Table 6: Outline of the Hospital Experience (cont.)

<table>
<thead>
<tr>
<th>Hosp. Day</th>
<th>Doctors Orders</th>
<th>Lab Reports</th>
<th>CT</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>3hr. pprd BS this afternoon FBS am Increase to Lente 20u Semilente 6u qam</td>
<td>4p pprd-204mg%</td>
<td>7:00a-1+ 11:00a-3+ 4:00p-3+ 8:00p-3+</td>
<td>Need and action of insulin discussed.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>7a FBS 236mg%</td>
<td>7:00a-0 11:00a-3+ 4:00p-0 8:00p-0</td>
<td>Taught insulin injection, gave first injection.</td>
</tr>
<tr>
<td>8</td>
<td>BS low 200 Clinitest 3+ times one Otherwise doing well 3hr pprd BS afternoon</td>
<td>3:35p pprd 213mg%</td>
<td>7:00a-0 11:00a-3+ 4:00p-0 8:00p-0</td>
<td>Diet reviewed and reinforced.</td>
</tr>
<tr>
<td>9</td>
<td>FBS 80mg% this am 3hr pprd 213mg% Neg. Ct Increase Semilente to 12u qam Lente 20u</td>
<td></td>
<td>7:00a-0 11:00a-0 4:00p-0 8:00p-2+</td>
<td>Drawing up insulin.</td>
</tr>
<tr>
<td>10</td>
<td>Nearing good control No problem 3hr pprd BS afternoon</td>
<td>3:30p pprd 113mg%</td>
<td>7:00a-0 11:00a-3+ 4:00p-0 8:00p-0</td>
<td>Taught insulin reaction, acidosis, and skin care.</td>
</tr>
<tr>
<td>11</td>
<td>Discharge</td>
<td></td>
<td>8:00a-0 11:00a-0</td>
<td></td>
</tr>
</tbody>
</table>
Summary

Debbie was an intelligent twelve year old and was eager to learn. Upon discharge of this patient she had a basic idea of the disease she had and what to do for it. Her education was however unorganized and important topics were left out (i.e., insulin injection by another family member, and exercise) due to an oversite by the staff and lack of time with this author before discharge.

Many of the topics that the author of this paper taught were actually rationale for procedures that she had been taught by the nursing staff. She always showed interest in knowing why she was doing something. She was also anxious to know about what Diabetes is and commented that all her doctor had told her was that she had Diabetes.

Debbie's education was adequate. She received all of the needed information, with a few omissions. Her overall education was usually unstructured and often out of order, but the essentials were there. She was discharged before all the areas were discussed. Had her education been more organized, the author feels she would have returned home much more able to control her own disease.
This checklist, as illustrated in Figure 4, allows all persons involved in caring for a patient to know what a patient knows, what he has mastered, and where he needs further instruction. This list ensures that a patient is not being taught anything he already knows or that some segment of his education is being overlooked.

Instructions

Diabetes. It is necessary for a new diabetic and his family to be taught what Diabetes is so that they can understand the reasons for and the importance of the treatment the child is receiving. The causes of Diabetes must be reviewed with the parents so that the possibility of Diabetes in future children is understood. The differences between Adult Diabetes and Juvenile Diabetes should be explained to the family. This is so the family will understand why oral hypoglycemic agents and diet alone will not provide adequate management of Juvenile Diabetes. Also explain that beta cells in the Juvenile Diabetic are partially destroyed early in the disease and almost completely gone two to five years later. Therefore, the Juvenile Diabetic patient is a total diabetic after five years duration of his disease.\(^1\)

The patient and his parents need to be encouraged to study and review literature from reputable sources concerning Diabetes. Material can be obtained from the American Diabetic Association, Inc., 18 E. 4th St., New York, ---

\(^1\)Hamilton, p. 53.
Section IV: Education

Introduction

The one person most capable of managing Diabetes, a condition which is affected by daily changes in the environment, is the child himself along with his parents. However, diagnosing the condition alone does not provide the patient with adequate information to maintain control of his disease and prevent complications for the rest of his life. The child and his family must be taught what Diabetes is; how it affects the body; how to test urine; prepare insulin; calculate and prepare his diet; recognize signs and symptoms of acidosis and insulin shock, and how to treat it; and the importance of general hygiene, medical and dental supervision, and exercise. In this section the author will discuss the topics to be taught the child and his family and present a checklist for the education of the Juvenile Diabetics, and finally, a booklet for the child and his parents to read about Diabetes and its treatment, in the appendix.

Checklist

There is so much information that needs to be taught and a large number of people involved in the teaching (doctors, nurses, and dietitians) that a definite plan for teaching must be established. One such method is a Diabetic Checklist which organizes education, clearly defining what has been taught and what is mastered or needs continued work.

1Krupp, p.728.
2Hamilton, p.325.
This checklist, as illustrated in Figure 4, allows all persons involved in caring for a patient to know what a patient knows, what he has mastered, and where he needs further instruction. This list ensures that a patient is not being taught anything he already knows or that some segment of his education is being overlooked.

