

# ► Improved access to subspecialist diabetes care by telemedicine: cost savings and care measures in the first two years of the FITE diabetes project

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## Summary

We have used telemedicine clinics supplemented by online education to provide effective care for children with diabetes. Before the programme began, the mean interval between visits was 149 days; in year 1 of the programme it was 98 days, and in year 2 it was 89 days. Before the programme, there were on average 13 hospitalizations a year (47 days) and this decreased to 3.5 hospitalizations a year (5.5 days). Emergency department visits decreased from 8 to 2.5 per year. On 10 occasions after the programme started, ketosis was managed by telephone intervention alone, relying on family-initiated calls. Over 90% of patients and family members expressed satisfaction with the telemedicine service and wished to continue using it. In all, 95% felt little self-consciousness. Over 90% felt their privacy was respected. The programme saved US\$27,860 per year. The present study demonstrated improved access to specialized health care via telemedicine in combination with online education improved health status and reduced costs by reducing hospitalizations and emergency department visits.

## Introduction

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A combination of increasing numbers of children with diabetes, a growing population, shortages of specialists and complex management of children with diabetes has led to poor accessibility to endocrinologists. Outreach programmes at the University of Florida have brought specialists to underserved regions such as Volusia County (VC).<sup>1</sup> Physicians from the University of Florida have cared for children with diabetes ( $n = 44$ ) and other endocrine problems ( $n = 55$ ) in the region, but families had little contact with the physicians between clinic visits. Quarterly visits by the physician teams entailed a 2.5 h drive, with 40 patients scheduled and little time to do effective diabetes management or education. If the appointment was missed, either the family came to the University of Florida in Gainesville or they waited for the next visit by the physician to the region, resulting in six months between appointments.

We hypothesized that telemedicine clinics, supplemented by online education, could provide effective care for children with diabetes while making efficient use of physician time.<sup>2-4</sup> By increasing efficiency, patients would

receive more time per visit and more frequent visits, thus enhancing their health care. This, in turn, would result in cost savings from decreased rates of hospitalization and decreased numbers of emergency department visits.

The Florida Initiative in Telehealth and Education (FITE) diabetes project was established in 2001 as a university project in conjunction with the Florida Department of Health Children's Medical Services Network (CMSN), which serves patients with a chronic medical illness and a family income level below 200% of the federal poverty level. The project focused on improving care of diabetes for children in VC, an area of Florida that was underserved in terms of paediatric endocrine services. The project included a semi-monthly remote telemedicine clinic and development of a Web-based education site.

## Methods

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The study was approved by the appropriate ethics committees.

## Clinic

CMSN nurses in VC were trained to perform evaluations of children with diabetes and to use the videoconferencing equipment and hand camera. Videoconferencing was

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conducted at 384 kbit/s, using commercially available equipment (an Intern model, Tandberg, in VC and a model 800, Tandberg, at the university). After providing informed consent, patients and their parents completed a satisfaction questionnaire before and after their first telemedicine visit and again yearly. At each visit, a nursing evaluation was completed using a template outlining the history, diabetes self-management data and physical examination. Downloaded blood glucose logs and history were sent by fax to the hub. The physician supplemented the information provided by telemedicine. Treatment plans were made by the provider. In-person visits with the physician were performed for new patients and for *all* patients annually.

### Economic analysis

Pre-FITE (1999–2001), all paid Medicaid claims for the sample population were reviewed for costs incurred, including transportation, hospital emergency room visits and inpatient hospitalizations. Post-FITE, families were asked if there were any illnesses requiring telephone, emergency room or hospital contact. Records were kept documenting recommended home management of acute illness.

### Web-based education

Child-friendly cartoons, narration and text were developed to educate about the basics of diabetes care. Accomplishments in the education programme were tracked automatically via online testing. Families were surveyed about access to computers and the Internet. Participants were provided with computers and Internet access if needed. Pre- and post-test scores for each module were automatically recorded on an administrative site.

## Results

### Clinic

The mean visit interval was 98 days in year 1, 89 days in year 2 and 149 days in the year before FITE. Before FITE, there were on average 13 hospitalizations a year (47 days); this decreased to 3.5 hospitalizations a year (5.5 days). Emergency department visits decreased from 8 to 2.5 per year. On 10 occasions after the programme started, ketosis was managed by telephone intervention alone, relying on family-initiated calls. Over 90% of patients and family members expressed satisfaction with the telemedicine service and wished to continue using it. In all, 95% felt little self-consciousness. Over 90% felt their privacy was respected.

