PHYSICIAN MANUAL FOR CUSTOMIZING AND PROGRAMMING

INSULIN DOSAGE COMPUTER 41

BCMC BETTER CONTROL MEDICAL COMPUTERS INC.

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TABLE OF CONTENTS

INTRODUCTION

Type I diabetes requires exogenous insulin therapy. In all insulin-dependent diabetics, grossly inadequate insulin replacement may result in a catabolic state where metabolism is deranged so that unchecked glycolysis, lipolysis, and ketogenesis lead to hyperglycemia, glycosuria, ketonemia, dehydration and eventually electrolyte and osmotic inbalances. Clinically, the resulting hyperosmolar, ketoacidotic state is life threatening. Adequate insulin replacement[1] reverses this catabolic situation and restores an anabolic condition where fuel is stored and released as needed. To achieve a physiological balance, insulin must be provided to approximate the variations occurring in non-diabetics with insulin levels increasing at meal times and then decreasing to appropriate basal amounts in the postabsorptive periods of the day. This latter aspect of adequate insulin therapy has added importance in childhood where the hormone also acts as a growth factor.[2] Generically, two formulations of depot insulin are available for the management of insulin-dependent diabetes: short and long (or intermediate) acting preparations.

Short-acting insulins are ideally suited to the primary (breakfast and dinner) meal situations while admixed intermediate-acting insulins can accommodate the secondary meals (lunch and bed-time snack) as well as provide the extended basal requirements overnight.[3-5] All presently available intermediate-acting insulins have a duration of action which is significantly less than 24h[6] and therefore, necessitate at least twice daily injection therapy.[7] In this way, the insulin dose given before the evening dinner can exert its critical anabolic and growth effects. Even with long-acting insulins, there is a need for 2-3 daily injections.[8] Recently, continuous subcutaneous insulin infusions using either portable pumps[9,10] or multiple daily injections[11] have been advocated as a means to facilitate tight blood glucose control.

Fig. 1: The IDC-41 BG/UG
Insulin Dosage Computer

However, regardless of the insulins used or the methods of administration, the problem of dosage titration to achieve and maintain ideal metabolic control must be solved for each case. To do this, algorithms for dosage adjustment must be developed individually and then taught to each patient. Notably, the algorithms for systematically adjusting regular- and intermediate-acting insulins twice daily based on capillary blood[11,12] or urine[13] glucose measurements are difficult to understand and teach effectively so that patients will accept the responsibility for their self-management with confidence. Herein lies the classical need for the health care professionals: the physician, the nurse-educator and the nutritionist. Now to complement their efforts in instructing and managing the diabetic, a pocket sized microprocessor based device has been developed[14] to further assist their patients in self-management[15-17] (see Fig. 1, opposite). This manual describes the features of this new "take-home" device which is called an insulin dosage computer.

INSULIN DOSAGE COMPUTER (IDC)

The IDC is a custom microprocessor device weighing 200 g and measuring 3/4 x 3 x 5½ (DWL) inches and designed to be a single function computer capable of receiving, storing and processing patient-measured data in regards to glucose concentrations, dietary carbohydrate and physical exercise. Furthermore, the computer is firmware programmed with sophisticated algorithms for insulin dosage adjustments based on the method of glucose measurement recommended by the physician who also customizes (programs) it with parameters individually selected for each patient as detailed below. Subsequently, at each entry, the computer refers to the data in its memory and, if indicated, calculates changes in the current dosages of short- and intermediate-acting insulins in order to achieve or maintain a target glucose level (in blood or urine) set by the physician. Although proprietary in detail, the dosage computing algorithms in general follow certain assumptions and published guidelines[11-13] as outlined below.

Algorithms for Dosage Adjustment: Firmware Programming of the IDC

In general, the algorithms for dosage adjustment assume (1) that the patient follows a consistent lifestyle, is free of intercurrent acute illness and keeps a constant level of activity, although unpredictable exercise can be compensated with food intake and predictable exercise can be entered into the computer as detailed below; (2) that a basic food plan is consistently followed according to recommended nutritional guidelines; (3) that the insulins are used in a multiple component regimen, so that one component of insulin coincides with each period of the day and each meal. A schematic representation of idealized periods of insulin effect for a split and mixed insulin regimen has been shown.[12] Accordingly, changes in insulin dosage are then made when patient measured glucose concentrations are above or below the target set by the physician. Also, insulin supplements may also be added or subtracted and certain safety features are available as detailed below.