Instructions

Diabetes. It is necessary for a new diabetic and his family to be taught what diabetes is so that they can understand the reasons for and the importance of the treatment the child is receiving. The causes of Diabetes must be reviewed with the parents so that the possibility of Diabetes in future children is understood. The differences between Adult Diabetes and Juvenile Diabetes should be explained to the family. This is so the family will understand why oral hypoglycemic agents and diet alone will not provide adequate management of Juvenile Diabetes. Also explain that beta cells in the Juvenile Diabetic are partially destroyed early in the disease and almost completely gone two to five years later. Therefore, the Juvenile Diabetic patient is a total diabetic after five years duration of his disease.¹

The patient and his parents need to be encouraged to study and review literature from reputable sources concerning Diabetes. Material can be obtained from the American Diabetic Association, Inc., 18 E. 4th St., New York,

¹Hamilton, p. 53.
Table 7: Methods of Urine Testing (cont.)

of urine encourages bacterial growth which can lead
to a change in the number of ketone bodies
b. Place tablet on a piece of white paper
c. Place one drop of urine on tablet
d. Compare urine ketone test results with color chart
   after 30 sec.
e. Record results

2. Ketostix--reagent strip
   a. Dip test area in freshly voided specimen or pass
      through a stream of urine
   b. Remove immediately, tap excess from strip
   c. Wait 15 sec. and compare with color chart.
d. Record results

child must be taught to test his urine for both sugar and
acetone at each testing. During the times when control is
being obtained or periods of illness, the urine should be
tested after getting up in the morning, before lunch, in
late afternoon, and just before bedtime. In times of good
control the urine should be tested once each day just
after getting up.

The child and his parents must also learn to keep a
daily record of his urine test with the date, hour, and
results. This record should be taken to the physicians
office at appointment times.¹ Record books for this pur-
pose are available at a pharmacy. The child may also wish
to make his own record sheet, an example of which can be
seen in Figure 5.

The child and his family must also understand the
results of his urine tests. Explain that in Diabetes, sugar
may appear in the urine when the level of sugar in the blood
exceeds 160 mg/100 ml. The urine might have glucose present

¹Lippincott, p. 653.
in it for the following reasons: the treatment the child is receiving is inadequate, he is not following his prescribed diet, his exercise is inadequate, or there is an infection present. The test may give a false positive reading if deteriorated reagent tablets or strips are used or if directions are not followed accurately. A checklist that the nurse may use to determine if the child or parent are correctly following urine testing procedures is illustrated in Table 8.

Diet. The purpose of the diabetic diet is to permit the child to lead a comfortable life free from symptoms and to attain normal growth and development. Explain to the family that the nutritional needs of diabetic children are no different from those of nondiabetic children. This special diabetic diet is essentially a normal, well-balanced diet with concentrated carbohydrates eliminated.¹

¹Graef, p. 403.
Table 8: Urine Testing Procedure Checklist.

<table>
<thead>
<tr>
<th>CLINITEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Uses the correct number of drops of water—10</td>
</tr>
<tr>
<td>2. Uses the correct number of drops of urine—2 or 5</td>
</tr>
<tr>
<td>3. Puts water in the tube first or rinses dropper after putting urine in</td>
</tr>
<tr>
<td>4. Holds dropper vertically</td>
</tr>
<tr>
<td>5. Drops fall to the bottom of tube, rather than down the sides</td>
</tr>
<tr>
<td>6. Drops one Clinitest tablet into tube without touching it</td>
</tr>
<tr>
<td>7. Does not shake tube while boiling</td>
</tr>
<tr>
<td>8. Waits 15 sec. after boiling stops to read results</td>
</tr>
<tr>
<td>9. Reads results correctly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KETOSTIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Holds stick at proper end, not touching the reactive paper</td>
</tr>
<tr>
<td>2. Dips the stick into the urine</td>
</tr>
<tr>
<td>3. Removes stick immediately and then waits exactly 15 sec. to read results</td>
</tr>
<tr>
<td>4. Holds stick before reading, rather than putting it down</td>
</tr>
<tr>
<td>5. Reads results correctly, with proper chart</td>
</tr>
</tbody>
</table>

The physician will prescribe a dietary regimen for the child; it is the nurses responsibility to aid the parents in adjusting to this new diet. The following are facts that the parents should know about their child's diet: The child must consume a consistent daily diet, three times a day. It is important that these meals be approximately the same time each day. Both the parents and the child may need to become thoroughly familiar with the food exchange lists (when exchange diet is prescribed). They must learn the caloric

value of frequently eaten foods and how to follow a calculated diet where thorough planning is required. In the beginning the mother, or whoever is preparing the meals, will need to use household measures or a gram scale until she learns to judge serving sizes accurately. The child's weight should be kept on an optimal level and weekly weight should be recorded. Extra calories should be taken in before unusual physical activity. A bedtime snack should be eaten to prevent hypoglycemia in the night. Diabetic patients who are finding it difficult to give up the pleasure of the sweet taste of foods may use artificial sweeteners.

