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Cori A. Reynolds

Erin Maughan

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Telehealth in the School Setting: An Integrative Review

Cori A. Reynolds RN

Graduate Student

Brigham Young University

Erin Maughan PhD, MS, RN, APHN-BC

Director of Research

National Association of School Nurses

Abstract: Telehealth, the provision of healthcare through long-distance telecommunications technology, is a tool that can be used by school nurses to address and improve the health status of school children. The purpose of this literature review is to examine research related to implementation of telehealth in the school setting. A review of the literature was conducted using CINAHL, ERIC, Medline, and Pub Med databases, and the search terms telehealth, telecare, telemedicine, school, and schools. Fifteen research studies related to telehealth in the school setting were identified. Themes identified included: benefits, barriers, feasibility, and limitations of telehealth. Implications for practice are presented, along with the potential of telehealth to integrate with the Affordable Care Act. School nurses who use telehealth can further meet the health needs of children in their care. The future of healthcare and school nursing is changing and telehealth is a tool that can improve care in an innovative and efficient way.

Telehealth in the School Setting: An Integrative Review

Schools play an important role in the health of children and the school nurse functions as a leader and coordinator of the healthcare provided to students (NASN, 2010). For many children, the school nurse is the only provider seen, yet some health needs require additional medical attention beyond what a school nurse is licensed to provide. Unfortunately, many schools also lack the resources necessary to meet the health needs of their students (The Children's Partnership, 2009). Several barriers exist that limit the provision of care by the school nurse including: reduced funding, the cost and time of travel, an increased number of students with medical needs, and lack of convenient access to or communication with the primary healthcare provider (NASN, 2010).

Telehealth, or the provision of healthcare through long-distance telecommunications technology, is a tool that can be used by school nurses to address and improve the health status of school children. According to the American Telemedicine Association, the terms telehealth and telemedicine are interchangeable (American Telemedicine Association). School-based telehealth includes video conferences, telephones, or web cameras in the school that connect with a distant healthcare provider (NASN, 2012). The technology can then be used by the provider to examine and interact with the student remotely and provide care. Telehealth is also used to provide health education to students and school staff (The Children's Partnership, 2009). Traditionally telehealth has been connected with community or school-based clinics, however newer models include having the school nurse work directly with the distant clinic for both urgent and chronic conditions and during the regular school day (E. Mauter, personal communication, March 13, 2014). The increasing availability of technology in schools can facilitate the implementation of a telehealth program. Although there are pockets of the country

where telehealth is used in the school, the majority of states are not using it statewide (J. Wright, National Association of State School Nurse Consultants, personal communication, August 30, 2013; The Children's Partnership, 2009). School nurses and healthcare providers can use telehealth as a tool to improve the health outcomes of the children in their care.

Even though much has been written and examples given about the use of telehealth in schools, there has been little written examining the research related to its implementation and effectiveness. The purpose of this literature review is to examine and synthesize research related to the implementation of telehealth in the school setting. The benefits, barriers, feasibility, and limitations of telehealth are addressed and implications for practice are presented.

Search Strategies

A review of the literature was conducted by searching the databases where school health research is included: CINAHL, ERIC, Medline, and Pub Med databases. The keywords searched included: telehealth, telecare, telemedicine, and title keywords of school and schools. Only English language articles, and those published after 2001 were included. This search resulted in 57 articles. Articles that were not primary research, and those not directly related to the school setting were excluded. Three additional relevant articles were retrieved from reference lists of studies using the ancestor approach. The final result of this literature search was fifteen studies related to telehealth in the school setting.

Results

The studies reveal the effectiveness and benefit of the use of telehealth in the school setting, as well as barriers to its implementation. Each theme will be discussed below. Table 1 provides a summary for each of the research articles included in the review.