High Glucose Concentration - Above Target

1. If the fasting pre-breakfast blood/urine glucose (BG/UG) is greater than the reference target for two days in a row, the evening NPH insulin is increased by 0-3 units up to a limit of 10%.

2. If BG/UG glucose before dinner in the evening is greater than the reference target for two days in a row, then the NPH in the morning is increased by 0-3 units to a limit of 10%.

3. If the pre-lunch at midday or pre-snack at bedtime BG/UG is above the reference target for two days in a row, then the regular insulin at breakfast or the regular insulin at dinner is increased by 0-3 units up to a limit of 3 U.

Low Blood Glucose - Below Target

1. If the BG/UG is below target at any of the measurement times as above, the appropriate insulin dose is reduced 0-3 units to a limit of 10%.

2. If there is a hypoglycemic reaction, the key labelled RXN is pushed at the next meal entry and the appropriately responsible insulin dose is cut by 10%.

Insulin Supplements

1. If the blood glucose on arising or before evening dinner is greater than the target, then extra regular insulin is given according to a scale which adds 1 extra unit for each 100 mg/dl above target, but only at that time.

2. If the blood glucose at breakfast or dinner is below target, then the regular insulin is reduced according to the same scale.

3. The Insulin Dosage Computer programmed to accept urine glucose concentrations does not usually recommend supplements.

Insulin Dosage Computer Safety Features

The following lists nine of the more significant safety features included in the design of the IDC.

1. Initial insulin dosage requirements are programmed into the computer for each patient individually by the physician.

2. The physician sets the limit on the maximum allowable single insulin dose the computer can recommend.

3. Dosage changes are limited to small increments of less than 10%.

4. Up to 28 days of entries by the patient are stored in RAM and can be reviewed by the physician to ascertain consistency and compliance.

5. The Program (Firmware) is in a protected, masked, silicon, read-only-memory (ROM) module so that the patient can never change any of the parameters or change the algorithm. The binary program in the ROM is non-volatile. It is one of the safest digital storage mediums made.

6. Reference glucose targets are programmed into the computer by the physician but cannot be set to values so low that the risk of hypoglycemia is unduly increased.

7. Appropriate insulin dosage adjustments are made immediately when a special "RXN" key is utilized to advise the computer of hypoglycemia or an insulin reaction.

8. Patients are denied access to the programming parameters which require a numeric access code known only to the physician.

9. The insulin dosage computer complies with the limits for a class B computing device persuant to subpart J of Part 15 of FCC rules and can therefore be used on aircraft. It will not interfere with the navigation system of the airplane.

Physician Programming of the IDC

The computer must be programmed by the physician. To do this, he accesses the physician programming mode and responds to the prompts sequentially entering the patient's name, the initial doses of short- and intermediate-acting insulins, the desired capillary blood glucose target or urine glucose target, the types of insulin (NPH or LENTE) prescribed for the patient, as well as specifying other important safety parameters such as the maximum allowable insulin dose and whether a 2 or 3 injection regimen should be followed.

Physician Programming for Two or Three Injections

The computer can be programmed to calculate dosages for two or three daily injections. With the two injection mode Regular- and Intermediate-acting insulins are mixed and injected before breakfast and before dinner. With the three injection mode Regular- and Intermediate-acting insulins are mixed and injected before breakfast but only Regular is given at dinner and then NPH/Lente is given before the bedtime snack.[8]

If a patient uses the three injection mode, then the computer will recommend a supplement of Regular insulin before the bedtime snack as well as the intermediate acting insulin if the capillary blood glucose is especially high. The computer calculates a supplement of Regular insulin for that occasion only. The supplement consists of 1 unit of regular for each 100 mg/dl above target. Supplements of insulin are only given if the computer is programmed to accept capillary blood glucose measurements.

The IDC cannot be programmed to recommend insulin at lunchtime, the pre-lunch glucose value can usually be regulated with a breakfast injection of short-acting insulin, while the pre-dinner glucose value can usually be regulated with an admixture of Intermediate-acting insulin at the breakfast injection.

