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ORIGINAL ARTICLE

Pediatric Obesity Management in Rural Clinics in California and the Role of Telehealth in Distance Education

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Abstract

Objective: To determine health care provider needs related to pediatric obesity management in rural California and to explore strategies to improve care through telehealth.

Methods: Cross-sectional survey of health care providers who treated children and adolescents at 41 rural clinics with existing telehealth connectivity.

Results: Most of the 135 respondents were family physicians at designated rural health clinics serving low-income families. Respondents had practiced in rural areas for an average of 10 years. Most providers rated their self-efficacy in managing pediatric obesity as 2 or 3 on a 5-point scale. The barriers most frequently reported by health care providers were lack of local weight management programs, lack of patient motivation, and lack of family involvement in treatment. Providers reported that the resources they would find most helpful were readily accessible patient education materials, strategies to link patients with community treatment programs and training in brief, focused counseling skills. Three-quarters of providers already used telehealth for distance learning. Providers reported very high interest in participating in continuing education on pediatric obesity delivered by telehealth, specifically Internet communication with specialists, web-based education, and interactive video case-conferencing.

Conclusions: Rural health care providers face several barriers related to pediatric obesity management. Targeted interventions provided via telehealth to rural health care providers may enhance the care of obese children and adolescents. The results of this study provide directions and priorities for the design of appropriate interventions.

Key words obesity, pediatric, rural, telehealth, telemedicine.

The prevalence of obesity has doubled among children aged 2 to 5 years, and it has tripled among children aged 6-11 years, over the past 30 years.¹ Obesity is now considered a public health "epidemic" in the United States affecting 17% of children, with an additional 15% of children qualifying as overweight.² Childhood obesity has been identified as a risk factor for the development of multiple health problems, including type 2 diabetes, hypertension, hypercholesterolemia, obstructive sleep apnea, anxiety, depression,³⁻⁸ and adult obesity and its

complications.^{9,10} Childhood obesity is a particularly challenging problem in rural areas. Parents of obese rural children report that lack of local weight loss resources, lack of exercise facilities, and lack of access to healthy foods are barriers to weight loss.¹¹ Rural residents have lower access to pediatric and specialty care, greater travel time to health care providers, less availability of health insurance, lower likelihood of exercising, and higher rates of obesity, heart disease, and diabetes compared to their urban counterparts.¹²⁻¹⁵

Since approximately 90% of children have a source of ongoing health care, clinicians have recurring opportunities to contribute to the management of pediatric obesity.^{12,13} However, unique challenges faced by rural clinicians include professional isolation, reduced access to medical information and continuing education, and limited communication with subspecialists and ancillary support services.^{16,17} Telehealth is defined as the use of electronic information and telecommunication technologies to support long-distance clinical health care, patient and health care professional education, and public health.¹⁸ Telehealth has been successfully used in dermatology, psychiatry, pulmonary medicine, obesity, and cardiology,¹⁹⁻²³ and it has reduced the cost of health care and time related to travel.²⁴⁻²⁶ Few studies have assessed rural health care providers' challenges related to pediatric obesity and their interest in telehealth applications to address these challenges.

Our goals were to determine: (1) self-efficacy and perceived effectiveness of health care providers in rural California in managing child and adolescent obesity; (2) perceived barriers in the treatment of overweight rural children and adolescents; (3) clinical resources that may enhance the effectiveness of obesity management in rural areas; and (4) potential strategies to improve obesity management and rural health care provider training through telehealth. In addition, we assessed whether there were differences in attitudes, barriers, and need for clinical resources based on professional group, years of practice, and duration of practice in rural settings.

The Chronic Care Model offers a framework to identify factors influencing the management of pediatric obesity and guided the design of the questionnaire used in our study.²⁷ The model has been used to improve the quality of disease management for other chronic illnesses in a variety of settings and populations. The 6 key areas identified within the Chronic Care Model are: (1) self-management support, (2) decision support, (3) delivery system design, (4) clinical information system, (5) organization of the health care system, and (6) community resources.

