

**TOP FY 2000
Project Narrative**

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The problem

Tremendous socioeconomic disparities in childhood morbidity burden persist. Our own research in Rochester, for example, has demonstrated a 5-fold greater hospitalization rate for asthma exacerbation,ⁱ nearly a 4-fold greater hospitalization rate for bronchiolitis,ⁱⁱ and a 3-fold greater hospitalization rate for gastroenteritis/dehydration (unpublished data) among impoverished, inner city, minority children than among their more affluent suburban counterpart. Asthma is the most common chronic illness among children and asthma exacerbation is the most common reason for hospitalization in childhood. Bronchiolitis is the most common reason for hospitalization among infants.² Although differences in physical environment (e.g., environmental tobacco smoke, household crowding) almost certainly accounts for some of the socioeconomic disparity, treatment which is delayed or less appropriate also is likely to be an important etiologic factor.^{iii, iv, v, vi}

Less effective treatment is closely tied to difficulties in access to care. Inner city children not only endure a greater burden of morbidity, but their families have less social, material and financial resources to address this burden. Transportation and communication resources are limited. Based on the 1990 US Census, for example, 42% of Rochester's inner city households had no automobile and 13% lacked a phone. These figures compared with 4.6% (no automobile) and 0.7% (no phone) for suburban households. Based on analysis of Monroe County birth records for 1989 and 1990, 43.4% of inner city mothers had not completed high school at the time they give birth, versus 5.7% in the suburbs. 78% of new inner-city mothers were African-American or Hispanic, compared to 3.8% of suburban new mothers. Inner city families are served by health centers and hospital-based clinics whose strained resources can provide only limited continuity of care and limited evening office hours, as well as inconsistent and poorly responsive phone coverage systems. Use of hospital emergency departments to address problems that could often be managed by phone, telemedicine or office visits is a frequent consequence.

Care outside the home has become the norm for pre-school children in the US. Already in 1995, 60% of children from birth to 5 years of age, who were not yet in school, participated in a non-parental child care program.^{vii} With continuation of the trend for young mothers to join the work force and the advent of welfare-to-work programs throughout the US, this proportion is undoubtedly larger today, and it will continue to grow.

Acute, generally infectious illness is a very common and difficult problem for all involved in daycare centers. Higher incidence and greater severity of illness among children in daycare (7 or more children from different families in a non-residential setting for at least 20 hr/wk) than among children in home care is well documented.^{viii, ix, x, xi} Economic burden of illness in daycare is also substantial.^{xii, xiii, xiv} Direct and indirect costs are attributed primarily to costs of physician visits, medications, alternative care arrangements and parent time lost from work.

Daycare providers have the difficult responsibility of determining whether illness requires a child to be removed from the center and seen by a physician. Appendix 2 contains NY State Department of Social Services (DSS) regulations relating to health in daycare. Despite thoughtful and assiduous efforts that have gone into their development, directives from DSS relating to exclusion policies are only stated in general terms. They are subject to judgment, various interpretations and legitimate debate. Developing the operational details of exclusion policies is left

to individual daycare centers. Policies often require an MD to certify readiness for return to daycare.

Parents find themselves in an even more difficult situation. They are frequently called at their jobs to pick up ill children. One study found that a child's illness accounted for 40% of missed work for daycare parents.¹³ Many inner city parents, who jeopardize employment by leaving work as demanded, don't have easy access to a medical professional for diagnosis, treatment, guidance and documentation that will allow rapid return to daycare. Written (or faxed) doctor's orders are required by NY State to allow a licensed center to give prescription medication. Parents, desperate to keep jobs that they can't afford to lose, delay pick-up of sick children and hasten the return of recovering children to centers. Centers are pressured by parents to interpret exclusion policies loosely. Daycare providers report that febrile illness frequently becomes apparent late in the morning, at the time that antipyretic medication, given by parents shortly before morning drop-off time, wears off. Nurses and physicians whose children use daycare report informally that they have often resorted to this practice.