### Economics

Even when line charges and equipment costs of US\$18,826 were included, the programme saved US\$27,860 per year.

The reduction in hospital days saved amounted to US\$44,419 per year and the reduction in emergency department visits amounted to US\$2267 per year. The cost–benefit ratio was 0.40, not including treatment team or family transportation costs and work/school time saved. Education about why and when to call the health-care team allowed early intervention and prevention of many emergency department visits and hospitalizations.

The Medicaid transportation cost for one family to Gainesville for the diabetes clinic was US\$262. Such transportation is required for families who need access to specialist care unavailable in their home area. There would be additional savings of US\$64,978 if Medicaid family transportation to the hub was necessary in the absence of the telemedicine clinic.

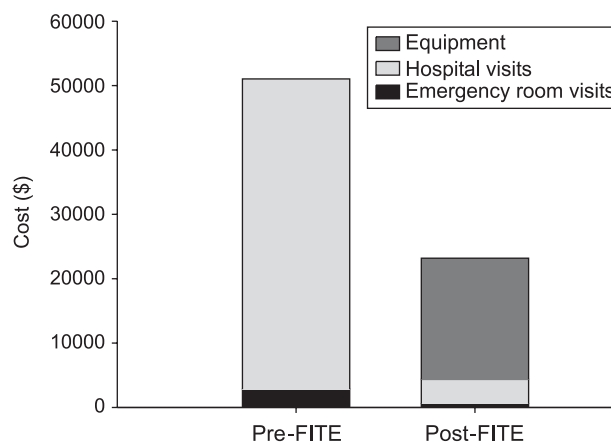
### Web-based education

There were improvements between the pre- and post-test educational results. Satisfaction and ease-of-use ratings were high.

## Discussion

Patients in the study group had many risk factors for poor adherence: less than optimum visit frequency, poor understanding of the disease process, low socioeconomic status, inadequate health insurance, transient lifestyle, residence in an area without access to a subspecialist and low health literacy. When geographical barriers to care were removed, education was made available, and health-care team efficiency was improved through the use of telemedicine. The result was cost savings (Figure 1).

Pre-FITE, ketones or vomiting often precipitated an emergency room visit. Post-FITE, telephone interaction with the health-care team was often sufficient to restore metabolic status and allow home management of acute



**Figure 1** Cost for provision of care to the children in VC for the three years preceding the programme and the first two years of its operation. The reduction in hospitalization and emergency room visits more than compensated for the cost of the required equipment and line charges

illness. This replaced emergency department or hospital-based care. Improved accessibility was demonstrated and delivery met the standard of care. The visit interval decreased from 149 to 89 days as the bi-weekly telemedicine clinics replaced quarterly clinics.

Many academic centres provide health care through staff who travel to remote centres. Replication of the FITE programme therefore has the potential to improve efficiency and save time for physicians and diabetes treatment teams already trying to meet the demands of their busy schedules. While the programme was both clinically effective and cost-effective for the small group of patients studied, replication on a larger scale and at more sites will be necessary to provide justification for insurers to meet the start-up cost and line charges associated with telemedicine. The present study demonstrated improved access to specialized health care via telemedicine in combination with online education improved health status and reduced costs by reducing hospitalizations and emergency department visits.

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# ► School nurse, family and provider connectivity in the FITE diabetes project

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## Summary

The Florida Initiative in Telehealth and Education (FITE) diabetes project includes a system of remote blood glucose monitoring and online education for school personnel, families and providers. Forty-four patients with diabetes (100% of patients), six caregivers, six case managers and 18 school nurses were provided with secure email access, allowing blood glucose and other data transfer. In all, 50% of school nurses and 100% of case managers completed educational modules on the FITE Website. Over 90% of patients and all school nurses received equipment for transmitting blood glucose data to their computers. The data were discussed during clinic appointments. Inclusion of previously unavailable data from school nurses contributed to fine-tuning the diabetes management regimen. Those patients, families and school nurses who chose to transmit blood glucose data and participate in online education expressed satisfaction with the technology, the process and the improved communication.

## Introduction

Diabetes care for school-age children is increasingly complex, requiring analysis of daily blood glucose data, insulin doses, food intake and exercise. This requires

frequent doctor–patient interaction and a high level of education, not only of patients, but also of caregivers, including school personnel. This shift to intensive management is based on research about preventing life-threatening consequences of diabetes. However, it has been accompanied by a shortage of paediatric endocrinologists and an increased incidence of childhood diabetes.

The Florida Initiative in Telehealth and Education (FITE) diabetes project was established in 2001 at the University

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