Benefits

Effectiveness. One of the themes in the literature is that researchers found school nurses can use telehealth as a tool to improve care of children with chronic conditions. Conditions such as asthma, allergies, diabetes, celiac disease, autism and other behavioral diagnoses are becoming more prevalent. School nurses spend many hours performing case management for these children, which often involves communication with the children's specialized healthcare providers. Researchers found that children receiving telehealth visits with an asthma care specialist increased their number of symptom free days by 83% (P<.05) and the mean asthma symptom scores reduced 44% (P<.001) (Romano, Hernandez, Gaylor, Howard, & Knox, 2001). Telehealth access to an asthma specialist also resulted in better control of symptoms, improvement in functional health status, and reduction in the number of asthma attacks from .33 at baseline to .153 after the intervention (p<.05) (Bergman et al, 2008; Burke, Bynum, Hall-Barrow, Ott, & Albright, 2008;). Izquierdo et al. (2009) used a school telehealth program to care for children with type 1 diabetes. The school nurse, child, and diabetes team video conferenced using a telemedicine link in the school nurse office once a month during the school year. Children participating in the telehealth program experienced fewer hospitalizations (one hospitalization in the telehealth group compared to four in the usual care group) and emergency department visits, and lower hemoglobin A1c levels (p<.02), an indication of better blood glucose control, within six months. Children participating in a telehealth intervention for

attention deficit hyperactivity disorder (ADHD) were observed through a video link in the classroom to facilitate evaluation for ADHD. Researchers found these children experienced improvement in behaviors, including attention (p<.05) and impulsivity, measured using a teacher and parent rating scale for ADHD (Gallagher, 2004).

Improved Collaboration. In addition to better chronic disease management, another key benefits of telehealth identified in the literature is improved communication and collaboration. Enhanced communication between the school nurse, child, parents, school staff, and healthcare provider occurred, especially in rural or medically underserved schools. Improved communication with, and access to, subspecialty care via telehealth was identified as a key factor for better outcomes for children in several other studies. Blood glucose results were transmitted remotely between the school nurse and diabetes specialist in a remote part of Florida, which influenced decisions about diabetes management during in-clinic visits (Malasanos, Patel, Klein, & Burlingame, 2005). Children seen remotely by an asthma specialist experienced improvement in family social activities, asthma control and the number of asthma attacks (Bergman et al., 2008; Burke et al., 2008; Romano et al., 2001).

Mackert and Whitten (2007) found convening parents, school nurses, providers, and staff together at the same time via telehealth eliminated miscommunication and improved the ability of all involved to help the children. Primary care providers and school nurses were satisfied with treating children through telehealth (Young & Ireson, 2003), and nurses involved in a telehealth program helped parents connect with community resources and were directly involved in the interaction between students and health care providers. This improved the collaboration of care and inclusion of community support for the children (Whitten, Kingsley, Cook, Swirczynski, & Doolittle, 2001).

Telehealth was also used to facilitate communication between the school and diabetes center by allowing simultaneous consultation with the school nurse, student, parents, and diabetes nurse practitioner. This communication occurred through a video conferencing link. Blood glucose information was exchanged between the school setting and the diabetes center. This communication improved collaboration of care and resulted in improved outcomes for the diabetic students (fewer hospitalizations and emergency department visits, and lower hemoglobin A1c levels, $p<.02$) (Izquierdo et al., 2009).

Reduced Absenteeism and Improved Convenience. Another theme found in the literature was the impact of using telehealth on absenteeism, or time away from class. Children benefit when time away from class is minimized. Decreased absences and increased convenience occurred due to telehealth. Researchers showed that a school telehealth clinic reduced student absences due to illness by 63%, most likely attributable to early diagnosis and treatment (McConnochie et al., 2005). Bergman et al. (2008) illustrated asthma assessment and education can be accomplished during the school day via telehealth and the assistance of a school nurse, thus reducing the need to miss school for an in-office visit.

In addition, parents caring for a sick child also benefit from less time away from work. In two different studies, parents highlighted not missing work and convenience of time saved by telehealth was appreciated (McConnochie et al., 2005; McConnochie et al., 2010). Parents reflected that 93.8% of problems managed by telehealth would otherwise have required an in-office or emergency department visit (McConnochie et al., 2005). McConnochie and colleagues (2010) also found that parents often had conflicts between work responsibilities and care of a

sick child. Parental perceptions of convenience and time saved by telehealth were mentioned in 33.6% of all parental survey comments—more than any other category.