Physician Targeting for Blood or Urine Glucose

When a physician programs the IDC to be used with capillary blood glucose measurements, he may target the reference blood glucose (RG) from 110 mg/dl to 200 mg/dl. The patient's lifestyle and compliance will determine the proper blood glucose target. Most physicians start the treatment process with a target of 140 to 160 mg/dl. Target blood glucose levels less than 110 mg/dl are automatically reset to this value as a safety feature to avoid hypoglycemia.

When a physician programs the IDC to be used with urine measurements, he may use targets (RG) between 0.1 and 5 g/dl. Although desirable ideally, it is not at all necessary to establish the renal threshold. However, all urine measurements must be first-voided specimens and the urine glucose target can never be set at 0 g/dl. Again, as a safety feature, the computer will automatically reset a target glucose of zero to 0.1 g/dl. It should be noted that if the patient has diabetic or unrelated renal disease, this should be considered when programming the patient's target level for urine glucose losses. Patients whose urine glucose levels are between 4 and 5 g/dl should initially be targeted to 1.5 g/dl and assessed a month later when the target if achieved can be lowered.

The possibility of precipitating retinopathy[18,19] by too rapid glycemic normalization should be considered when lowering target glucose levels.

Once programmed by the physician, the computer receives and processes subsequent information entered by the patient on glucose concentrations ascertained before each meal, each day of the week. After storing sufficient readings to establish initial glucose concentration trends, the Insulin Dosage Computer calculates appropriate changes in the Regular and Intermediate-acting insulin dosages to achieve and then maintain

the targeted glucose value and to counteract any upward or downward trend.

A Custom Medical Device

The act of physician programming converts the otherwise standard computer into a custom medical device which as such is not generally usable by other physicians or patients without reprogramming. It is intended for use solely by the individual patient named in the programming by the physician. In this way, the device is made in a specific form for the patient and is intended to meet the special needs of the physician in the course of his professional practice.

MEASURING GLUCOSE IN URINE OR BLOOD

The Insulin Dosage Computer can be programmed by the physician to either accept blood glucose measurements[20] OR urine glucose measurements.[21] All urine measurements used by the computer to adjust insulin are based on first-voided specimens. To do this, the person would simply hold the reagent pad on the plastic strip under the urine stream for about one second, remove excess urine, wait two minutes and then compare the resultant colour to the 8 pairs of calibrated color scales on the vial.

First-voided specimens before each meal are an indication of urinary glucose spillage over the entire preceding period of time and reflect the relative insulinization of the patient. The algorithms are specifically designed to make insulin dosage changes from this perspective. Second-void samples are of no value since they are eventually always negative.

To achieve maximum benefit from this measurement modality, clearly patients should be encouraged to pass urine only four times a day, precisely before each meal. If more voidings are required then the pa-

tient should measure at each, add the values and then divide by the number of voidings thus calculating an average glycosuria over a given time.

Urine glucose measurements should only be made using reagent strips based on the glucose oxidase/peroxidase system which quantify the concentration of glucose in the urine according to a visual color scale ranging from 0 (negative) to 5 g/dl. Decimal fractions i.e. 2.50 are accepted. All other methods are insufficiently accurate[21] and affected by intercurrent antibiotic as well as vitamin therapy.[22]

Blood glucose should be measured in accordance with the specific stick manufacturer's instructions, 4 times each day before breakfast, lunch, dinner and bedtime snack. Any visually estimated or meter assisted method can be used but the patient's methodology should be reviewed[20] and the accuracy should be verified by laboratory assay of simultaneously drawn whole blood.

The IDC requires a maximum of 4 glucose (blood or urine) measurements each day if four insulin doses are to be adjusted. If only Intermediate-acting insulin is used, then two measurements each day suffice. Measuring less often has no adverse effect but does slow down the process of dosage titration.

CHOOSING INSULINS

In choosing insulins[23,24] for a patient who is going to use the IDC, the physician should consider the following. The algorithms in the IDC are designed to adjust Regular and Intermediate-acting insulins, not SEMILENTE and ULTRALENTE insulins. Lente is a 30/70 mixture of SEMI-

and ULTRALENTE insulins. ULTRALENTE contains excess zinc. When Regular insulin is added to LENTE, the Regular binds to the excess zinc to form more ULTRALENTE. Thus patients who mix Regular and LENTE are in fact using an undefined mixture of REGULAR, SEMILENTE and ULTRALENTE insulins.