Letters of support from daycare centers (Appendix 1) and responses to a survey, distributed to parents by centers during the first week of March, 2000 (Appendix 10), support this characterization of problems relating to acute illness. To summarize, acute and generally infectious disease is a very common and challenging problem for all involved in daycare centers. Care outside the home has become the norm for pre-school children in the US. Resources for dealing with this burden of illness are not readily available to many inner city families. Tremendous socioeconomic disparities in childhood morbidity burden persist. Thus, the children and families most burdened by illness, and whose reliance on daycare is most important to their ability to improve their economic circumstances, are those least equipped to deal with the problem.

The solution

The TDC Project will address the problem by bringing health services to daycare centers. Proposed characteristics of the telemedicine consultation service are as follows. Attributes are subject to modification based on guidance from the Advisory Boards and knowledge gained through experience.

- *Regular availability at drop-off time.* Availability for 1 hour at morning drop-off time. This will allow centers to address health problems that are immediately apparent. Because of the potential to resolve illness issues immediately, it may also encourage parents not to hide problems from daycare staff.
- *Later consultation.* Consultation later on in the day will be available based on request. Most likely these later consultations will occur in the afternoon because illness not identified at drop-off time will most likely be identified late in the morning or early in the afternoon. These consultations will be provided at a mutually agreed upon scheduled time. The scheduled time will be within 1 hour of the request, although generally it could be provided within 30 minutes.
- *Consultation initiation procedure.* We have proposed that telemedicine consultations entail the following sequence of events throughout Stages I and II. Consultation procedures will later be modified to meet the stipulations of Stage III.
 1. Daycare center calls the phone nurse of the Pediatric Practice of Strong Hospital.

2. Decide with the phone nurse (based on protocols developed by the Advisory Boards) whether telemedicine consultation is needed or whether advice based on phone conversation with nurse or physician is sufficient. The phone nurse will be able to obtain a visual telemedicine assessment as part of this triage process.
 3. At drop off time, the evaluation will be immediate.
 4. For later consultations, the evaluation will be scheduled within 60 min, as discussed above.
- *Parent permission.* Blanket parent permission to initiate telemedicine evaluation whenever needed to address concerns of center staff will be requested. In addition, whenever symptoms of illness develop while the child is in daycare, parents will be contacted and given the option of telemedicine evaluation.
 - *Responsibilities of the daycare centers' TDC Site Coordinators.* These will include roles of (1) scheduling telemedicine consultation, (2) obtaining parent permission, (3) summarizing information available to daycare staff regarding the nature of the child's illness (eg, symptoms, prior illness, parent observations), (4) preparing the child for the evaluation (eg, explaining procedures to the child, taking the child's temperature), (4) operating equipment and manipulating peripheral devices such as the ear, nose and throat scope, (5) describing palpable attributes of skin and eye lesions, (6) contacting parents regarding the outcome of evaluations, (7) preparing hard-copy documentation of the evaluation for parents, (8) obtaining and recording illness outcome information (eg, exclusion from daycare, in-person office visit, prescription filled; see Evaluation section page 8 for detailed description).
 - *Providers.* Telemedicine evaluations will be provided by pediatricians from the Children's Hospital at Strong. These will be either an attending pediatrician or an experienced pediatric nurse practitioner or senior pediatric resident who is closely supervised by an attending pediatrician on site. All key clinical observations and recommendations will be reviewed by the attending before conclusion of the consultation.
 - *Records.* Daycare centers and providers will document telemedicine encounters in a fashion that will meet their current requirements and requirement of the TDC Project (see section on Evaluation, page 8). In addition, records of telemedicine encounters will include a picture of all visible physical exam findings, and, when important, a picture that documents the child's general appearance.
 - *Communications.* Records will be faxed or emailed to the primary care physician immediately after the encounter occurs. In some cases, for example when the telemedicine encounter results in the recommendation for an in-person physician office visit, phone contact with the primary care physician will be made by the telemedicine provider. Following telemedicine evaluation, either the telemedicine provider or the center's Site Coordinator (depending on the nature and complexity of the problem) will immediately contact the family to communicate findings and discuss management options. Records will also be provided to the parent on the day of the encounter.
 - *Supervision of providers.* The Medical Director and Project Director will provide up-to-date guidance to telemedicine physicians or nurse practitioners on management of health problems in daycare based on review of the latest guidelines from regulatory and advisory groups, consultation with infectious disease experts, and guidelines developed by the TDC Projects 2 Advisory Boards.