Telehealth can increase convenience for school staff as well. Researchers found hearing screenings performed remotely through telehealth technology were not statistically different than results obtained through on-site screenings (p=.37) (Lancaster, Krumm, Ribera, & Klich, 2008). These results demonstrate the ability of telehealth to improve convenience for school staff, while continuing to provide quality care.

Satisfaction of Health Education. Health education via telehealth was another benefit of telehealth identified by researchers and participants expressed satisfaction with the telehealth process. Group and individual health education was provided to students, families, and school staff through group educational sessions, videos, online modules, and video conferencing (Burke et al., 2008; Bynum et al., 2002; Gallagher, 2004; Izquierdo et al., 2009; Malasanos et al., 2005; Spaulding et al., 2008). The most common method of providing education was online. Patients, families and school nurses that participated in an online educational program about diabetes expressed satisfaction with the experience and the improved communication (Malasanos et al., 2005). Parents and school staff reported the education provided online regarding children with disabilities was beneficial (Gallagher, 2004). Diabetes education modules provided to school staff online was part of a telehealth program that also included visits between the school nurse, student, and a diabetes specialist. Although results may not have been influenced by education alone, the hemoglobin A1c levels of the students that participated in this program were significantly lower than students that received standard care (Izquierdo et al., 2009).

Other methods of providing education included videos and group education sessions directly from a telehealth clinic link. Students rated satisfaction with a group telehealth educational program delivered through video as an average of 4.1 out of 5 on a Likert scale (Bynum, Cranford, Erwin & Denny, 2002). One study included group educational sessions for teachers and school staff via a telehealth clinic, which created educational opportunities for the school staff (Burke et al., 2008).

Telehealth is a way to increase access to health education. Spaulding, Davis, and Patterson (2008) compared satisfaction results of group health education classes provided face-to-face versus through telehealth. The results showed satisfaction levels with both methods were high, although face-to-face presentation was preferred (mean 4.3 out of 5 on a Likert scale for telehealth and mean 4.6 out of 5 for face-to-face presentation). Provision of health education by telehealth may be a viable and well-accepted alternative if face-to-face presentation is not possible, such as in a rural area.

Cost Effectiveness. Another benefit of telehealth is that it is cost effective. Young and Ireson (2003) discovered the average family saved hours of work time, emergency department costs and physician visit costs with each telehealth encounter. Savings for families ranged from $101 to $224 per encounter. The average cost of a telehealth consult and a traditional clinic visit were approximately equal when 165 telehealth consults were performed. When 200 consults were performed, the average cost of a telehealth visit was 9.5% less than a clinic visit. This demonstrates telehealth can be cost competitive with traditional clinics (Doolittle et al., 2003).

Barriers

Several barriers were identified in the research literature that influenced the implementation of telehealth in the schools. Issues of startup, maintenance, technical expertise and equipment, reimbursement, and buy-in were addressed. Whitten et al. (2001) found that the availability of a technician when problems arose was crucial to success. Internet speed and bandwidth capability affected performance of remote hearing screenings (Lancaster et al., 2008).

Provider reimbursement was the most frequent barrier to telehealth use mentioned in the studies (Whitten et al., 2001; McConnochie et al., 2005; Izquierdo et al., 2009). Limited or absent reimbursement by Medicaid and insurance companies is a major obstacle to provision of healthcare via telehealth. Medicaid reimbursement for telehealth varies by state, and depends upon State Medicaid laws. Some insurance companies reimburse for a variety of telehealth services, while others do not (HRSA, 2013). Healthcare providers agreed to donate their services to the medically underserved population in one study (Whitten et al., 2001). While this is a generous solution, it is not reasonable for long term sustainability

An additional barrier to telehealth implementation is provider and school nurse acceptance of the program. Concerns with incorporating visits into the daily workload can be problematic (Doolittle et al., 2003). All parties involved must be willing to do their part to ensure the success of a telehealth program. Nurses were apprehensive about any extra workload caused by a telehealth program, but the nurses that embraced the change considered it a positive experience (Mackert & Whitten, 2007). Physicians in the community expressed concerns about patients being taken away due to a telehealth clinic. Physicians were reassured telehealth was an enhancement to the pediatric care in the community and was not intended as a replacement

(Burke et al., 2008). A collaborative effort is critical for success of a telehealth program (McConnochie et al., 2005).