Insulin. Insulin is required in the treatment of Juvenile Diabetes. Insulin comes in vials and is prescribed in units/ml. Explain to the patient that units 40(red) and units 80 (green) were the most frequently used insulins, but now units 100(orange) is used most often. U-40 insulin should only be used with a U-40 syringe, U-80 with a U-80 syringe, and U-100 with a U-100 syringe, to prevent any dangerous errors. The type of insulin required for a specific patient is dependent on the onset of action desired, the time of peak effect, and duration of action required. Both the patient and the parents should know when insulin has its peak effect and when hypoglycemic reactions are likely to occur. Table 9 lists types of insulin and

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1 Lippincott, p. 653.
2 Krupp, p. 724.
3 Lippincott, pp. 645-646.
Table 9: Insulin and Times Reactions May Occur.\(^1\)

<table>
<thead>
<tr>
<th>Type of Insulin</th>
<th>Time When Insulin Reaction May Occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid acting</td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>Before lunch if given in a.m., before bedtime if given prior to evening meal</td>
</tr>
<tr>
<td>Semi-lente</td>
<td>Before lunch</td>
</tr>
<tr>
<td>Intermediate acting</td>
<td></td>
</tr>
<tr>
<td>Glargin</td>
<td>Late afternoon</td>
</tr>
<tr>
<td>NPH</td>
<td>Late afternoon, during the night</td>
</tr>
<tr>
<td>Lente</td>
<td>Late afternoon, during the night</td>
</tr>
<tr>
<td>Slow acting</td>
<td></td>
</tr>
<tr>
<td>Protamine Zinc</td>
<td>Between 2am and breakfast</td>
</tr>
<tr>
<td>Ultra-lente</td>
<td>Between 2am and breakfast</td>
</tr>
</tbody>
</table>

estimated times of reactions.

Each patient and his parents should learn the reasons for and the procedure of insulin administration. A child of 7 to 10 years of age can usually be taught to give his own injections; even an intelligent younger child can learn. The earlier the patient is given this responsibility the better off he will be.\(^2\) One or both parents must also be taught how to administer insulin so that they may give their child injections in areas the child cannot reach. Since the family’s greatest concern is the injection this should be taught first, and then include loading the syringe and rotation of sites as the patient is able to understand these new topics.\(^3\)

Table 10 lists the procedure for insulin injection.

\(^1\)Luckmann, p. 1326.
\(^2\)Marlow, p. 659.
\(^3\)Lippincott, p. 655.
Table 10: Insulin Injection

Equipment:
- Prescribed bottle of insulin
- Insulin syringe
- Absorbent cotton and alcohol
- Small tray for supplies

Procedure
1. Give the patient the syringe containing the prescribed dose of insulin, prepared for injection
2. Have the patient prepare the skin with alcohol with a circular motion moving outward
3. Instruct the patient to hold the syringe as he would a pencil
4. Show the patient how to pinch up the subcutaneous tissue between the thumb and forefinger
5. Select areas of the upper arms, thighs, flanks, and upper buttocks for injection when the patient becomes proficient at injecting the insulin
6. Assist the patient to insert the needle with a quick motion into the pinched up skin at right angles to the surface
7. Instruct the patient to release the skinfold and exert slight pull on the plunger. Push the plunger in
8. Hold the alcohol sponge against the skin and withdraw the needle
9. Dispose of the syringe in

Rationale
4. Avoid pressing the skin tightly between the fingers as this is a common cause of irritation
5. These areas have more subcutaneous fat and the skin is loose
6. The insulin is injected into the deep subcutaneous tissue
7. Pulling back on the plunger ensures that the needle is not in a blood vessel
8. This maneuver prevents painful pulling of the skin as the needle is withdrawn

1Lippincott, pp. 655-656.
Table 10: Insulin Injection (cont.)

A proper place—the needle should be broken off from the barrel.

10. Develop a systematic plan for insulin administration with rotation of sites in a clockwise manner.

10. Systematic rotation of sites will keep the skin supple, favor uniform absorption, and prevent scarring.

An alternate method is to inject the insulin deep between the layer of fat and muscle instead of deep within the subcutaneous tissue. This method reduces the possibility of irritation to tissue and allows for a smooth absorption rate. Instruct the patient that to reach the area 1) pick up the layer of skin and fat, 2) select a needle long enough to go through the fat, 3) insert the needle at a 20-45 degree angle. To determine the best needle length, pick up a layer of skin and fat between the thumb and forefinger and measure across the base of this fold. This should give the length of the needle that will reach the pocket. The angle of entry is important also. The pocket is most accessible when the needle enters the skin at the base of the fold almost parallel to the skin. When insulin is injected properly into this pocket, it is absorbed at a fairly predictable rate and with very little scarring.¹ Figure 6 illustrates the site for injection and the needle entry.

