagher, et al, Treating rural paediatric obesity through telemedicine vs. telephone: Outcomes from a cluster randomized controlled trial, *J Telemed Telecare* 22(2) (2016), 86-95.
[19] M. Dharmar, N. Kuppermann, P.S. Romano, et al, Telemedicine consultations and medication errors in rural emergency departments, *Pediatrics* 132(6) (2013), 1090-1097.
[20] S. Desai, M.L. Williams, A.C. Smith, Teleconsultation from a secondary hospital for paediatric emergencies occurring at rural hospitals in Queensland, *J Telemed Telecare* 19(7) (2013), 405-410.
[21] M. Dharmar, P.S. Romano, N. Kuppermann, et al, Impact of critical care telemedicine consultations on children in rural emergency departments, *Crit Care Med* 41 (2013), 2388-2395.
[22] B. Heath, R. Salerno, A. Hopkins, et al, Pediatric critical care telemedicine in rural underserved emergency departments, *Pediatr Crit Care Med* 10(5) (2009), 588-591.
[23] M. Raska, Mathison. D, telemedicine for acute care: Compairing in-person visits to telemedicine visits at a pediatric emergency department, *Int J Telerehabil* 7(2) (2015).
[24] M. McCarthy, K. Muñoz, K.R. White, Teleintervention for infants and young children who are deaf or hard-of-hearing, *Pediatrics* 126(Supplement 1) (2010), 52-58.
[25] C. Sicotte, P. Lehoux, J. Fortier-Blanc, et al, Feasibility and outcome evaluation of a telemedicine application in speech-language pathology, *J Telemed Telecare* 9(5) (2003), 253-258.
[26] E. Baharav, C. Reiser, Using telepractice in parent training in early autism, *Telemed J E Health* 16(6) (2010), 727-731.
[27] K.M. Blaiser, D. Behl, C. Callow-Heusser, et al. Measuring costs and outcomes of tele-intervention when serving families of children who are deaf/hard-of-hearing, *Int J Telerehabil* 5(2) (2013), 3-10.
[28] S. Grogan-Johnson, R. Alvares, L. Rowan, et al A pilot study comparing the effectiveness of speech language therapy provided by telemedicine with conventional on-site therapy, *J Telemed Telecare* 16(3) (2010),134-39.
[29] S.M. Govender, M. Mars, The use of telehealth services to facilitate audiological management for children: A scoping review and content analysis, *J Telemed Telecare* 23(3) (2016), 392-401.
[30] O.D. Taylor, N.R. Armfield, P. Dodrill, et al. A review of the efficacy and effectiveness of using telehealth for paediatric speech and language assessment, *J Telemed Telecare* 20(7) (2014), 405-412.
[31] A.C. Smith, S. Dowthwaite, J. Agnew, et al, Concordance between real-time telemedicine assessments and face-to-face consultations in paediatric otolaryngology, *Med J Aust* 188(8) (2008), 457-460.
[32] A.C. Smith, C. Perry, J. Agnew, et al, Accuracy of pre-recorded video images for the assessment of rural indigenous children with ear, nose and throat conditions, *J Telemed Telecare* 12(3_suppl) (2006), 76-80.
[33] P. Lancaster, M. Krumm, J. Ribera, et al, Remote hearing screenings via telehealth in a rural elementary school, *Am J Audiol* 17(2) (2008), 114-122.

[34] A.C. Smith, N.R. Armfield, W.I. Wu, et al, A mobile telemedicine-enabled ear screening service for Indigenous children in Queensland: Activity and outcomes in the first three years, *J Telemed Telecare* 18(8) (2012), 485-489.
[35] C.Q. Xu, A.C. Smith, P.A. Scuffham, et al, A cost minimisation analysis of a telepaediatric otolaryngology service, *BMC Health Serv Res* 8(1) (2008).
[36] P.M. Yellowlees, D.M. Hilty, S.L. Marks, et al, A retrospective analysis of a child and adolescent eMental Health program, *J Am Acad Child Adolesc Psychiatry* 47(1) (2008), 103-107.
[37] R. Spaulding, N. Belz, S. DeLurgio, et al, Cost savings of telemedicine utilization for child psychiatry in a rural Kansas community, *Telemed J E Health* 16(8) (2010), 867-871.
[38] K.M. Myers, J.M. Valentine, S.M. Melzer, Child and adolescent telepsychiatry: Utilization and satisfaction, *Telemed J E Health* 14(2) (2008),131-137.
[39] Y. Xie, J.F. Dixon, O.M. Yee, et al, A study on the effectiveness of videoconferencing on teaching parent training skills to parents of children with ADHD, *Telemed J E Health* 19(3) (2013), 192-199.
