

Outpatient Versus Inpatient Care of Children Newly Diagnosed With IDDM

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As health care systems scramble to find more cost-effective ways of delivering care, the issue of outpatient versus inpatient management and education for children with newly diagnosed diabetes comes into question. Although some centers have been successfully practicing routine outpatient management for decades, the common practice of the majority of providers is to hospitalize new-onset children for metabolic stabilization and initial education. Increasingly, however, health care services are being shifted from inpatient to outpatient settings in an effort to reduce costs. Potential for substantial savings may exist for the initial treatment of IDDM. Approximately 13,171 newly diagnosed cases of IDDM in patients under age 19 years are estimated to occur every year in the U.S. (1). If we assume that the average length of stay for an inpatient admission in these cases is 3–5 days and that the average hospital expense per inpatient per day is \$931 (2), then the hospital costs for these events would amount to \$36.8–61.3 million per year in 1994 dollars. The purpose of this review is to summarize the current literature that discusses the feasibility, effectiveness, and reduced cost of outpatient care of children newly diagnosed with IDDM (Table 1).

REVIEW OF STUDIES— The idea of initial outpatient management of patients with IDDM is not a new one. As early as the 1950s, Walker (3) reported that a successful outpatient program had been instituted in England to manage a group of adults with IDDM. This success was based on anecdotal information; no specific measures were used.

Laron et al. (4) established an ambulatory program in Israel in the 1970s for management of children diagnosed with IDDM. They reported success in improving metabolic control; however, an important metabolic measure, glycosylated hemoglobin level, was unavailable. Metabolic measurement was qualitatively categorized and reported as good, fair, bad, or very bad. In addition to this metabolic rating, success of the program was based on other physiological outcome measures, such as number of hospital readmissions for diabetic ketoacidosis (DKA) and hypoglycemia.

More recently, Hamman et al. (5) examined a sample from several sites in Colorado of 305 children who were under the age of 18 years when diagnosed with IDDM between 1978 and 1982. The study used a retrospective self-report questionnaire and compared patients who received only outpatient management with those who received only inpatient management. Of the sample, 12% had received only outpatient management. Factors included in the comparison were severity of illness at onset based on serum pH values (normal, ≥ 7.35 ; severe, ≤ 7.10), serum bicarbonate levels (normal, ≥ 18.0 mEq/l; severe, ≤ 10.0 mEq/l), and urine ketones (normal, < 1). Those children treated only as outpatients had normal values in all severity categories. Physiological health outcomes examined in the study included rehospitalization for diabetes-related complications, DKA, and severe hypoglycemia up to 2.5 years after diagnosis. Preliminary conclusions drawn were 1) that outpatient care in the patients studied was not associated with increased complication rates and 2) that substantial economic benefits would occur if treatment

of children with less severe illness at diagnosis were managed as outpatients.

Chase et al. (6) used a retrospective self-report questionnaire and review of medical records to compare long-term outcomes of 121 subjects diagnosed with IDDM before the age of 18 years. This study drew subjects from the same registry of Colorado residents as the previous study by Hamman et al. (5). Comparisons were made between those patients who had received complete inpatient management at diagnosis and those who had received no more than 1 day of initial management in the hospital for metabolic stabilization and the remainder of their management and education as outpatients. Of the subjects, 30% fell into the outpatient management category in this study. Only patients with at least 5 years of follow-up visits were included in the comparison. Family income and education and severity of illness at diagnosis were similar between the inpatient and outpatient management groups. The two groups were compared on physiological parameters for occurrence of acute complications of diabetes and for glycemic control based on longitudinal HbA_{1c} levels. Results concluded that outpatient management and education is a safe and effective alternative to hospitalization of children newly diagnosed with IDDM. No difference between the two groups for diabetes-related hospitalizations and acute complications was demonstrated, and longitudinal HbA_{1c} values did not differ significantly between the groups for any of the 5 years of follow-up. Economic impact of outpatient management and education was not examined in this study.