¹Elizabeth Burke, "Insulin Injection, The Site and the Technique", *American Journal of Nursing* (December 1972), p. 2196.
After the patient has learned to give his own injections of insulin, he can then be taught to load the syringe. Observe the patient when he is withdrawing the insulin and

1Burke, p. 2195.
check the amount withdrawn before it is injected. If the child is young he may not be able to withdraw the proper amount of insulin, even though he can give his own injection. This should be done for the child only until he is able to follow the procedure correctly. However, the parents should prepare the syringe while the child is present so that he may learn the procedure from observing the parents. Emphasize to the child the importance of drawing up the exact amount of insulin prescribed by his physician. Table 11 gives the procedure for loading the syringe.

Quite often two types of insulin are ordered, one short-acting and one long-acting, and are to be given at the same time, in the same syringe. When this is the case, the procedure in Table 12 should be followed.

When instructing the patient in the techniques for self injection, Luckmann and Sorensen's book, Medical-Surgical Nursing lists these points which should be emphasized:

- Always purchase an extra bottle of insulin, an extra syringe, and extra needles; extra equipment is needed in case the insulin bottle or glass syringe breaks.
- Wash hands thoroughly before preparing an injection.
- Use only sterile syringe and needles. To re-sterilize equipment after use, boil the syringe, plunger, and needle in a pan of water for ten minutes. When traveling use disposable syringes, also it is permissible to sterilize the syringe parts and needle by covering them with alcohol for five to ten minutes. (This is not as applicable today as in the past, disposable syringes are widely used.)
- Always clean the top of the insulin bottle before inserting the sterile needle and withdrawing the insulin.
- Rotate sites systematically according to a def-
Table 12: Loading the Syringe with Two Types of Insulin

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Inject just enough replacement air into the cloudy, long-acting insulin without dipping the needle into the insulin, remove the needle.</td>
</tr>
<tr>
<td>2.</td>
<td>Inject just enough air into the clear, regular insulin and withdraw the dose.</td>
</tr>
<tr>
<td>3.</td>
<td>Insert the needle into the cloudy insulin and remove the dose.</td>
</tr>
<tr>
<td>4.</td>
<td>Put a bubble into the syringe and rock it back and forth to mix the two types.</td>
</tr>
</tbody>
</table>

The patient should be instructed on the possibility of the development of these complications. Hypertrophy is a thickening of the subcutaneous tissue at the injection site and appear as a lumpy, hard area or it may have a more spongy texture. Atrophy is a loss of subcutaneous fat or a depression at the site of injection. A small dimple may be the only evidence, or deep, extensive concavities may appear. It is felt that the cause for these conditions is either repeated injections at the same site with accompanying tissue trauma or the biological activity of cold insulin. It is also believed that cold insulin may contribute to the development of lipodystrophy.

Rotating the sites of insulin injection is probably one of the most effective measures to prevent. Explain to the patient that each area for injection (upper

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1 Hamilton, pp. 323-324.
2 Burke, p. 2194.
arms, flank, thigh, buttocks) is scored in rows with approximately one inch between injection sites. Figure 7 illustrates how these areas are divided. Instruct the patient to rotate the sites in a clockwise direction in such a manner that the first day site A-1 is used, next B-1, then C-1...A-2,B-2, C-2.... This ensures that the same site is not used more often than once every 8-9 weeks. The patient and his family should be instructed to post a chart similar to Figure 7 and to check off the site used each day on the map. Emphasize to the patient the importance of adhering to this definite injection plan in order to avoid eventual tissue damage.

The patient and his parents must also be instructed in the storage of insulin at home. The vials should be stored in their boxes to protect them from contamination and from exposure to strong light. Any bottle that is older than the expiration date printed on the bottle, has sat open but unused for several weeks, or contains granules or clumped particles, should be thrown out. For the relatively short time a bottle of insulin is being used, its strength would not diminish appreciably if left unrefrigerated. The patient should be instructed to allow the bottle of insulin he is currently using to set outside the refrigerator.

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1 Burke, p.2196.
2 Luckmann, pp. 1328-1329.
3 Ibid., p. 1327.
4 Burke, p.2196.
Figure 7: Map for Rotation of Insulin Injection.
This will help prevent complications from using cold insulin.

Maintenance of Health. Regular exercise must be emphasized to the patient as an important part of his treatment. While in the hospital the child should be kept as busy as he would at home. The child and his parents should plan daily moderate exercise for the child when he returns home. If excessive exercise is anticipated, instruct the patient to prepare by ingesting supplementary carbohydrates.

Skin care for the child is also very important, and the need for special attention should be emphasized to the family. Frequent baths should be taken, about every other day. Shoes should fit well and discarded when the child grows out of them. Also the nurse and the parents should teach the child to promptly report any breaks in the skin. ¹

Maintenance of Control in Illness. The registered nurse should teach the family to notify the physician when unusual signs and symptoms are noticed. Dietary adjustments may be prescribed by the physician during a period of illness. The child should continue taking his insulin, and his urine should be tested more frequently and results recorded. The physician may also order a change in the insulin dosage. Emphasize to the patient and his parents that any changes in the child's diet or insulin must be directed by their physician only. ²

¹Marlow, p.659.
²Lippincott, pp. 654-655.
FINAL SUMMARY

In this paper the author has attempted to present a complete picture of a Juvenile Diabetic and his care. Through writing and researching this topic, the author has found that a strong background in pathophysiology of any disease is required to provide professional nursing care. For this reason this paper included a complete section on the pathophysiology of Diabetes.