The telemedicine model. A substantial amount of evidence and experience, summarized in Appendix 8 suggests that telemedicine can replace a large proportion of office visits for childhood

illness. Each center's Site Coordinator will allow the clinician to focus on clinical evaluation and decision making, largely ignoring equipment-related, scheduling and other logistical issues. In addition to high quality, real time video and audio transfer, telemedicine units at daycare centers will include peripheral devices that provide examination tools basic to routine pediatric practice. Specifically, these are an ENT scope for ear and throat exams and a stethoscope for heart, lung, and abdominal exams. Assessment that depends of tactile sensation (eg, palpation to assess firmness, tenderness or increased warmth of an area of skin swelling) will depend on the experience of the Site Coordinator and the telemedicine clinician, and on the quality of communication between them.

To be useful in the daycare setting, telemedicine doesn't need to accomplish all that might be done in an in-person office visit. For example, simply by quickly confirming that an office visit is, or is not, required, telemedicine might avert suspicious or angry feelings among parents, their employers, and daycare staff. Various types of appropriate and timely response to illness may reduce exclusion due to illness.

Reducing exclusion because of illness.

The extent to which the availability of telemedicine consultation, in conjunction with other components of the TDC Project (e.g., activities of the Health in Daycare Advisory Board), can reduce exclusion is another key determinant of the measurable impact of this endeavor. While policies for exclusion have long been in place, their implementation is problematic for a number of reasons. To summarize reasons discussed in Appendix 9, they are: (1) exclusion may require a parent to leave work (or school) early or miss these completely; (2) alternative care for a sick child may be very difficult to arrange; (3) for many inner city parents, the ability to keep a job may be seriously threatened by time missed from work because of a child's illness; (4) interpretation of exclusion policies mandated by regulatory bodies is subject to judgment; (5) capacity to care for mildly ill children may vary among centers, depending on staffing patterns and experience of staff with ill children; (6) exclusion policies sometimes conflict with scientific evidence on transmission of infectious disease. We expect that the TDC Project will reduce exclusion through a number of mechanisms. Support for the belief that exclusion from daycare will be reduced comes from a related project, providing telemedicine services in elementary schools in Kansas City (NTIA award #20-60-98030) to medically underserved urban children. This project promises to have a significant impact on school attendance problems.^{xv}

Project outcomes. Measurable outcomes are linked to the 3 primary objectives as follows.

- I. *Implement a telemedicine service in 3 daycare centers located in inner city areas of Monroe County (Rochester), New York.*
 1. The partnership will be formed under the leadership of the Project Director and the Director of Program Evaluation from the Department of Pediatrics and the School of Nursing, both at the University of Rochester.
 2. The 3 implementation stages will be completed.

II. Reduce the impact of illness in daycare on children, parents, center staff, and industry.

1. Reduce the time children are excluded from daycare because of illness.
2. Reduce conflict between parents and daycare providers regarding illness in children.
3. Reduce the time parents miss work because of illness in their daycare children.
4. Reduce conflict between parents and employers regarding time lost from work because of illness in daycare children.
5. Reduce the frequency with which parents bring their daycare children to MD offices or EDs.

III. Ensure the continuation and expansion of this program beyond the project period and beyond this community.

1. Develop a *Health in Daycare Advisory Board* that serves as a network for sharing information on this issue among community agencies with a major interest in this issue and that develops guidelines for addressing this issue.
2. Develop a *Health Care Provider Advisory Board* that includes nurses and physicians who regularly provide pediatric primary care services to children in this community.
3. Involve all the major health care providers for inner city children in the TDC Project.
4. Ensure that payment mechanisms are established for telemedicine services in daycare centers.
5. Ensure that nurses, daycare workers, and physicians in training, who are presently working in this community, become familiar with the potential for telemedicine to provide services to children in daycare.
6. Disseminate information from the TDC Project through presentations at national meetings, publications in public health, telemedicine, nursing, and pediatric journals, and display at a web site created specifically for this purpose.

INNOVATION

The TDC Project is innovative in many respects. Studies evaluating telemedicine for triage and management of acute illness episodes in preschool children have not been published and probably do not exist. Application of network technology to address illness in daycare represents a novel yet logical and efficient approach to a the serious problem of national significance. The importance of this problem has increased as the trend for young mothers to join the work force has continued and care for pre-school children outside the home has become the norm. Illness in daycare represents a significant challenge to the success of welfare-to-work programs that have been implemented throughout the US and to efforts to break the “cycle of poverty”.