[40] G. Pramana, B. Parmanto, P.C. Kendall, et al, The SmartCAT: An m-health platform for ecological momentary intervention in child anxiety treatment, *Telemed J E Health* 20(5) (2014), 419-427.
[41] E.L. Nelson, M. Barnard, S. Cain, Feasibility of telemedicine intervention for childhood depression, *Counselling and psychotherapy research* 6(3) (2006), 191-195.
[42] A.M. Monteiro, D.G. Corrêa, A.A. Santos, et al, Telemedicine and pediatric radiology: A new environment for training, learning, and interactive discussions, *Telemed J E Health* 17(10) (2011), 753-756.
[43] A.B. Silva, A.C. de Amorim, A Brazilian educational experiment: Teleradiology on web TV, *J Telemed Telecare* 15 (2009), 373-376.
[44] F. Zennaro, M. Bava, A. Casalino, et al, Smartphones for mobile teleradiology in paediatric imaging: Evaluation of diagnostic accuracy, *Egyptian Computer Science Journal* 37(5) (2013), 94-98.
[45] R, Griggs, S, Andronikou, R. Nell, et al, World federation of pediatric imaging [WFPI] volunteer outreach through tele-reading: the pilot project in South Africa, *Pediatr Radiol* 44(6) (2014), 648-654.
[46] S.D. Hutchison, H. Sargeant, B.A. Morris, et al, A community-based approach to cancer counselling for patients and carers: A preliminary study, *Psychooncology* 20(8) (2011), 897-901.
[47] D.C. Seitz, C. Knaevelsrud, G. Duran, et al, Efficacy of an internet-based cognitive-behavioral intervention for long-term survivors of pediatric cancer: A pilot study, *Support Care Cancer* 22(8) (2014), 2075-2083.
[48] I. Qaddoumi, E. Bouffet, Supplementation of a successful pediatric neuro-oncology telemedicine-based twinning program by e-mails, *Telemed J E Health* 15(10) (2009), 975-982.
[49] I. Qaddoumi, A. Mansour, A. Musharbash, et al, Impact of telemedicine on pediatric neuro-oncology in a developing country: The Jordanian-Canadian experience, *Pediatr Blood Cancer* 48(1) (2007), 39-43.
[50] M. Bensink, N. Armfield, H. Irving, et al, A pilot study of videotelephone-based support for newly diagnosed paediatric oncology patients and their families, *J Telemed Telecare* 14(6) (2008), 315-321.
[51] T.C. Santiago, J.J. Jenkins, F. Pedrosa, et al, Improving the histopathologic diagnosis of pediatric malignancies in a low-resource setting by combining focused training and telepathology strategies, *Pediatr Blood Cancer* 59(2) (2012), 221-225.
[52] M.C. Yilmaz, S.A. Ozsoy, Effectiveness of a discharge-planning program and home visits for meeting the physical care needs of children with cancer, *Support Care Cancer* 18(2) (2010), 243-253.
[53] N. Bradford, J. Young, N.R. Armfield, et al, A pilot study of the effectiveness of home teleconsultations in paediatric palliative care, *J Telemed Telecare* 18(8) (2012), 438-442.
[54] N.K. Bradford, N.R. Armfield NR, J. Young, et al, Principles of a paediatric palliative care consultation can be achieved with home telemedicine, *J Telemed Telecare* 20(7) (2014), 360-364.
[55] A.K. Black, U.K. Sadanala, C.E. Mascio, et al, Challenges in implementing a pediatric cardiovascular home telehealth project, *Telemed J E Health* 20(9) (2014), 858-867.
[56] K. Chen, Y. Ren, D. Gaebler-Spira, et al, Home-based tele-assisted robotic rehabilitation of joint impairments in children with cerebral palsy, Conf Proc IEEE, 2014, 5288-5291.
[57] H. Hansson, H. Kjaergaard, C. Johansen, et al, Hospital-based home care for children with cancer: Feasibility and psychosocial impact on children and their families,*Pediatr Blood Cancer*60(5)(2013),865-72.
[58] D.S. Chan, C.W. Callahan, V.B. Hatch-Pigott, et al, Internet-based home monitoring and education of children with asthma is comparable to ideal office-based care: Results of a 1-year asthma in-home monitoring trial, *Pediatrics* 119(3) (2007), 569-578.
[59] R.L. Jan, J.Y. Wang, M.C. Huang, et al, An internet-based interactive telemonitoring system for improving childhood asthma outcomes in Taiwan, *Telemed J E Health* 13(3) (2007), 257-268.