Newly diagnosed children between the ages of 0 and 18 years receiving care at Texas Children's Hospital between 1987 and 1990 were studied (7) using retrospective medical record review. During that time, the percentage of newly diagnosed patients receiving outpatient care increased from 0 to 38% and the length of stay for those who were initially admitted to the hospital declined. Severely ill patients, including those with vomiting, severe dehydration, and changes in sensorium, were initially treated with inpatient management for rehydration and initiation of insulin therapy and were subsequently

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DKA, diabetic ketoacidosis.

Table 1—Summary of articles within the last decade on outpatient management of newly diagnosed children with IDDM

Reference, date	Design	Methods		Illness severity index	Criteria for classification as outpatient	Health-related outcomes results
		Sample size	Age (years)			
Schneider (10), 1983	Retrospective. Descriptive of new program.	49	2–14	Category 3 (hospitalized): 1) pH value <7.1, 2) sodium bicarbonate level <5 mEq/l, 3) required intravenous therapy, 4) >10% dehydration.	Not hospitalized at diagnosis.	No specific outcomes were evaluated. Developed an illness severity index composed of three categories based on ketonuria, blood glucose, and intravenous therapy requirement. Outpatient program was determined feasible.
Hamman et al. (5), 1985	Multisite registry data. Retrospective self-report questionnaire. Comparison: outpatient vs. inpatient.	305 (37 outpatients)	<18	NL, mild, moderate, severe: 1) pH value (NL, ≥ 7.35 ; severe ≤ 7.10), 2) sodium bicarbonate (NL, ≥ 18.0 ; severe, ≤ 10.0), 3) ketones (NL, <1).	Not hospitalized for 2 weeks after diagnosis.	Outpatient care was associated with lower rehospitalization and DKA rates, and there was no difference in severe hypoglycemia.
Duncan and Malone (11), 1986	Retrospective. Descriptive of new program.	32	<20	Outpatient: 1) well-hydrated, 2) not vomiting, 3) ketotic.	Not hospitalized at diagnosis.	Outpatient care was associated with normal FBG and GHb, without clinical hypoglycemia. Comparison between inpatient and outpatient care was not assessed.
Chase et al. (6), 1992	Multisite registry data (same registry as Hamman, above). Retrospective self-report questionnaire and medical record review. Comparisons: outpatient vs. inpatient (long-term).	121 (41 outpatients)	<18	NL, mild, moderate, severe: 1) pH value (NL, ≥ 7.35 ; severe, ≤ 7.10), 2) sodium bicarbonate (NL, ≥ 18.0 ; severe, ≤ 10.0), 3) ketones (NL <1).	Not hospitalized >1 night.	Long-term (5-year follow-up) results of outpatient care showed that there were no differences between groups in GHb values or in the occurrence of acute complications (rehospitalization, DKA, severe hypoglycemia).
Lee (7), 1992	5-year follow-up retrospective. Medical record review.	Mean: 40 cases/year (up to 38% outpatients)	Not specified	Severe DKA admitted (no lab values): 1) vomiting, 2) severe dehydration, 3) changes in sensorium.	Not hospitalized at diagnosis or hospitalized for stabilization only.	Over time, there was a decrease in inpatient admissions and length of stay for newly diagnosed patients declined. Outpatient care led to a decrease in readmissions and in length of stay for readmissions.
Swift et al. (8), 1993	Registry data and medical records review. Retrospective. Comparison outpatient vs. inpatient.	236 (138 outpatients)	<15	Not hospitalized: 1) pH >7.2, 2) not vomiting.	Not hospitalized at diagnosis.	Outpatient care was associated with fewer rehospitalizations and fewer recurrent rehospitalizations. No difference in GHb between groups.