The partnership between daycare centers and families, an academic medical center, inner city health care providers, and a telecommunications company represents a unique organizational structure designed to address the problems of illness in daycare. The Kansas City elementary school telemedicine project, mentioned above, is somewhat similar both in the nature of the partnership and the type of health care problems addressed. A major difference between that project and the TDC Project is that illness is substantially more common and frequently more severe among the younger children who are in daycare than among elementary school children.

Further, as discussed in the following section on Diffusion Potential, this network and the TDC Project Plan have been carefully designed to facilitate the introduction and spread of telemedicine throughout the community. It appears likely that use of telemedicine for evaluation

and management of common childhood illness will increase efficiency and facilitate access for all socioeconomic groups.

DIFFUSION POTENTIAL

Strategy. Care for ill children, especially preschool children, challenges parents in all segments of society. A broad array of institutions, from health and social service agencies to industrial giants and the federal government, are invested in improving availability and quality of child care. Access to health services and to alternative child care arrangements for ill children present greater challenges to impoverished inner city families. Thus, providing innovative solutions first to this group is appropriate. Yet, the ability of telemedicine in daycare to continue beyond the project period almost certainly requires that it be recognized as an important and cost-efficient service for all socioeconomic groups. Health services innovations with potential to dramatically alter the nature of the medical evaluation and decision making process, patterns of health services utilization, and the structure of reimbursement mechanism, will not realize their potential without this recognition. To ensure this recognition, several strategies will be adopted including the involvement of resident physicians in providing telemedicine services. After completion of their 3-year pediatric specialty training, the majority of these residents (18 in each "class") in the Department of Pediatrics end up in primary care practice, many in the Rochester area, but also many in other urban and rural areas.

Local diffusion. Child care centers represent centrally located homes away from home for a large proportion of children and families. Many offer after-school care and recreation programs for elementary school and adolescent children in addition to care for pre-school children. Some are affiliated organizationally or geographically with churches, adult recreation, social service agencies or other community organizations. Thus, in addition to the 3 inner city partners, there are many other child care centers in this area that represent natural locations for telemedicine sites.

Payment mechanisms for telemedicine in daycare will evolve. The two largest employers in the area already pay \$10/hr for a little used service that provides bonded home care for sick children of their employees. Apparently, parents would rather not have a sick child cared for by unfamiliar people. If local industry favors the TDC concept, physicians determine that it offers quality care, families find it convenient and effective, and evidence generated from this project suggests that it is feasible and less expensive than in-person care, then coverage by both Medicaid and local health insurance can be expected. Until that time, local industry, DSS and, for middle class families, parents themselves might subscribe to TDC directly. Precedent for insurance coverage exists, based on both Medicaid and Blue Cross/Blue Shield coverage for telemedicine in Kansas City schools.¹⁵

Local diffusion of the TDC concept will be promoted by presentations at Pediatric Grand Rounds and Family Medicine Grand Rounds, conferences that are well attended by community- as well as university-based physicians, and by interactions involving the Health in Daycare Advisory Board and the Health Care Provider Advisory Board. In addition, a web site devoted to TDC will be developed and maintained on the University of Rochester Department of Pediatrics web server.

Availability of the technology. SDSL technology will shortly be marketed by our corporate partner, Frontier Communications. Frontier currently provides ADSL to the Rochester community

and will introduce SDSL within the time frame of this proposal. Current pricing is based on a national network pricing which also takes into consideration the inability to deliver this product to the business segment of the community at the present time. Based on DSL packages from around the US, we can expect that the monthly recurring charge quoted by Frontier at the present time will drop considerably when SDSL becomes commercially available in this community. Monthly recurring charges in other communities range from \$260 to \$650. By the end of the demonstration period, Frontier expects SDSL to be widely available in the Rochester area at a competitive monthly rate which would allow individual organizations to afford such technology.