This paper also included a general guideline for the care and education of Juvenile Diabetics and their families. Each individual's care obviously must be specific for him, but the methods presented in this paper provide a guide for the care of the child while in the hospital and preparation for returning home.

In writing this paper the author found that the nursing care for a Juvenile Diabetic, as well as all other conditions that a child must be hospitalized for, requires knowledge of the disease process, the signs and symptoms which reveal the patient's status, and the priorities of care specific to each individual and his diagnosis. Also this author has discovered that care of the patient must be organized and communicated to all members of the health team through the use of a written outline of care.

It is the author's hope that the reader has gained knowledge of Juvenile Diabetes and the care of the child admitted to the hospital with this diagnosis. And that this knowledge will be applied to the reader's nursing care of the Diabetic child.
APPENDIX
Juvenile Diabetes: What is it?

Diabetes is a condition where the body cannot use the food you eat the way nature planned it. Our body makes a substance called glucose from the proteins, carbohydrates and fats that we eat. Glucose is used by the body cells for energy. The body must have another substance called insulin to use this glucose we get from food. Insulin is made by a gland called the pancreas that lies behind the stomach.

Insulin allows the glucose to go from the bloodstream into the cells to be used for energy. In Juvenile Diabetes there is usually not enough insulin to allow the body to use and store glucose. Instead of the glucose going into the cells it builds up in the bloodstream and spills over in the urine, showing up as sugar in the urine.

The kind of Diabetes you have is called Juvenile Diabetes. A person is usually under 15 years old when he begins to have symptoms of this disease. His pancreas is not producing enough insulin. The symptoms often start suddenly and the child may lose weight, and become weak, he may be thirsty and hungry, and urinate frequently. You may have had these symptoms before you went to the doctor.

Some diabetics can control their blood sugar level by keeping to a diet that is carefully planned and doesn't have too many carbohydrates, or by taking special pills. People with Juvenile Diabetes must take daily injections of insulin for the rest of their lives.
Control of Diabetes

There are four major areas which go together to control Diabetes. These are: diet, insulin injection, exercise, and urine testing.

1. Diet - Your diet is ordered for you by your doctor. This "diabetic diet" is much the same as any other child's diet. The only difference is that the amount of foods you eat is carefully controlled and the sweets are limited.

Your meals should be at the same time every day and your parents need a scale to weigh the food you eat so that you have the right amounts your doctor orders. Having meals at the same time every day keeps the body chemistry in balance. You will probably have between meal snacks that must be eaten at about the same time every day. Even when you are not really hungry, you need to eat the food your mother prepares for you. This will keep your Diabetes under control.

Here are three main types of diets your doctor might order for you:

- Weighed diet - This kind of diet has a meal plan which tells you what kind of foods you can eat each day and how much of each kind. The plan will tell how much each serving can weigh.

- Free Diet - In this diet you do not have to measure the foods you eat. You must eat a nutritious diet with food from the basic four food groups (meat, milk products, fruits and vegetables, and breads and cereals). You must limit the amount of sweets you eat.

- Exchange Diet - In this diet you choose the foods you will eat from exchange lists developed by the American Diabetic Association. Each list has different foods on it, one food can be exchanged for another food on the same list. You cannot
exchange from list to list. The doctor will order the number of "exchanges" from each list that you can have at a meal. This is like one fruit exchange, two meat exchanges, and one bread exchange for breakfast. This means you may have one kind of fruit from the list of fruit exchanges and so on. The exchange lists make it easy for you and your mother to plan your diet, and gives you a wide variety of foods to eat.

When you are going away from home or to a party, food can be a problem. You and your parents will learn how to adjust your diet so that you will be able to eat some of the foods offered to you away from home. Your doctor can tell you what foods you may have, like diet pop or gelatin or maybe ice cream or plain cake sometimes.

2. Insulin - Every child with Juvenile Diabetes must take insulin. It is the best way to replace the hormone which the pancreas is not making. There are many different kinds of insulin and you must always take the kind your doctor prescribes for you. He may order a combination of two different kinds of insulin or he may start with one kind and change to another. Table I on the next page shows all the kinds of insulin your doctor might use.

Your doctor will tell you what kind of insulin to take, when to take it, and how much. You must always follow his instructions exactly. You will learn to give insulin injections and so will one or both of your parents.

Insulin is made in three strengths: 100 units per cubic centimeter of solution (U-100) in bottles with orange caps, 80 units per cubic centimeter (U-80) with green caps, and 40 units per cubic centimeter (U-40) in bottles marked with red caps. Insulin usually comes in little
Table I: Table of Insulins.  