FBG, fasting blood glucose; NL, normal.

transferred to an outpatient setting once metabolic stabilization had occurred. No specific laboratory criteria for admission or discharge were used. This review of physiological outcomes, including hospitalization for diabetes-related complications and incidence of DKA and hypoglycemic reactions, confirms that outpatient management is feasible and effective for the management of newly diagnosed children with IDDM. Significant cost reduction for initial management and education was demonstrated, as well as cost savings in lower rates of rehospitalization.

In England, Swift et al. (8) also concluded that children with newly diagnosed

diabetes may be safely and effectively managed out of the hospital. A retrospective study including 236 subjects under the age of 15 years was performed by reviewing information from the district diabetes registry and medical records between 1979 and 1988. Of the total number of subjects, 58% were treated in an outpatient setting. Hospitalized children were younger or acedotic at the time of onset. Physiological health outcomes examined were HbA₁ levels and rehospitalization for problems related to diabetes, including DKA and hypoglycemia. Patients treated in the outpatient setting actually had fewer readmissions than those treated as inpatients. (No

significant difference in HbA₁ levels was present.) The study also identified two factors that ensured the success of an outpatient management program: the presence of committed specialists in the field of diabetes management and the use of nursing specialists with skills in educating patients in an outpatient setting.

More recently in Finland, Simell et al. (9), carried out a randomized prospective 2-year study to evaluate the effectiveness of an outpatient treatment program for children with newly diagnosed IDDM, compared with a 1-week hospitalization. A total of 60 children were consecutively randomized between the two treatment groups.

The researchers concluded that outpatient treatment led to marked decreases in hospital use and costs, and metabolic control was equally good in both groups over the 2-year period.

ADVANTAGES OF OUTPATIENT PROGRAMS

— Studies of outpatient management of newly diagnosed IDDM suggest that children, especially those with less severe symptoms at onset, can be safely and effectively managed as outpatients and that the trend should be toward treating more of them in an outpatient setting (5,6,8–11). Classification of the severity of illness and the child's age have been used as outpatient management eligibility criteria (10,11). Children with more severe symptoms at onset and younger children should receive in-hospital stabilization of their clinical condition and then be transferred to an outpatient setting. Based on physiological outcomes, children managed in outpatient settings did as well and often better than the inpatient cohort (e.g., fewer readmissions and lower glycosylated hemoglobin levels).

A successful outpatient program is dependent on availability of committed, experienced diabetes specialists (7,8,12) and knowledgeable nurse education specialists who are able to maintain close outpatient follow-up through telephone contact and home visits (8). Outpatient management could be an option in reducing the cost of delivering health care (5,7).

Advantages of outpatient management could be far-reaching. Most importantly, reduced risk of hospital readmission (5,7,8) and reduced or comparable incidence of diabetes-related complications, such as DKA (5,6) while maintaining satisfactory metabolic control (6,8) should compel health care providers to at least consider implementation or continuation of outpatient programs for managing IDDM from the time of onset. During this time of health care reform and heightened awareness of the cost of health care, the economic advantage of the lower cost of outpatient management cannot be overlooked. In one study (13), average cost of hospitalized treatment was \$3,000 per patient and \$625 for those in the outpatient group. In another study (14), cost of a 4-day hospitalization was \$2,548, which contrasted with \$560 for an outpatient program, a savings of 80%. Furthermore, it was implied that outpatient management may actually enhance families' adjustment to

diabetes and improve their skills in self-management by allowing them control of their condition from the time of diagnosis and reducing the stress caused by a required hospital stay (7).

DISADVANTAGES OF OUTPATIENT PROGRAMS

— There are some potential disadvantages to outpatient management. Lee (7) identified several potential risks with outpatient care. Potential exists for insulin-induced hypoglycemia. According to Lee, the outpatient program at Texas Children's Hospital controls for this complication by initiating insulin therapy using a low split-dose regimen and initially planning a hypercaloric diet. This type of therapy may now be considered less than optimal. Recently, Steffes et al. (15) reported that intensive diabetes therapy helps sustain endogenous insulin secretion in IDDM, which in turn allows for improved metabolic control and fewer long-term complications. If control is tightened early in the course, the risk of hypoglycemia increases.