Methods

Study Population and Design

We conducted a cross-sectional descriptive survey of health care providers in rural California. A 3-page questionnaire was developed to assess health care providers' perceived effectiveness with respect to the treatment of pediatric obesity, challenges and solutions to providing care in rural areas, and the potential utility of telehealth in addressing these challenges. Health care providers

(physicians, nurse practitioners, and physician assistants) working in rural clinics in California who provided health care to individuals younger than 18 years were eligible to be included in the study. A mailing list of rural clinics in California with existing telehealth connectivity with the University of California (UC) Davis Center for Health and Technology was obtained ($N = 78$). Listed contact persons at each clinic site were contacted by telephone to obtain information on whether the clinic provided health care to children ($N = 41$). We also acquired information on which health care providers at each clinic provided health care to children.

A total of 156 health care providers at 41 rural clinics in California with telehealth connectivity were eligible for this study. Copies of the survey questionnaire were mailed with a postage-paid return envelope to the contact person at each clinic in May 2007. The accompanying cover letter requested that the questionnaires be distributed to all eligible providers, collected after completion, and mailed back in the enclosed envelope. The survey packet was resent to contact persons at all clinics with nonresponding health care providers 2 more times, 4 and 8 weeks after the first mailing. The study protocol was approved by the University of California (UC) Davis Medical Center Institutional Review Board.

Measures

The same questionnaire was sent to all professional groups. The development of the questionnaire was informed by a review of the literature, discussions with clinicians who work with obese children, and obesity experts. The questionnaire was pilot-tested for face validity by 6 health care providers including 3 family physicians and 1 nurse practitioner practicing in rural California, as well as 2 pediatricians practicing in urban academic medical centers in California who are experts in pediatric obesity. Input from these health care providers was used to refine the survey instrument. Human subjects research approval was obtained from the UC Davis Institutional Review Board.

Perceived effectiveness of treatment was assessed on a 5-point scale (1 = highly ineffective, 5 = highly effective). Twelve potential barriers to treatment that emerged through the pilot-testing process were listed, and providers were asked how often each posed a barrier to treatment using a 5-point scale (never, occasionally, sometimes, often, or always). To assess the helpfulness of clinical resources for treating obese children, respondents were asked to rate 7 potential resources using a 4-point scale (definitely unhelpful, possibly unhelpful, possibly helpful, or definitely helpful). The survey also included 3 questions on preferred continuing medical

education methods using telehealth technologies. Respondents were also asked questions about their type of practice and demographic characteristics.

Data Analysis

Data analysis was performed using STATA 10 and R 2.10.0.^{28,29} We used univariate and multivariate linear models to investigate differences in perceived effectiveness, self-efficacy, barriers, and interest in telehealth related to the following health care provider characteristics: professional group, age, years in practice, years in rural practice, estimated percentage of patients with low income, and use of electronic medical records. All multivariate models included professional group, years in practice, estimated percentage of patients with low income, and use of electronic medical records. Coefficients for continuous outcomes (namely years in practice, years in rural practice, and percentage of low-income patients in practice) represent the change in outcome for each additional unit increase in the predictor variable. We used logistic regression to investigate differences in current use of telehealth technology.

Results

A total of 135 health care providers at 39 rural clinics returned questionnaires following all 3 mailings (response rate 86.5%).

Practice Setting

Approximately 90% of health care providers worked at designated Rural Health Clinics or Federally Qualified Health Centers in rural areas.³⁰ Health care providers estimated that 71% of the children and adolescents they cared for lived in low-income families.

Health Care Provider Demographics

The average age of health care providers was 46.7 years (range 27-78, SD = 10.4); 58% were female and 78% were white (Table 1). Providers had been in clinical practice for an average of 13 years (SD = 10.4) since completing their medical training. They had spent a mean of 10 years in clinical practice in a rural area (SD = 8.7). More than half of all providers were physicians, 24% were nurse practitioners, and 22% were physician assistants. Most responding health care providers (78%) reported that they specialized in family practice. The next most commonly reported specialty was pediatrics (17%).