<table>
<thead>
<tr>
<th>Insulin</th>
<th>Mixture compatible with</th>
<th>Onset</th>
<th>Action</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rapid acting-</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>All Other</td>
<td>1/2-1 hr.</td>
<td>3-4 hr.</td>
<td>6 hr.</td>
</tr>
<tr>
<td>Semilente</td>
<td>Other Lentes</td>
<td>1/2-3/4 hr.</td>
<td>5-7 hr.</td>
<td>12-18 hr.</td>
</tr>
<tr>
<td><strong>Intermediate acting-</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPH</td>
<td>Regular</td>
<td>1/2-1 hr.</td>
<td>7-11 hr.</td>
<td>24-28 hr.</td>
</tr>
<tr>
<td>Lente</td>
<td>Regular, Lente</td>
<td>1-1 1/2 hr.</td>
<td>7-11 hr.</td>
<td>24-28 hr.</td>
</tr>
<tr>
<td>Globin</td>
<td>Regular</td>
<td>1-2 hr.</td>
<td>8-10 hr.</td>
<td>24 hr.</td>
</tr>
<tr>
<td><strong>Long acting-</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protamine</td>
<td>Regular</td>
<td>6-8 hr.</td>
<td>10-18 hr.</td>
<td>24-36 hr.</td>
</tr>
<tr>
<td>Zinc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultra Lente</td>
<td>Regular</td>
<td>5-8 hr.</td>
<td>22-26 hr.</td>
<td>36-96 hr.</td>
</tr>
</tbody>
</table>

bottles called vials with ten cubic centimeters in them.

Insulin syringes are especially made to give your insulin. There is a U-100, U-80, and U-40 syringe and you must always use the same number syringe as the insulin you are using. You should also use the size needle recommended by your doctor.

Giving your insulin injection - Wash your hands with soap and water. If the insulin you are getting is not a clear solution, roll the vial between your hands to mix it. Do not shake the vial because this puts air bubbles into the insulin. Wipe the rubber stopper on top of the vial with cotton soaked in alcohol. Pull the plunger back to the mark on the syringe that is the amount of insulin to be withdrawn.

1 Traisman, p. 46.
Insert the needle through the rubber stopper and inject the air into the vial. Turn the vial upside down and pull the plunger until the desired amount of insulin is withdrawn.

If your doctor orders a mixture of regular and long-acting insulin you must follow these steps so that the regular insulin is not contaminated by the long-acting insulin. First, inject air into the vial of long-acting insulin, taking care not to get any insulin on the needle; second, inject air into the vial of regular insulin and withdraw the prescribed amount; finally, withdraw the long-acting insulin and mix the two types by gently rocking the syringe.

To inject insulin, use cotton soaked in alcohol and clean the skin at the injection site. Pick up the skin between the first finger and thumb. Insert the needle quickly at the base of the fold, at a 45 degree angle. Pull back on the plunger slightly, if blood appears in the syringe remove the needle and choose a different site. If there is no blood, press down the plunger as far as it will go. Hold the cotton over the site where the needle entered the skin and withdraw the needle quickly. Hold the cotton over the site for a few moments. Then dispose of the syringe and needle in a safe place.

Figure 1 on the next page shows the areas where insulin should be given. You should rotate the sites where you give your insulin injection. Never use the same site again for 6-8 weeks. Using a map like the one on the next page, you need to check off the site you use each day, and move in a clockwise direction. The order would be like this: Day 1 A-1, Day 2 B-1, Day 3 C-1,...Day 9 A-2, Day 10 B-2,
Figure I: Map for Rotation of Insulin Injection
so on.

3. Exercise - You must exercise moderately every day. This will allow you to use up the glucose in your blood and decrease the amount of insulin you need. If you are going to exercise hard - like playing tennis, riding a bike, playing baseball; the doctor may allow you extra food to give you the extra energy you need. Eating cheese, meat, or drinking milk (protein) before strenuous exercise will give you the extra glucose you need. You should be able to participate in active sports with the proper adjustment in diet and following the proper time schedule.

4. Urine Testing - Your doctor has ordered frequent urine tests and you may be wondering why. The results of these tests tell the doctor (and you) how well the Diabetes is being controlled. Diabetes is controlled by keeping in balance your diet, exercise, and insulin. How well these are balanced is reflected in the amount of glucose in the urine. If there is a great change in the urine tests, your doctor may want to change your diet or the amount of exercise or insulin you are getting.

The test for ketones in the urine tells you that acidosis may be developing. This is a complication of Diabetes that your doctor will want to treat to prevent you from developing diabetic coma.

The urine should be tested at least once a day when you are in good control, and four times a day during times of illness or stress. Always urinate once and discard this
urine. A half hour later, urinate again and test this
specimen according to the instructions given on the package.
Record results in a notebook or on a card that you can show
your doctor when you go in for an appointment. Along with
the urine results, you should record the insulin dose and
any other things that tell about your state of health.

Emergencies

Two serious emergencies that can develop are
hypoglycemic reaction (low blood sugar) and acidosis (dia-
abetic coma). You must be able to tell the difference
between the two and know what to do for each. Table II on
the following page explains both reactions. By following
the doctors orders you can prevent these two complications.
You must always be prepared for a hypoglycemic reaction by
carrying with you some hard candy or lumps of sugar, and
take these at the first signs of hypoglycemic reaction.