Discussion

The results of this literature review show the use of telehealth in the school setting can be a cost effective and efficient tool to provide excellent care to school children. Telehealth benefits the school nurse by improving communication with healthcare providers. Students and families benefit through improved access to care, better management of chronic conditions, improved education, reduced travel time and expenses, and fewer absences from school and work. The increasing use of technology and internet access in schools should make implementation of a telehealth program, or other means of communication with providers, more feasible. Telehealth has the potential for future use in many areas. Examples of this include remote dental and eye exams, voice disorders, nutritional and obesity counseling, and behavioral and mental health counseling and assessment (Glassman, Helgeson, & Kattlove, 2012; Kelchner, 2013).

Health care reform is an opportunity for school nurses to become more involved with telehealth. In addition to budget cuts, changes in healthcare, such as the Affordable Care Act (ACA), point to increased use of technology, with many groups specifically highlighting the use of telehealth to improve health care access and services (American Telemedicine Association, 2010). The ACA emphasizes preventive care, chronic illness management, care coordination, caring for at-risk populations, and electronic health records, which all play to the strengths of telehealth (Patient Protection and Affordable Care Act, 2010). School nurses already serve as coordinators of care between families, schools and community (Engelke, Swanson & Guttu,

2013). Telehealth would facilitate this role by increasing access and collaboration. In addition, the ACA emphasizes Accountable Care Organizations (ACOs) to improve the coordination of care from multiple healthcare providers including schools, community organizations, and primary providers for Medicare and Medicaid patients. These organizations work together to improve care and decrease costs, and receive financial incentives if successful (Patient Protection and Affordable Care Act, 2010). Telehealth can be used by an ACO as a tool for successful coordination. For example, Bergman et al. (2008) connected children with asthma and the school nurse with an asthma care specialist through a school based telehealth link. Recommendations for care were then sent to the child's healthcare provider and family.

Medicaid views telehealth as a potentially cost-effective alternative to traditional face-to-face provision of medical care (Medicaid.gov, 2013). Yet, Medicaid policies vary by state, and so it is important for the school nurse to know the rules for his or her own state. Financial reimbursement from Medicaid can help overcome the barrier identified in the literature related to provider reimbursement. As states review their current Medicaid policies, school nurses have the opportunity to advocate for changes that would allow reimbursement for telehealth services and other changes to allow for reimbursement for health services provided in the schools. Increased awareness of the benefits of telehealth and how it potentiates the goals of the ACA may pave the way for better funding of telehealth for future research and reimbursement from Medicaid and insurance programs.

Overcoming Barriers

Although the literature regarding telehealth is overwhelmingly positive and technology is available, limited community and school nurse buy in can impede increased implementation in

schools. Burke et al. (2008) identified steps to successfully implement a telehealth program including: assessing needs, securing community support, evaluating resources, configuring logistics, training staff, and informing parents. After assessing needs, if telehealth is an appropriate option for an area, school nurses can work with Parent Teacher Associations, city councils, and health departments to gain the necessary support of community members (Burke et al., 2008). Telehealth in the schools will also require support and collaboration from school administrators, staff, parents, students, and healthcare providers.

Evaluating and obtaining resources or funding is also a barrier. Sustainable funding, which can impact the implementation and longevity of a successful telehealth program, must be obtained (Doolittle et al., 2003; McConnochie et al., 2005; Whitten et al., 2001). Schools are often strapped for the resources of time and money. Telehealth requires startup costs including purchasing equipment, obtaining technical support, and educating staff. Once the program is running, there must be continual technical support and training made available.