Table 1 Characteristics of Responding Health Care Providers

Characteristics	Respondents (N = 135)
Gender, n (%)	
Male	56 (41.5)
Female	79 (58.5)
Age groups, n (%)	
<35 y	21 (15.7)
35-44 y	39 (29.1)
45-54 y	42 (31.3)
55-64 y	27 (20.2)
≥65 y	5 (3.7)
Race & ethnicity, n (%)	
White	105 (78)
Asian	15 (11)
Black/African American	3 (2)
Native Hawaiian/Pacific Islander	1 (0.7)
Native American/Alaskan Native	1 (0.7)
Other	8 (6)
Hispanic	12
Profession, n (%)	
Physician	73 (54.1)
Nurse practitioner	32 (23.7)
Physician assistant	30 (22.2)
Specialty, n (%)	
Pediatrics	24 (17.8)
Family medicine	105 (77.8)
Other	6 (4.4)
Years in clinical practice	
<5	33 (24.4)
5-10	33 (24.4)
>10	69 (51.1)
Years in rural practice	
<5	41 (30.4)
5-10	42 (31.1)
>10	52 (38.5)
Practice utilizes electronic health records, n (%)	
Yes	31 (23.0)
No	102 (75.6)

Self-Perceived Effectiveness and Self-Efficacy

When respondents were asked to rate their beliefs on the effectiveness of health care providers in treating pediatric obesity on a 5-point scale (1 = lowest, 5 = highest), 49% rated this effectiveness as 3 and 32% ranked it as 4. When asked about their own self-efficacy in treating pediatric obesity on a similar 5-point scale, most providers (62%) rated their self-efficacy as 3 and 51% rated their self-efficacy as 2. Beliefs about effectiveness of treatment and provider self-efficacy were not related to the number of years in clinical practice, number of years in rural practice, health care provider type, specialty, percentage of patients who were low income, use of electronic medical records, or health care provider age in univariate and multivariate analyses.

Table 2 Barriers to the Management of Pediatric Obesity in Rural Clinics

Barrier	Average Score (1-5 Scale)	Often/Always a Barrier
Lack of local weight management program	3.87	74%
Lack of patient motivation	3.84	78%
Lack of parent involvement	3.81	77%
Lack of access to psychologists	3.36	55%
Lack of ready access to educational materials	3.36	54%
Lack of reimbursement	3.30	55%
Lack of time	3.28	49%
Lack of access to dieticians	3.26	52%
Lack of community resources	3.00	38%
Provider's lack of counseling skills	2.78	23%
Provider's lack of knowledge	2.75	23%
Provider's fear of precipitating eating disorders	1.91	9%

Barriers

The barriers most frequently reported by health care providers were lack of local weight management programs, lack of patient motivation, and lack of family involvement in treatment (Table 2). Other barriers included lack of access to psychologists and dieticians, lack of readily available educational materials, and lack of third-party reimbursement for pediatric obesity management.

Health care providers who had greater clinical experience in rural areas perceived the lack of parental involvement as less of a barrier to obesity treatment. Specifically, the average score decreased by 0.02 units per year of practicing in rural areas (effect = -0.02 units per year in rural practice; 95% CI, -0.03 to -0.01; *P* = .019). Treating a higher proportion of low-income patients was correlated with providers perceiving parental involvement as a greater barrier to the management of pediatric obesity (effect = 0.1 per 10% increase in the percentage of low-income patients; 95% CI, 0.04 to 0.2; *P* = .017). A higher proportion of low-income patients was also associated with providers perceiving poor reimbursement as a greater barrier to the management of pediatric obesity (effect = 0.1 per 10% increase in the percentage of low-income patients; 95% CI, 0.001 to 0.2; multivariate *P* = .051). Older health care providers as well as those who had been in clinical practice longer were less concerned about precipitating eating disorders during obesity treatment compared to younger providers or those with less clinical experience (years in practice: effect = -0.02 per year; 95% CI, -0.04 to -0.002; *P* = .014).