Infections, injuries, or illness can upset the
balance of your body. You should always tell your parents
and the doctor when you feel ill. Even though the illness
is mild it could lead to acidosis and your doctor should be
told.

Hygiene

Certain skin problems may show up in someone with
Diabetes. Any problems with your skin should be reported to
your doctor. Frequent baths should be taken and you should
take especially good care of your feet. Keep your feet
clean, warm, and dry all the time. Always wear socks and shoes
<table>
<thead>
<tr>
<th></th>
<th>Insulin Reaction - Hypoglycemia (Rapid Onset)</th>
<th>Diabetic Coma (Slow Onset)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Causes</strong></td>
<td>*too much insulin</td>
<td>*too little insulin</td>
</tr>
<tr>
<td></td>
<td>*not eating enough food</td>
<td>*failure to follow diet</td>
</tr>
<tr>
<td></td>
<td>*taking an unusual amount of exercise</td>
<td>*infection, fever, emotional stress</td>
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<tr>
<td></td>
<td>*delayed meal</td>
<td></td>
</tr>
<tr>
<td><strong>Signs to Watch</strong></td>
<td>*excessive sweating, faintness</td>
<td>*increased thirst and urination</td>
</tr>
<tr>
<td></td>
<td>*headache</td>
<td>*large amounts of sugar and ketones in urine</td>
</tr>
<tr>
<td></td>
<td>*hunger</td>
<td>*weakness, abdominal pains, generalized aches</td>
</tr>
<tr>
<td></td>
<td>*pounding of heart, trembling, impaired vision</td>
<td>*loss of appetite, nausea and vomiting</td>
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<td></td>
<td>*not able to awaken</td>
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<tr>
<td></td>
<td>*irritability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*personality change</td>
<td></td>
</tr>
<tr>
<td><strong>What to do</strong></td>
<td>*give the child sugar or any food containing sugar (fruit juice, candy)</td>
<td>*call the doctor at once</td>
</tr>
<tr>
<td></td>
<td>*call the doctor</td>
<td>*put the child to bed and keep him warm</td>
</tr>
<tr>
<td></td>
<td>*do not give the child any insulin</td>
<td>*give the child fluids without sugar</td>
</tr>
<tr>
<td></td>
<td>*give glucagon if loss of consciousness</td>
<td>*continue usual urine tests</td>
</tr>
</tbody>
</table>

that fit well. Cut your toe nails straight across and keep the length the same as your toe. If you have any problems with your feet tell your parents and your doctor.

Parents -

Remember, your child is not a "diabetic", he is a child with Diabetes. You are responsible not only to help keep his Diabetes under control, but to help him to grow up to be a healthy youngster. Don't treat your child as if he was different. Allow him to inform his peers of his condition at his own speed. Help him to become more and more responsible for his own care as he matures and is able to master new tasks, always involving him in the things he cannot yet do so that he may learn procedures from watching you. Allowing him to handle his own care aids in the control of his disease and helps him mature and develop socially.
GLOSSARY

Acidosis-- A disturbance in the acid-base balance of the body in which there is an accumulation of acids or a loss of bicarbonate. (See Diabetic Coma)

Anabolism-- The conversion of carbohydrates, fats and proteins into glycogen and stored in the liver.

Catabolism-- The destructive phase of carbohydrate metabolism where the carbohydrate molecule is broken down into smaller components.

Diabetic Coma-- Condition caused by a lack of insulin in the body and an increase in the number of ketone bodies in the blood due to a rapid breakdown of fats; caused by a failure to take insulin, not enough insulin, resistance to insulin, ingesting more than prescribed amounts of food, infections, vomiting, diarrhea, or physical stress; may lead to loss of consciousness, coma, and death.

Glucose Tolerance Test-- In this test a glucose load is given to a patient, blood and urine samples are taken at certain intervals and tested for glucose, results illustrate ability of a patient to metabolize glucose.

Glycogenesis-- Conversion of sugar to glycogen.

Glycogenolysis-- The conversion of glycogen to glucose.

Glycolysis-- The breakdown of sugars to simpler compounds.

Glyconeogenesis-- Changing fats or proteins of glycogen.

Glycosuria-- Sugar (glucose) in the urine.

Hyperglycemia-- Increased blood sugar. (See Diabetic Coma)

Hypoglycemia-- Decreased blood sugar. (See Insulin Reaction)

Insulin-- A hormone produced by the beta cells of the islets of Langerhans in the pancreas which functions to lower serum glucose levels.

Insulin Reaction-- The result of too much insulin in the blood stream; characterized by rapid onset, low blood sugar levels, irritability, mood swings, hunger, sensations of weakness or dizziness, sweating, nervousness, tremors, pallor, and rapid pulse; caused by an overdose of insulin, insufficient food intake, or violent exercise without taking an extra amount of carbohydrate.
Ketone Bodies-- Compounds produced during the breakdown of fatty acids.