Proper funding must be procured. Several of the successful telehealth programs reviewed in this article were funded by grant money for research or provision of care to underserved populations. Possible sources of funding include federal and state grants, health departments, school districts, charitable organizations, and private businesses. Local universities, hospitals, and non-profit healthcare systems may be appropriate funders due to their missions and purposes to outreach those in greatest need. For example, the University of Virginia founded the Virginia Telehealth Network to further their mission of teaching, clinical care, research, innovation, and public service (Rheuban, 2010). The ACA has put more emphasis on not for profit hospitals needing to conduct community assessments and provide community benefit. Providing telehealth could be that benefit for hospitals.

Examples of charitable organizations that provided support for the research in this literature review include Ronald McDonald House, Children's Miracle Network, and United Way (Young & Ireson, 2003; Izquierdo et al., 2009; McConnochie et al., 2005). The United States Department of Commerce and the Department of Health and Human Services were sources for funding as well (McConnochie et al., 2005; McConnochie et al., 2010; Izquierdo et al., 2009; Doolittle et al., 2003).

It may be possible to obtain funding and support through a private business interested in promoting their equipment. For example, LifeScan Inc. donated glucose monitoring supplies for research (Izquierdo et al., 2009). Other potential sources of support or funding may be manufacturers of the computer or video equipment used for telehealth. A telehealth project to provide healthcare in rural Pakistan included a collaborative effort and donated technology by the State Department, IBM, Motorola, the U.S. Army, and Wateen Telecom, a Pakistani based company (Hayes, 2008). This project is an example of creative resources available to sustain a telehealth program. Telehealth is innovative and may appeal to an entrepreneur or investor that recognizes the potential for a successful business venture, which would improve sustainability, especially once initial grants or donations run out.

Although adequate funding will help minimize equipment, training, and technical support issues, some school nurses may be wary of new technology and the changes it brings. There may also be concerns regarding privacy and liability. Health information must be kept confidential and the protection of this information can take a significant amount of time and money (NASN, 2012). The Health Insurance Portability and Accountability Act (HIPAA) requires the privacy of personal health information and the Federal Educational Rights and Privacy Act (FERPA) protects the privacy of student educational records (U.S. Department of

Education, 2013; U.S. Department of Health & Human Services, 2013). Schools may have concerns regarding the liability of providing privacy and a higher level of healthcare through telehealth as opposed to sending the child out to a traditional clinic visit. Proper parental consent for provision of telehealth care and sharing of children's health information must be obtained. In order to comply with HIPAA, care must be taken to ensure the transmission of health information is secure. The location where telehealth services are administered should also protect the patient's privacy (The Children's Partnership, 2009). However, existing telehealth programs are able to ensure these conditions.

School Nursing Implications

As part of their role as leaders and student advocates, school nurses can use telehealth to ensure students receive adequate care that they need to learn (NASN, 2012). Researchers have shown telehealth can lead to improved health outcomes. By allowing the student to stay in the building, less school days are missed, and there is an increased seat time so a student can learn when telehealth is used. Telehealth has also been the reason to ensure there is a school nurse in every building because of the valuable service school nurses have in telehealth (E. Mauter, personal communication, March 18, 2014).

Funding for school nursing is a constant concern and telehealth can be expensive but many successful models have been found to fund telehealth. The key is for school nurses to articulate the need to appropriate decision makers. For example, Mary Newell provided data to provide the argument why a clinic would meet the health and education goals of the school (Blad, 2014). The emphasis from the ACA on telehealth can also help school nurses advocate for services in the school setting. Medicaid can also assist in funding telehealth services, but school nurses must ensure state laws include this provision. Other funders may include education

and clinics who serve at risk populations. School nurses could also approach corporations who employ the majority of the students' parents because telehealth also allows parents to stay at work instead of care for sick children.

Telehealth can benefit school nurses who service students who are at risk in urban communities because they may lack health access otherwise. Yet telehealth can also benefit school nurses working with students in rural areas because they would not have to travel long distances for appointment. Many programs exist (The Children's Partnership, 2009) and can be found on-line. The issue is a lack of rigorous evaluation of the programs.

Limitations

The studies included in this literature review have several limitations. There was only one randomized controlled trial available. Therefore, most of the studies were qualitative, observational or case studies and lacked proper randomization. Several of the studies used small sample sizes. Additional research with larger sample sizes and proper randomization would improve the strength of the argument for the implementation of telehealth in the school setting.