National diffusion. The Department of Pediatrics and the School of Nursing at the University of Rochester are nationally recognized as leaders in developing and evaluating innovative health services. Given their positions in this academic institution, which emphasizes research, presentations and publications relating to the TDC Project represent the “coin of the realm” for the Project Director and the Director of Program Evaluation. Thus, commitment to national dissemination of knowledge gained through this project is solid. Presentations will be at national health services meetings (eg, Societies for Pediatric Research, American Public Health Association, Association for Health Services Research) as well as telemedicine meetings, and publications will be in leading, peer-reviewed medical, nursing, public health and telemedicine journals. Program descriptions and research findings will also be available at our web site.

PROJECT FEASIBILITY

The congruence of values, interests and expectations of major stakeholders summarized in Appendix 7 supports not only the diffusion potential of telemedicine in daycare and in routine child health services, but also the feasibility of the TDC Project.

Technical approach. For this project, we will be utilizing a Symmetrical Digital Subscriber Line (SDSL) Wide Area Network (WAN) Service using a local Asynchronous Transfer Mode (ATM) Network provided by Frontier Corp., the primary telecommunications provider in Rochester, NY. Reasons for choosing this transmission method include bandwidth requirements for real-time videoconferencing (the SDSL loop will provide us with a transmission speed of 1.544 Mbps), security on a virtual private network, and the proposed future availability of SDSL service community-wide.

Each site will be equipped with a 500 MHz AMD K6-2 PC with 17” monitors, and video and sound cards. Windows 98 will serve as the operating system at all sites and videoconferencing software with an appropriate CODEC will allow store-and-forward as well as interactive communication between the clinician site and the daycare centers. Each daycare site will be equipped with Shure unidirectional microphones to eliminate background noise that would interfere with assessment. The clinician site will have a general purpose computer microphone and a general purpose video camera.

The daycare sites will each have an AMD General Purpose Examination Camera which has power zoom (1-50x), auto focus, one button freeze frame capability, one button white balance, and electronic image polarization. This will serve as the main diagnostic camera as well as the conferencing video camera on the patient end. An AMD-300 Illumination and Imaging base system will be used to drive the AMD-2015 ENT scope that will be used for examining ears, nasal

passages, and throats. Finally, AMD will be providing an electronic stethoscope that can transmit lung and heart sounds on a simultaneous stream with the video, or they may be stored and forwarded for later assessment by the clinician.

Applicant qualifications. Throughout their careers, project leaders (Project Director and Director of Evaluation) have been committed to developing innovative approaches to redressing socioeconomic disparities in child health and evaluating these approaches with scientific rigor. (See Appendix 6.) They have collaborated on several projects, most recently as Co-Principal Investigators in the successful development of In Home Hospital-level Care (IHHC) and the conduct of a randomized clinical trial of IHHC. Nancy Wood, the Project Coordinator for IHHC will be Project Coordinator for the TDC Project. IHHC replaces inpatient care for a large proportion of common acute medical problems that heretofore have required hospitalization. IHHC staff has trained 32 pediatric nurses to provide this service. Although the randomized trial is not yet complete, cost of IHHC is less than half that of inpatient care, quality appears equal or better, and family and physician satisfaction is high. The Telecommunications Director and staff of the University of Rochester have been extremely helpful in providing technical support and assisting in negotiations with Frontier Corp.

The community. Community and university based pediatricians in Rochester have a long history of collaboration in developing and studying health services innovations.^{xvi, xvii} This tradition continues to grow in the current managed care environment. Recent manifestations include collaboration in the development and study of In-Home Hospital-level Care (IHHC). IHHC, described above, is currently being evaluated in a randomized clinical trial conducted by our research group. Recent community- and university-based pediatrician collaborations also include the development of a community-wide phone triage system that has been well received^{xviii} and is used by a majority of pediatric practices in this community. In many ways the TDC concept represents an extension of the phone triage system.

Budget and timeline. The TDC Project Plan involves 3 stages: Stage I (single provider, single inner city daycare center); Stage II (single provider, 3 inner city centers); Stage III (multiple providers, all 3 centers). The timeline is detailed in Appendix 3. The budget requests funds for modest salary support of the Project Director, Director of Evaluation, TDC Medical Director and the Project Coordinator. Funds for telemedicine equipment (PC's, peripheral devices) also represent a substantial portion of dollars requested. Daycare centers account for a substantial portion of matching funds in their contribution of their TDC Site Coordinators. Frontier Corporation contributions of DSL line installation and service fees represents the largest contribution to matching funds.