Ketouria-- Ketone bodies present in the urine.

Polydypsia-- extreme thirst.

Polyphagia-- extreme hunger.

Polyuria-- frequent urination.

Post Prandial Blood Sugar-- Blood test where samples are taken either one or two hours after the patient has eaten a meal with about 100gms of carbohydrate. Results reflect the body's ability to metabolize carbohydrates.
BIBLIOGRAPHY


Brown, Joseph; Molhar, Gabriella; Clark, William; Mullen, Yoko. "Control of Experimental Diabetes Mellitus in Rats by Transplantation of Fetal Pancreases". Science. 28 June, 1974.


### Figure 41  DIABETIC CHECKLIST

<table>
<thead>
<tr>
<th>Topic</th>
<th>Instructed</th>
<th>Mastered</th>
<th>Comments</th>
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<tbody>
<tr>
<td><strong>DIABETES</strong></td>
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<tr>
<td>1. Definition of Disease</td>
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<tr>
<td>2. Cause of Disease</td>
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<tr>
<td><strong>DIABETIC CONTROL</strong></td>
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<tr>
<td>1. Clinitest</td>
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<tr>
<td>- Method</td>
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<td></td>
<td></td>
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<tr>
<td>- Meaning of</td>
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<td>2. Acetest</td>
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<tr>
<td>- Method</td>
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<td></td>
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<tr>
<td>- Meaning of</td>
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<tr>
<td>3. Records</td>
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<tr>
<td><strong>DIET</strong></td>
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<tr>
<td>1. Restrictions</td>
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<tr>
<td>2. Calculating diet</td>
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<tr>
<td><strong>INSULIN</strong></td>
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<tr>
<td>1. Administration</td>
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<tr>
<td>- Child</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Parent(s)</td>
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<td></td>
<td></td>
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<tr>
<td>2. Preparing syringe</td>
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<td></td>
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<tr>
<td>- Child</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Parent(s)</td>
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<tr>
<td>3. Rotation of sites</td>
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<tr>
<td>4. Insulin reaction and signs and symptoms and treatment</td>
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<tr>
<td>5. Diabetic Coma, signs and symptoms, and treatment</td>
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Figure 4: Diabetic Checklist (cont.)

<table>
<thead>
<tr>
<th>MAINTENANCE OF HEALTH</th>
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</thead>
<tbody>
<tr>
<td>1. Exercise</td>
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<td></td>
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<tr>
<td>2. Skin Care</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ILLNESS</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Care During Illness</td>
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</table>

New York 10017. Also encourage the family to attend available classes about diabetes.¹

Diabetic Control. The child should be taught how to test his urine for sugar and acetone, and to understand the implications of the results. A child of six years of age can do this test.² Several methods of urine testing are available. The parents should understand that even though different manufacturers make tapes, sticks, and tablets which give accurate results when used correctly, these tests may differ in the method of reporting the results. Parents should be encouraged to use the type ordered by their physician, and they should never use a color chart from one manufacturer and materials from another. The materials that the child uses in the hospital should be the same as what will be used at home.³ Table 7 outlines common methods, by brand name, for urine testing.

Along with these methods for testing urine, the

¹Lippincott, p. 653.
²Hamilton, p. 326.
³Mash, p. 635.
Table 7: Methods of Urine Testing

A. Urine Collection—use the second voided specimen
1. Void and discard the urine
2. Drink several glasses of water
3. Void 30-45 min. later in a clean container—the second specimen reflects the glucose and ketone levels in the urine more accurately
4. Test this specimen
5. Always use only fresh voided urine

B. Tests for glucose in urine
1. Clinitest—5 drop method
   a. Hold dropper vertically and place 5 drops of urine into a clean test tube
   b. Rinse the dropper with water and add 10 drops of water to the test tube
   c. Add Clinitest tablet (avoid touching tablet with hands)
      1. Watch while reaction takes place
      2. Do not shake test tube during reaction or 15 sec. after reaction
   d. Observe the solution during the reaction and for 15 sec. waiting period to detect pass through color change that indicates glycosuria over 2%
      1. If the solution passes through orange and dark shades of green-brown it means that more than 2% (4+) urine sugar is present
      2. Record this as such without referring to color scale
   e. After 15 sec. shake tube gently and compare to color scale
   f. Record results
2. Diastix—reagent strip
   a. Dip the reagent end of the strip in the urine specimen for 4 sec. and remove, or wet the end of the strip in a stream of urine for 2 sec.
   b. Remove excess urine by tapping stick on edge of container or sink
   c. Exactly 60 sec. after removing stick from urine, compare reagent side of strip with closest matching color block on package
   d. Record results
3. Test-Tape—reagent strip
   a. Dip a part of the test tape into the urine
   b. Expose to the air for 60 sec.
   c. Compare the darkened area with color chart
   d. Record results

C. Tests for acetone
1. Acetest—reagent tablets
   a. Use a freshly voided specimen—prolonged standing

1Lippincott, pp. 358-359.