[60] D. Gustafson, M. Wise, A. Bhattacharya, et al, The effects of combining Web-based eHealth with telephone nurse case management for pediatric asthma control: A randomized controlled trial, *J Med Internet Res* 14 (2012), e101.

[61] B. Hopper, M. Buckman, M. Edwards, Evaluation of satisfaction of parents with the use of videoconferencing for a pediatric genetic consultation, *Twin Res Hum Genet* 14(4) (2011), 343-346.
[62] L.P. Maximino, M.M. Picolini-Pereira, J.L. Carvalho, Telegenetics: application of a tele-education program in genetic syndromes for Brazilian students, *J Appl Oral Sci* 22(6) (2014), 477-483.
[63] H.J. Stalker, R. Wilson, H. McCune, et al, Telegenetic medicine: Improved access to services in an underserved area, *J Telemed Telecare* 12(4) (2006), 182-185.
[64] J.S. Hilgart, J.A. Hayward, B. Coles, et al, Telegenetics: A systematic review of telemedicine in genetics services, *Genet Med* 14(9) (2012), 765-776.
[65] A.Bhambal, S. Saxena, S.V. Balsaraf, Teledentistry: potentials unexplored,*J Int Oral Health* 2(3) (2010), 1-6.
[66] S, Bissessur, A comparative analysis of traditional dental screening versus tele dentistry screening. 2016.
[67] D.T. Kopycka-Kedzierawski, R. Billings, Prevalence of dental caries and dental care utilisation in preschool urban children enrolled in a comparative-effectiveness study, *Eur Arch Paediatr Dent* 12(3) (2011), 133-138.
[68] K. Adlassnig, Remote diagnosis of children dental problems based on non-invasive photographs–a valid proceeding?, *Stud Health Technol Inform*, 150 (2009), 458-462.
[69] T. Subbalekshmi, V. Anandan, R. Apathsakayan, Use of a Teledentistry-based Program for Screening of Early Childhood Caries in a School Setting, *Cureus* 9(7) (2017), 1-7.
[70] K.C. Pentapati, P. Mishra, M. Damania, et al, Reliability of intra-oral camera using teledentistry in screening of oral diseases–Pilot study, *Saudi Dent J* 29(2) (2017), 74-77.
[71] D.T. Kopycka-Kedzierawski, R.J. Billings, Teledentistry in inner-city child-care centres, *J telemed telecare* 12 (4) (2006), 176-181.
[72] R.M. Shulman, C.S. O'Gorman, M.R. Palmert, The impact of telemedicine interventions involving routine transmission of blood glucose data with clinician feedback on metabolic control in youth with type 1 diabetes: A systematic review and meta-analysis, *Int J Pediatr endocrinol* 2010(1) (2010), 1-9.
[73] A,J, Smith, Á. Skow, J. Bodurtha, et al, Health information technology in screening and treatment of child obesity: A systematic review, *Pediatrics* 131(3) (2013), 894-902.
[74] R. Gattu, G. Teshome, R. Lichenstein, Telemedicine applications for the pediatric emergency medicine: A Review of the current literature, *Pediatr Emerg Care* 32(2) (2016), 123-130.
[75] A. Simpson, A. El-Refaie, C. Stephenson, et al, Computer-based rehabilitation for developing speech and language in hearing-impaired children: A systematic review, *Deafness Educ Int* 17(2) (2015), 111-119.
[76] J. Van Allen, A.M. Davis, S. Lassen, The use of telemedicine in pediatric psychology: Research review and current applications, *Child Adolesc Psychiatr Clin N Am* 20(1) (2011), 55-66.
[77] M. Boisvert, R. Lang, M. Andrianopoulos, et al, Telepractice in the assessment and treatment of individuals with autism spectrum disorders: A systematic review, *Dev Neurorehabil* 13(6) (2010), 423-432.
[78] N, Bradford, N.R. Armfield, J. Young, et al, The case for home based telehealth in pediatric palliative care: A systematic review, *BMC Palliat Care* 12(1) (2013), 1-13.
[79] E. Ahmad, D.E. Grimes, The effects of self-management education for school-age children on asthma morbidity: a systematic review, *J Sch Nurs* 27(4) (2011), 282-292.
[80] R. Mariño, A. Ghanim, Teledentistry:A systematic review of the literature, *J Telemed Telecare* 19(4) (2013), 179-183
[81] M. Estai, S. Bunt, Y. Kanagasingam, et al, Diagnostic accuracy of teledentistry in the detection of dental caries: A systematic review, J *Evid Based Dent Pract* 16(3) (2016), 161-172.