To preserve the identity of each insulin, patients who must use LENTE should be instructed not to mix the insulins and preferably to draw-up the Regular first and inject it alone and then to draw up the LENTE and inject it into an independent, adjacent site. Otherwise, an early effect is realized only when relatively large amounts of Regular are mixed with LENTE. This confounding of the identity of the Regular and Intermediate-acting insulin simply (but unnecessarily) prolongs the period the IDC needs for dosage adjustment to achieve a specified target glucose level.

Purified species NPH (ISOPHANES) and the corresponding Regular insulins can be mixed in any proportions without the loss of the identity of either insulin.

These differences in the Intermediate-acting insulins should be considered when the physician is ordering insulins as well as when interpreting the clinical outcome of glucose control with the IDC.

INSULIN INJECTION AND MEAL TIMING

The physician should advise the patient how much time to allow between the acts of injecting and eating.[25-27] Sometimes it is advantageous to allow the Regular component to begin acting for 15-30 minutes before a meal. The IDC responsive to blood glucose recommends that the patient inject and eat or inject and wait depending on whether or not the measured blood glucose corresponds to the target level by 30 mg/dl. The computer responsive to urine measurements always suggests to inject and wait. How long to wait is specified by the physician.

USING THE OPTIONS FOR EXERCISE AND EXTRA CARBOHYDRATE

An Exercise Option[28] can be used by diabetics who wish to adjust their insulin requirement in keeping with their exercise program. The following example illustrates the use of the Exercise Option.

Suppose a vigorous game of tennis is planned in the afternoon. The patient would then push the key labelled EX while the dose is displayed at breakfast time. The computer will then ask what level of exercise is planned. There are three exercise levels, 1 is moderate, 2 is medium, and 3 is strenuous. The patient must learn from experience the levels suitable for each activity. Fractional levels (ie. 2.5 or 3.5) of exercise are acceptable. The computer will then ask if the Exercise is Soon or Late: Soon means in the morning and Late means in the afternoon. The game of tennis after lunch should be entered as being Late. A person may also wish to exercise at a certain level in the morning and another level in the afternoon. The appropriate insulin doses will be altered to accommodate both times of exercise by keying in either Soon or Late when the dose is displayed. This is done sequentially in any order.

A patient may also use the CHO Option either at breakfast or at dinner to enter more or less carbohydrate. While the dose is displayed, the patient must push CHO and enter then extra (or less), ie. plus (or minus) CHO which is estimated in grams (one carbohydrate exchange is about 15 g). When planning less CHO, a patient must first enter the number of grams and then push the MINUS key.

HYPOGLYCEMIA

A diabetic should be instructed to use the key labelled RXN when hypoglycemia was experienced. If the patient is unsure about the symp-

toms, a capillary blood glucose measurement should be performed to verify the symptoms. At the next meal entry, the special key labelled RXN must be pushed instead of entering a blood or urine glucose value. The appropriate insulin dose will be reduced immediately by 10% although the change may only be apparent the following day. For example, a reaction entered before lunch reduces the breakfast Regular immediately, but the dose is shown only the next morning.

However, the patient must be cautioned only to use the RXN key if the reaction was caused by too much insulin and not because they failed to eat the usual amount or exercised too strenuously without compensating with extra food.

At the beginning of an IDC assisted insulin regimen, most physicians suggest a person should set the alarm around 3:00 a.m. and make sure that hypoglycemia is not occurring. If it is, then the RXN key should be pushed at breakfast time instead of entering the pre-breakfast urine glucose or pre-breakfast blood glucose value.

THE MEAN: A MEASURE OF DIABETES CONTROL

The IDC permits the physician to compute and display the mean of glucose readings entered at each meal over the preceding seven days. The mean function is activated by pushing the key labelled RXN. It is an important feature whereby the physician can monitor improvements achieved in glucose control.

When a patient measures his urine glucose the mean function is especially important in evaluating diabetes control. Suppose the physician has targeted the patient to spill 1 g/dl of glucose in the urine. He should ask the patient to check the mean function once a week. If all pre-meal glucose values have reached a 1 g/dl mean or are close to it, then this

is the time to do a blood glucose profile with measurements before and after meals. If fasting blood glucose measurements are close to normal then the target of 1 g/dl is the right one for this individual. If the fasting blood glucose measurements are below or above normal, then the target should correspondingly be raised or lowered.