Sustainability. Issues addressed in the section on diffusion (page 5) relate directly to the economic and organizational viability of TDC beyond the grant period. Appendix 8 presents an analysis of the anticipated financial impact of telemedicine on the Pediatric Practice at Strong. This analysis suggests, by analogy, that provision of similar services by health care providers throughout the community should become economically viable.

COMMUNITY INVOLVEMENT

TDC Project Partners are listed in the executive summary. In addition, the *Health in Daycare Advisory Board* and a sub-group, the *Health Care Provider Advisory Board*, will provide forums for exchange of experience, ideas, and knowledge; for consensus building; and for direction of the TDC Project. The Health in Daycare Advisory Board will include the 3 Daycare Center Directors or a designee; a Department of Social Services representative; Kathleen Peterson Sweeney, RN, Professor of Nursing, State University of New York at Brockport; the TDC Director of Evaluation; a parent representative from each daycare center, and the Health Care Provider Advisory Board. Members of this subgroup are as follows: Larry D. Denk, MD. Medical Director, Rochester General Hospital Pediatric Associates; Mark Brown, MD. Medical Director, Westside Health Services; Robert Chavkin, MD. Chief of Pediatrics, Anthony Jordan Health Center; Ann Strasser, RN, PNP, Daycare Services Coordinator, Visiting Nurse Service of Rochester; Neil Herendeen, MD, TDC Medical Director and Medical Director for the Pediatric Practice at Strong; and the TDC Project Director. Letters of support confirming the interest and participation of each of these organizations/individuals are found in Appendix 1. A letter also documents the support of the Director of the Monroe County Health Department.

REDUCING DISPARITIES

Redressing socioeconomic disparities in health represents an important long term goal to which TDC Project leaders have long been committed. The proposal section characterizing the problem (page 1) documents deprivation among inner city households (eg, 13% lacked a phone, 42% lacked an auto) that is undoubtedly associated with poor access to information technology. Providing telemedicine units and services in inner city daycare centers is clearly focused on reducing disparities in access to information technology and health services, and on reducing the well-documented disparities in health status among Rochester's children.

EVALUATION AND DOCUMENTATION

Evaluation plan. The project has three main objectives: to implement a telemedicine service; to reduce the impact of illness in daycare on children, parents, center staff, and industry; and, to ensure the continuation and expansion of this program beyond the project period and beyond this community. We have identified measurable outcomes for each of the objectives and have developed the sources of data, the procedures for data collection, and the data analysis strategies to answer questions related to each of the objectives and sub-objectives. A description of the data gathering instruments and procedures for collecting and compiling the data can be found in Appendix 4. All instruments and procedures for data collection will be pilot tested prior to their utilization in the evaluation. Also found in Appendix 4 is an overview of the evaluation. Approaches to the analysis will depend on the type of data and the question being asked. Activities and outcomes will be described qualitatively; descriptive statistics will quantify both activities and outcomes. Focus group transcriptions will be analyzed using qualitative analysis facilitated by *Ethnograph* software. Differences in the impact of illness in daycare on children, parents, center staff, and industry between the pre-telemedicine group and the post-telemedicine group will be determined using quantitative analysis, including statistical tests of group difference. To assure that differences between the pre- and post-telemedicine analysis groups are not due to changes over time that are unrelated to telemedicine, concurrent comparisons between similar daycare sites will be analyzed. Staged introduction of telemedicine in different sites allows this. Assume, for example, that emergency department (ED) visits from daycare Center A fall significantly from pre- to post-telemedicine (see Timeline, Appendix 3). If ED visits from a very similar Center B, which

has not yet initiated telemedicine, remain constant during this time, it is reasonable to conclude that telemedicine contributed to this improvement. If, on the other hand, ED visits from Center B also fell during this time, perhaps some alternative explanation (eg, the expansion of evening hours at a neighborhood health center) is more likely.

Since one of our primary objectives is to ensure the continuation and expansion of this program beyond the project period and beyond this community, we are placing high priority on timely dissemination of what we are learning in the implementation process and in the evaluation of its impact, as described in the section on Diffusion Potential (page 5).

Documentation Plan. See Appendix on project evaluation.

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