<div align="center">

Conclusion

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The benefits of telehealth and its potential to integrate with the ACA should be closely examined. Barriers to successful implementation of a telehealth program can be overcome if the benefits are determined to outweigh the cost and obstacles. School nurses who use telehealth can further meet the health needs of underserved children. The future of healthcare and school nursing is changing and telehealth is a tool school nurses can use to improve care in an innovative and efficient way.

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Table 1. Synthesis of Literature

Author	Design	Sample Characteristics	Intervention	Findings	Limitations
Bergman *et al.* (2008)	Prospective cohort study	N=83 students with asthma from three elementary schools in San Francisco. No control group	Each student was seen by an asthma expert via a telemedicine link at 0, 8 and 32 weeks. Treatment recommendations were sent to the children's PCP	94% of parents rated the program as excellent or good. Significant improvement in child asthma knowledge (P=.03) and parent asthma knowledge (P<.001). Significant improvement in the physical (P=.009) and social (P=.008) categories for children on asthma survey. No significant change found in ER visits, spirometry, or hospitalizations	No control group. Number of days with asthma symptoms not measured, which is considered the "gold standard" of measuring asthma outcomes. Researchers not able to assess changes in care received from PCP
Burke, Bynum, Hall-Barrow, Ott and Albright (2008)	Case study	N=92 students. Rural participants from one high school and one elementary school.	Fifteen group education sessions about health and behavioral education provided to teachers and counselors	Seven essential steps documented to consider if implementing a telehealth program	No randomization or control group. Observational study

Bynum, Cranford, Irwin and Denny (2002)	One-group posttest design	N=3319 students Convenience sample of Arkansas junior high and high schools who participated in the School Telehealth Education Program for years 1997-1999	Telehealth educational videos provided information about health risks, disease prevention, health promotion, personal growth and health sciences	Participants had medium to high levels of satisfaction with program interest and quality. Higher satisfaction (p<.001 to p=.005) in scores of juniors, female, and African American students	The one-group design limits generalizability. Differences in administration of the program at different locations
Doolittle, Williams and Cook (2003)	Cost analysis	Cost analyses from 10 school clinics that performed 386 telemedicine consults. Data gathered in Kansas	386 telemedicine clinical consults were performed and costs analyzed	The average cost of a telemedicine consult ranged from $173.13 to $7328.17 depending upon how many consults were completed. Telemedicine is cost competitive with conventional clinics when 200 or more consults are provided	Some difficulty separating costs of program with costs of medical center where consults were provided. Only ten sites studied
Gallagher (2004)	Case study	N= 84 parents of school children with ADHD symptoms; 566 parents, teachers and therapists using an educational website, teachers and parents of children receiving OT and/or PT (in school)	Evaluation of telehealth and website	Satisfaction surveys showed significant improvement in all areas. Parents most satisfied with timeliness, referral process and evaluation. Teachers reported improvement in classroom behaviors. Educational website and on-site PT/OT viewed as beneficial	Children evaluated for ADHD and referred to their own physician for follow up care. Therefore, each child received differing treatment. Voluntary response surveys to the online education. Observational study design limits generalizability

Izquierdo *et al. (2009)*	Random Controlled Trial (RCT)	N=41 students with type 1 diabetes from 25 public schools (K-8th grade) in New York. Control group: 18 students from 13 schools. Intervention group: 23 students from 12 schools	The school nurse, child and diabetes team video-conferenced via a telemedicine link once a month. Educational modules about diabetes provided through telehealth for school nurses and staff.	A1C values increased for students in the control group and decreased in the telemedicine intervention group (p<.02). Diabetes-related problem visits to the school nurse decreased over time in the intervention group.	Small sample size. Some technical difficulties during first three months. Vacation break for students at 6 month mark, during which there was no intervention.
Lancaster, Krumm, Ribera, and Klich (2008)	Matched pairs	N=32 third-graders from elementary school in rural Utah.	Hearing screening services were provided on-site and via a telehealth link	No significant difference in hearing screening results obtained using traditional vs. telehealth procedures	Small sample size with children of the same age and most with no hearing problems. Two different audiometers used to conduct hearing screenings.
Mackert *and Whitten* (2007)	Case study	N=23 administrators, physicians, and school nurses involved in TeleKidCare program in Kansas	Interactive TV systems in the school enable school nurses to communicate with physicians to provide consultations for children ill at school.	Those who used the program the most viewed it as a positive. Telecare program enabled those providing care to children to get together at the same time. Different schools and nurses may implement telecare in different ways.	Case-study design reduces ability to generalize findings. Small sample size