Frequent hypoglycemia indicates too low a reference target of blood or urine glucose has been set in the light of the patient's lifestyle, compliance with diet, meal timing, activity and/or emotions and the target should be raised by the physician.

USING THE MEAN TO EVALUATE THE DIET

Sometimes a patient's diet is inconsistent with good control. The mean function can be used by the physician to evaluate the patient's diet at a glance. For example, if the four mean premeal glucose levels (in urine or blood) have reached the target previously set, then a review of the diet is probably not necessary. However, if one of the premeal values is unusually elevated, say for example the predinner value, then a review of the diet is indicated. It will probably show that the patient is taking a late afternoon snack which is too rich in carbohydrates and cannot be accommodated by the waning action of the morning Intermediate-acting insulin. Deletion of the snack, reduction of the carbohydrate component or substitution with fibre, ie. vegetables should be considered. Notably, substitution of carbohydrate with protein and fat are not indicated because protein can stimulate glucagon release and induce hyperglycemia even if no carbohydrate is in the snack.

Printing

A printer may be attached to the computer in the clinic or physician's office to print out the patient's data. It will print out the patient's name, the current insulin doses, as well as the target glucose and the safety levels set, the means of data for each meal over the last 28 days and then list all the meal blood or urine glucose entries for the last 28 days.

PHYSICIAN PROGRAMMING

A New Patient

Push the tiny tab centered between the USER and PRGM keys upward and remove the custom keyboard overlay for access to the programming keys.

To gain access to the programming mode for customizing the computer, a specific sequence of keystrokes must be executed and a unique access code must be entered.

To begin custom programming:

1. Push ON and immediately push R/S.

   Do not wait until the computer goes to DAY = ? If you have waited too long and the computer goes to DAY = ? then you must wait until the computer shuts iteself off (this takes about 8 seconds) and begin again with step 1.

2. Disregard the numbers in the display.

3. Now enter the unique access code 123 by pushing keys 1,2,3.

   Display shows: 123 -

4. Push COS (this is also the RXN key).

5. Display shows: CLEAR DATA 1

6. Push numeral 1

   Display shows: 1 -

7. Push R/S to clear all data.

8. Display shows: NPH 0/ LEN 1

Choose either NPH or LEN by pushing 0 or 1 depending on the type of insulin required.

Push R/S to continue.

9. Display shows: 2 INJECT 3

Choose either 2 for two injections which are administered before breakfast and before dinner or push 3 for three injections. These are injected before breakfast, before dinner and before bedtime snack.

Push R/S to continue.

> Note: A small O will appear and remain in the display if you have chosen the three injections mode.

10. Display shows: NAME = 0.00

Now key in the name of your patient. Do not exceed six alphabetic characters.

Push R/S to continue.

11. Display shows: REG B = 0.00 U

> Key in the digits for the fast-acting component of the initial doses at breakfast. This regular dose should exclude any supplement for hyperglycemia and correspond to the amount taken if the blood glucose was normal before breakfast.

Push R/S to continue.

12. Display shows: NPH B = 0.00 U

or LEN B = 0.00 U

Key in the digits for the intermediate-acting component of the initial insulin doses at breakfast.

Push R/S to continue.

13. Display shows: REG D = 0.00 U

Key in the numbers for the fast-acting component of the initial insulin dose at dinner. This regular dose should exclude any supplement for hyperglycemia and correspond to the amount taken if the blood glucose before dinner was normal.

Push R/S to continue.

14. Display shows: NPH D = 0.00 U

or LEN D = 0.00 U

or NPH S = 0.00 U

or LEN S = 0.00 U

Key in the numbers for the intermediate-acting component of the initial insulin dose at dinner or at snacktime if three injections/day are taken. Push R/S to continue.

15. Display shows: MAX I = 0.00 U

Key in the maximum insulin units to limit the highest individual dose. Usually MAX I is set to about 15 U above the morning NPH.

Push R/S to continue.

16. Display shows: RG = 0.00 G/DL

Key in a reference glucose target. If the USER measures BG, use numbers between 110 - 200 mg/dl. If the USER measures urine glucose, enter numbers between 0.10-5.00 g/dl (you may use decimal points).

Push R/S to continue. Note: RG is always programmed using grams regardless of whether the USER measures BG/UG in grams or mmol.