Family physicians perceived lack of knowledge and skills as more of a barrier to effectively treating pediatric obesity than did pediatricians (family physician vs

Table 3 Resources Helpful in the Management of Pediatric Obesity in Rural Clinics

Resource	Average Score (1-5 scale)	Possibly/Definitely Helpful	Chosen as Most Helpful Resource
Patient educational materials	3.66	97%	24%
Patients' access to treatment programs	3.57	93%	24%
Provider training in counseling	3.49	94%	18%
Improving clinic systems	3.39	90%	7%
Office staff training in assessment	3.36	90%	4%
Web-based inventory of local resources	3.36	90%	5%
Clinical algorithms	3.34	93%	13%

pediatrician contrast in mean barrier score = 0.63; 95% CI, 0.16 to 0.11; *P* = .01) or physician assistants (family physician vs physician assistant contrast = 0.43; 95% CI, 0.01 to 0.85; *P* = .043). There were no significant differences in barriers reported by nurse practitioners, pediatricians, and physician assistants. Compared to family physicians, nurse practitioners saw the lack of access to dieticians as more of a barrier to managing pediatric obesity (nurse practitioner vs family physician score contrast = 0.68; 95% CI, 0.06 to 1.3; *P* = .032). However, nurse practitioners considered time less of a barrier to managing pediatric obesity compared with family physicians (nurse practitioner vs family physician score contrast = -0.56; 95% CI, -1.07 to -0.05; *P* = .032).

Helpful Resources

Providers reported that the resources they would find most helpful were readily accessible patient education materials, strategies to link patients with community treatment programs and training in brief, focused counseling skills (Table 3). Other resources noted as being of help in the management of pediatric obesity were strategies to improve clinic systems, training for office staff, and access to an inventory of local resources.

Family physicians felt that office staff training and improvement of clinic systems would be more helpful in enhancing obesity management than did pediatricians (office staff training: effect = 0.54; 95% CI, 0.12 to 0.96; *P* = .012; clinic systems: effect = 0.49; 95% CI, 0.08 to 0.90; *P* = .019). Family physicians were also more interested in training in counseling skills than pediatricians (family physician vs pediatrician score contrast = 0.42; 95% CI, 0.05 to 0.79; *P* = .027). Providers who treated a high

Table 4 Rural Health Providers' Interest in Telehealth

	Average Score (1-5 Scale)	Providers Reporting High/Very High Interest
Specialist consultation	3.84	65%
Web-based education	3.76	61%
Internet-based case conferencing	3.61	57%

percentage of low-income patients considered strategies to link patients with community programs more helpful than did providers with lower proportions of low-income patients (effect = 0.01 per percentage point estimated low income; 95% CI, 0.004 to 0.02; $P = .021$).

Interest in Telehealth Technologies

Health care providers were provided with a standard definition of telehealth in the questionnaire.¹⁸ Of the providers surveyed, 73% reported using telehealth for distance learning. Of these providers, 74% reported employing telehealth to enhance patient care, 73% to keep up-to-date on advances in medicine, 63% to fulfill continuing medical education credits, 54% to reduce costs related to attending medical conferences, and 53% to reduce travel time to medical conferences. Older providers and those who had been in clinical practice longer were more likely to have used telehealth to reduce time and expenses associated with attending conferences (years in practice: $P = .011$ and $P = .023$, log OR = 0.064 and 0.054 per year in practice, OR for 10-year increase = 1.90 and 1.72). Providers with electronic record systems in their clinics were more likely to use telehealth to obtain continuing medical education credits than those who did not use electronic health records ($P = .043$, OR = 3.74). However, approximately 80% of providers had not attended education or training programs on pediatric obesity within the past 2 years, either in person or using telehealth technologies.

Providers were asked to report on their interest in participating in various forms of educational programs on pediatric obesity delivered by telehealth. More than half of the providers surveyed indicated that they had high or very high interest in conferencing with subspecialists over the Internet, taking part in web-based education, and participating in live Internet case-conferencing (Table 4). Interest in participating in educational programs on pediatric obesity delivered by telehealth was not significantly associated with the number of years in clinical practice, number of years in rural practice, or whether the clinic utilized electronic health records. Interest in participating in interactive video case-conferencing

was significantly higher among nurse practitioners than among family physicians (nurse practitioner vs family physician score contrast = 0.75; 95% CI, 0.19 to 1.31; $P = .01$).