The second potential management problem is worsening of DKA without continuous health professional supervision. This complication, according to Lee (7), has not been reported or experienced during his 5 years of outpatient management of newly diagnosed diabetic patients. A third disadvantage is the need to establish a new program that will require flexibility and 24-h staff coverage for outpatient education and provision of affordable housing for families who do not live locally. A fourth disadvantage of outpatient management is the reluctance of third-party providers to accept and reimburse for outpatient services (14). Although insurance reimbursement has been possible for some (13,14), many are experiencing this problem. It is hoped that this will change as more evidence is presented that supports the safety, short- and long-term feasibility, and cost-effectiveness of initial outpatient management.

GAPS AND LIMITATIONS — Several limitations are apparent in the research conducted thus far regarding outpatient management of patients newly diagnosed with diabetes.

1. Sample size, especially of those subjects managed as outpatients, has been relatively small. For example, in Hamman's study (5) only 12% of the sample

received only outpatient management. The number of cases and the episodes of adverse patient outcomes were very small.

2. The majority of studies performed to date have approached the issue of outpatient management retrospectively and have relied solely on patient/family self-report and review of medical records. More prospective randomized controlled design studies are needed.
3. All of the research has focused on physiological health outcomes. No psychosocial or behavioral outcomes have been studied.

Even when controlling for severity of illness and socioeconomic status, there is significant evidence that outpatient management is not associated with increased medical complications. To the contrary, outpatient-managed groups of children have significantly fewer acute diabetic complications and hospital readmissions (5–8). Therefore, given the nature of the data, controlling for all other factors, why do children in outpatient programs have improved physiological health outcomes? With the information reported to date, the health care community can only speculate as to why this difference occurs. Could these differences be attributed to psychosocial factors? Psychosocial parameters have not been considered in previous research documenting differences in the outcomes of patients receiving initial management and education for IDDM. Lee (7) briefly alludes to the idea that the outpatient approach to initial diabetes care may improve psychosocial adjustment. Galatzer et al. (16) noted that by "initiating the process of management of diabetes out of hospital and allowing parents to adjust by practical activity to the crisis of diagnosis subsequent problems are managed more effectively."

Future research should include both psychosocial and behavioral outcomes. This research should consist of randomized control trials with prospective longitudinal designs. These studies should compare groups of children with newly diagnosed IDDM who are admitted for traditional inpatient management (irrespective of the length of the initial hospital stay [17]) with groups of children who are managed by a structured and documented outpatient program that uses endocrinologists, specialized diabetes nurse educators, social workers, and dietitians. Data should be collected during the immediate period of management and education, at intervals

throughout the 1st year, and 2 years after diagnosis. Factors to be investigated should include quality of life, adherence with self-care management, patient/family knowledge of diabetes, coping strategies, stress, attitudes, self-competence, self-efficacy, and psychosocial adjustment to illness.

These studies could also demonstrate that there is no short- or long-term psychosocial harm from outpatient therapy. In addition, they could help in developing a profile for families who might benefit most from outpatient management.

With pressure within the arena of health care reform to decrease hospital stays and avoid hospital admissions whenever possible, it seems almost inevitable that more care will be delivered in an outpatient setting. Thus, it seems wise to anticipate an increasing trend toward moving the care of patients newly diagnosed with IDDM from an inpatient to an outpatient setting (18). The health care community providing care to these children must be able to ensure that their care can effectively and safely be administered out of the hospital and that long-term physiological and psychosocial outcomes can be achieved as management and education are performed in outpatient settings. Diagnosis of a chronic illness, especially in children, causes an insult to families that should not be understated. Consideration of this impact should be incorporated into future research regarding the feasibility of initial outpatient management of children newly diagnosed with IDDM.

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