17. Display shows: G 0 / MMOL 1

    Key in 0 if the USER measures UG/BG in grams. Key in 1 if the USER measures UG/BG in mmol.

    Push R/S to continue.

18. Display shows: BG IN MMOL/L

    or BG IN MG/DL

    or UG IN MMOL/L

    or UG in G/DL

    If you have chosen RG between .1 and 5, it will show that the computer is programmed for UG. If you have chosen a RG between 110 mg/dl and 200 mg/dl, then the computer is programmed for BG. If you try to program a RG = 0 for UG, it will automatically raise the target to .1. If you try to program a RG = 100 or less for BG it will automatically raise it to 110.

    Push to continue.

19. Display shows: MODE = 2 INJ

    if the two injection mode was chosen, or

    MODE = 3 INJ

    if the three injection mode was chosen.

    Push R/S to continue.

20. The display briefly shows:

    MEAL : MEAN + - SD N

    and then

    B:

if there are no patient BG/UG data stored in memory
or

B: 146 + - 38 7

if for example seven days of USER data were entered at Breakfast and the mean (average) of these data was 146 with a standard deviation (SD) of 38.

Push R/S to continue to lunch means.

Push R/S to continue to dinner means.

Push R/S to continue to bedtime snack means.

Push R/S and the computer will shut itself off. Do not interrupt this sequence but let it run to the end.

If at any time you have made a mistake, you can start at the beginning by keying in the access code 123, pushing the key labelled COS or RXN to start the programming sequence over again.

To Examine/Change Programming

1. Push ON and follow immediately with R/S.

2. Push 123 and push the key labelled RXN (COS).

3. If you do not wish to CLEAR DATA then just push R/S to continue.

4. Display shows: NPH 0 / LEN 1

   If you do not wish to change this mode, continue by pushing R/S. If you wish to change this mode, push the appropriate digit (0 or 1) followed by R/S.

5. Display shows: 2 INJECT 3

If you do not wish to change this mode, continue by pushing R/S.

If you wish to change this mode, push the appropriate digit (2 or 3) and push R/S to continue.

6. Display shows: NAME = patient

   Either change by using the alphabet keys or push R/S to continue.

7. Display shows: REG B = rr U

   rr stands for the amount of fast-acting insulin the USER is currently injecting at breakfast.

   If you wish to change this dose, you may key in any new number. Push R/S to continue.

8. Continue to all the other doses and programming parameters by pushing R/S. If you do not wish to change a displayed parameter, then push R/S. If you wish to change it, push the appropriate keys and then push R/S to continue.

9. Termination of the programming sequence can be done at any time by pushing ON . Note: The computer does not have an OFF key. The computer is either ON or (not) ON.

Printing Patient Data

A Printer may be attached to the computer to print out a patient's data. It will print out current doses, means for each meal over the last 28 days as well as all meal BG/UG entries for the last 28 days. For 8½ x 14 inch page sized print-out, use the desktop Hewlett-Packard 2225B (HP-IL) Thinkjet together with the HP82160A Interface Loop module. Or, for portability use the HP82143A printer which interfaces directly with the IDC-41 and produces a 2¼ inch paper strip. To attach the printer, follow these steps:

1. Make sure both the computer and the printer are turned off.

2. Remove the port cap that is in port #4. Remember not to unplug port #1 since this is the ROM module used for the custom UG/BG IDC.