Discussion

Our goal was to assess rural health care providers' self-efficacy and perceived effectiveness with respect to the treatment of pediatric obesity, challenges and solutions to providing care in rural areas, and the potential utility of telehealth in addressing these challenges. Health care providers who responded to this survey were, in general, not very confident in their own ability to treat obesity in children but believed that obesity treatment in children can be effective. Several barriers, such as lack of local weight management programs, low patient motivation, and inadequate family involvement, may interfere with treatment efforts. Overall, providers expressed high interest in participating in additional training employing telehealth technologies.

Multiple challenges related to the care of obese children and adolescents currently exist in rural primary care. Continuing education for rural health care providers is additionally a challenge given their geographic isolation. However, telehealth technologies provide an opportunity to overcome this barrier. Resources that can potentially be delivered using existing telehealth technologies include: (1) access to weight management programs, dieticians, and psychologists³¹; (2) distance education in pediatric obesity treatment, motivational interviewing, brief-focused counseling, and strategies to maximize third-party reimbursement; (3) clinician and office staff training and support in office systems improvement; (4) access to web-based patient educational materials; (5) access to a web-based directory of local and regional resources that support healthy weight management; and (6) access to web-based clinical algorithms to guide treatment.

Surveys of health care providers in urban areas show similar results.³² Poor reimbursement for time-intensive visits for obesity treatment exists even in specialized obesity referral clinics, regardless of the severity of obesity.³³ A national needs assessment, which did not specifically examine geographic location, demonstrated that the 2 most frequent barriers to obesity treatment reported by clinicians were lack of parent involvement and lack of patient motivation.³⁴ Clinicians' self-reported confidence in their ability to help motivate patients to change behaviors has been reported as a barrier in other studies.³⁵ Many health care providers have not been trained in motivational interviewing and other counseling techniques to enhance adherence to behavioral change.³⁶ Motivational

interviewing and brief negotiation have been adapted for use in busy and time-limited clinical visits, and gaining proficiency in these techniques may be an effective approach in rural health care settings.³⁷⁻³⁹

Strengths of our study are the high response rate as well as the fact that we included a variety of health care professionals involved in the delivery of care in rural California (family physicians, pediatricians, nurse practitioners, and physician assistants). Although we have identified important issues related to the delivery of health care for pediatric obesity in rural underserved areas, our study relied primarily on self-report and did not include direct measures of health care provider knowledge or clinical practice. Additionally, it is possible that responding health care providers may have had greater interest in the management of pediatric obesity than nonrespondents.

Although our survey provides valuable data to plan targeted interventions in California, similar surveys of rural clinics in other states would help determine whether health care providers in other geographic locations face the same challenges to pediatric obesity management. Once targeted interventions have been designed, further research on the feasibility, acceptability, and effectiveness of such interventions to enhance obesity care in rural areas needs to be conducted. Since our study relied primarily on self-report, other measures of health care provider knowledge or clinical outcomes may provide further information regarding challenges to obesity management in rural areas.

Information obtained from this study will guide the development of tailored interventions delivered by telehealth to rural health care providers to enhance the clinical care of obese children and adolescents. For example, nurse practitioners may be a suitable target group for interventions using Internet case-conferencing, given their high interest in this medium of communication and lower reported time constraints. For rural clinics to provide effective care for chronic diseases such as obesity, it is additionally necessary to put into place efficient practice systems that facilitate implementation of clinical recommendations.

Implications

Our study indicates that rural health care providers face several barriers in treating pediatric obesity, including lack of access to weight management programs, lack of patient motivation and family involvement, lack of access to educational materials, poor reimbursement, and lack of time. Clinician and office staff training and support in office systems improvement was identified as another area of need. Health care providers expressed interest in distance education delivered using telehealth technolo-

gies to help overcome these barriers, specifically, video-conferencing with subspecialists, web-based education, and live Internet case-conferencing. Our findings highlight the need for increased educational opportunities to rural health care providers related to the management of pediatric obesity, specifically using delivery methods that overcome travel time, expense and geographic isolation. Follow-up studies to evaluate the effectiveness of strategies to improve the management of obese children and adolescents in rural areas are needed.

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