Malasanos, Patel, Klein, and Burlingame (2005)	Case study	N=44 school children with type 1 diabetes, 6 caregivers, 6 clinic nurses, 18 school nurses in Florida.	Online education modules to school nurses and case managers. Students and school nurses given equipment to transfer blood glucose meter data remotely.	Telehealth program improved communication in rural area. Participants expressed satisfaction with the program and improved communication. Compliance with school health plans improved.	Case-study design reduces ability to generalize findings. Privacy concerns limited participation. More details regarding data collection and results needed.
McConnochie *et al.* (2005)	Quasi-experimental	N=Total clinic enrollment-400 weeks of observations	Telemedicine link between childcare center and clinician to provide consultations for sick children.	Absences from childcare due to illness in the telemedicine group were less during the weeks with telemedicine. Telemedicine contributed to 63% reduction in absences due to illness. Parents indicated that telemedicine often allowed them to stay at work and decreased the need for a visit to a clinic or ER.	No randomization. Total enrollment numbers used in calculations, not just children with consent to be in study.
McConnochie, Wood, Herendeen, ten Hoopen, and Roghmann. (2010)	Descriptive, observational	N=800 parents of children participating in a telehealth program in 22 suburban and inner-city schools.	Parents surveyed regarding satisfaction with their child's participation in a telehealth program.	84.6% of comments were positive and most commonly included convenience and ability of parents to stay at work. Negative comments included reliability of diagnosis and technical problems.	Descriptive study from one community.

Romano, Hernandez, Gaylor, Howard and Knox (2001)	Matched pairs	N=17 asthmatic rural school children in Texas	Children had face-to-face encounters with asthma care specialist and telemedicine encounters to follow up at weeks 4, 12 and 24.	83% increase in mean number of symptom free days (p<.05). Mean symptom scores reduced 44% (p<.001). Specialty asthma care via telemedicine vs. face-to-face had similar outcomes in symptom control and quality of life.	Small sample size. No randomization.
Spaulding, Davis, and Patterson (2008)	Quasi-experimental	N=1389 school professionals. Convenience sample.	Educational information school staff received regarding chronic illness either by videoconferencing or by face-to-face presentation.	Face-to-face presentation preferred (p<.001), although satisfaction with both methods was high. If face-to-face presentation is not possible, video conferencing is an alternative.	No randomization
Whitten, Kingsley, Cook, Swircynski and Doolittle (2001)	Case study	N=49 teachers, two nurse focus groups, 8 administrative staff	Teachers and administrative staff involvement in a telehealth program.	Steps identified in the process for completing a telehealth consultation. The program was ultimately seen by the nurses as beneficial to students. Most school personnel were comfortable with the technology. Administrators felt program strengths were increased communication and positive public relations. Negatives were billing and school system support issues and insufficient planning and delays.	Small sample sizes. No randomization. Case-study design limits generalizability.

| Young and Ireson (2003) | Prospective exploratory study | N=150 telehealth encounters with students at one urban and one rural elementary school in Kentucky. Convenience sample. | School nurse, mental-health practitioner, pediatric clinic and child psychiatrist linked to provide consultations via a telemedicine system using phone lines. | High satisfaction scores from participants. Families saved in travel, ER, missed work, and physician visit costs. | No control group. Exploratory design limits generalization. |

ADHD=attention-deficit hyperactivity disorder; OT=occupational therapy; PT-physical therapy; ER=Emergency Room; PCP=Primary care provider