3. Insert the printer interface connector into the open port. Be careful not to put it in upside down.

4. The TRACE MODE on the HP82143A printer must be pushed to MAN.

5. Turn the Printer ON.

6. Turn the IDC-41 ON and push RXN.

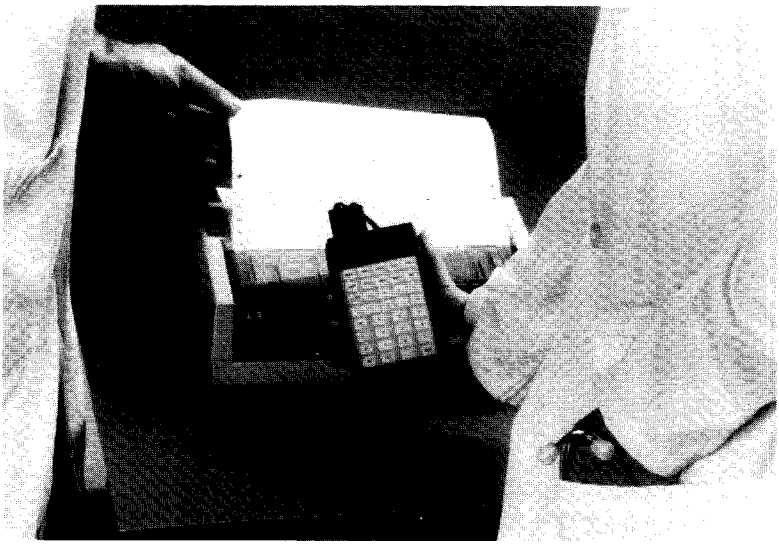
7. The printer will now print all its internal data.

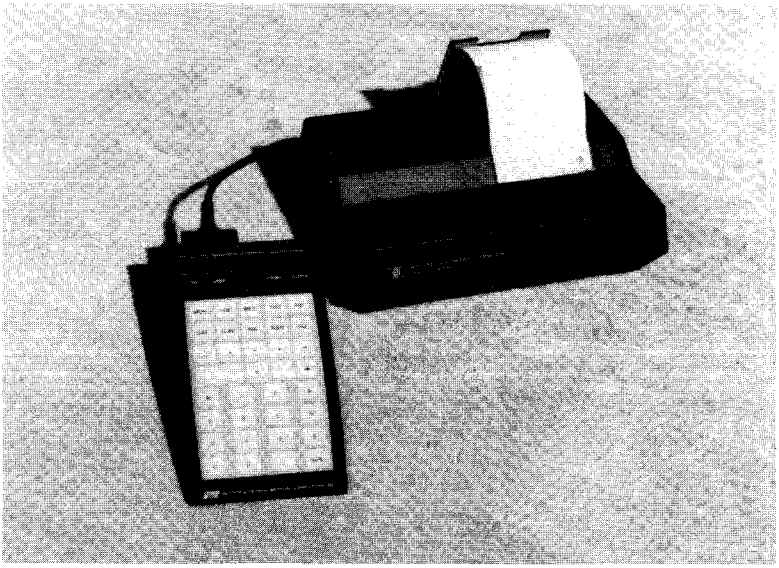
8. Be sure to turn both units off before unplugging the printer from the computer.

Chargers for both printers are available with ratings of 120V in North America and 220V in Europe.

** The computer cannot be reprogrammed while attached to a printer.**

Sample Patient Data Print-out





ABBREVIATED IDC USER INSTRUCTIONS

1. Estimate capillary BG or first-voided UG.

2. Push ON. Wait for DAY = ?

3. Push DAY key (MON, TUE, ...). Wait for MEAL = ?

4. Push B, L, D, S (Breakfast, Lunch, Dinner, or Snack). Wait for BG = ? or UG = ?

5. Key in BG or UG and push R/S. Wait for Day BG Meal = ? or Day UG Meal = ?

6. Verify data entered. If correct, push R/S. If not, push NO.

7. The insulin dosage will be computed and then displayed.

8. If you missed the insulin dosage, you may recall it by pushing ON, wait for DAY = ? and then pushing the key INS. This will recall the last insulin dose recommended.

9. If you wish to enter more or less carbohydrates, push CHO key while the dosage is displayed and answer the questions. You may also recall the last dose by pushing INS and then pushing CHO.

10. If you wish to enter exercise (3 levels, 1, 2 or 3), then push the EX key while dosage is displayed. Answer questions as they are displayed. You may also recall the last dose by pushing INS key and then pushing EX. Fractional EX levels, e.g. 2.5 are permitted.

11. Push key labelled RXN if you want the computer to calculate the mean BG for Breakfast. Assume the IDC is programmed for BG.

    Display will show: MEAL mean±SD N. For example:

B	176	+ - 32	5
↓	↓	↓	↓
Breakfast	Mean	Standard Deviation	Number of entries

    Push R/S to continue to the Lunch means.
    Push R/S to continue to the Dinner means.
    Push R/S to continue to the Snack means.
    Push R/S and the computer will shut itself off.

12. Hypoglycemia: if a reaction was experienced, at the next meal entry for UG = ? or BG = ? must be via the RXN key.

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BETTER CONTROL MEDICAL COMPUTERS INC.

Toronto Division
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