

Insulin pumps

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Objectives

1. Review the operations of an insulin pump.
2. Review the brands of insulin pumps available.
3. Review the brands and types of infusion tubing available.
4. Review and identify the different infusion sites.
5. Learn the manufacturer's recommendations regarding pump problems, damage, or malfunctions.
6. Review the Decreased Level of Consciousness protocol in the SPEMS protocols.

Equipment needed

CE answer sheet

Computer with Internet access

Access to the Lubbock EMS website at Lubbockems.org

No other specific equipment is required to complete this CE article

Insulin pumps and the diabetic patient

You are called to the scene of a diabetic patient. The family states that the patient has not been acting like their normal self for the past 30 minutes. The family also states that the patient has a history of insulin dependant diabetes mellitus. They state that the patient has eaten his normal diet this date and has had no increase in physical activity. Your physical assessment reveals that the patient is pale and diaphoretic and responsive to painful stimuli with moaning. You perform a glucose test and it reveals a blood glucose of 18 mg/dl. As you perform a quick secondary physical assessment you noted that the patient has a pager looking device attached to the belt and there is a small tube coming from the device and the other end is implanted in the abdomen. The family then states that the patient has an insulin pump.

Your treatment is normally simple with the exception of the insulin pump. What do you do with the pump? Do you turn it off? Take out the batteries? Disconnect or crimp off the tubing? Or do you just leave it alone, treat the hypoglycemia, and take the patient to the hospital? Before we make our decision, let's take a look at insulin pumps.

HISTORY OF INSULIN PUMPS

The first insulin pump was developed in 1963. It was the size of a large backpack which delivered insulin and Glucagon. By the 1970's and as technology progressed, the size of the insulin pump had reduced to the size of a brick. In 1983 MiniMed introduced the first miniature insulin pump that was the size of a large pager. Present day companies continue to revise and improve the pumps.



This is the first pump that delivered both Glucagon and insulin. It was developed in 1963.

The AS2C came out around 1977 and was used by a number of people living with Diabetes.



AutoSyringe which came out about 1980 and the MiniMed that was released in the 1990's.



Example of the size of current pumps in use today.

WHAT'S AN INSULIN PUMP?

The insulin pump is a simple device made of three main components: a pump reservoir filled with insulin, a battery operated pump, and a computer chip that allows the user to control how much insulin the pump delivers.

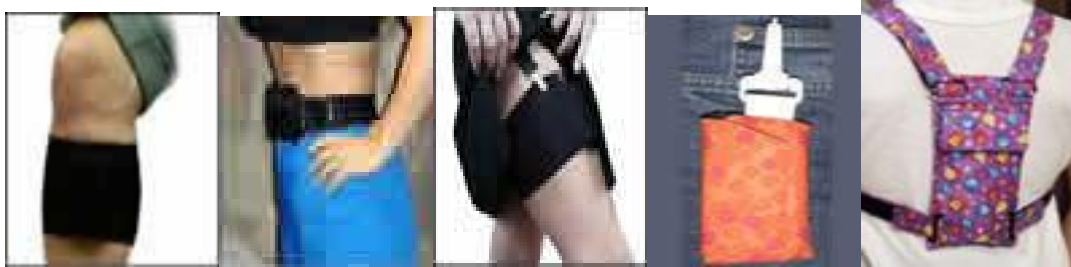
The insulin pump reservoir delivers insulin to the body by a thin plastic infusion set. The insulin pump reservoir can hold from 176 to 315 units of insulin. The needle or cannula at the end of the tubing is inserted under the skin. This is normally in the abdomen but it can be placed in several areas. The pump delivers insulin 24 hours a day according to the settings that are unique to each patient. However, the pump is not automatic, only a small amount of insulin is administered continuously (this is the basal rate). The patient must decide how much insulin will be administered based on predetermined insulin to carbohydrate rate. This requires the user to check his blood glucose at least 4 times a day. The patient may also program larger doses to be administered at meal time (this is the bolus rate).

WHAT ABOUT PUMP MAINTENANCE?

Most insulin pumps are designed to be maintenance free. Most pumps can be cleaned with a damp cloth and mild soap. The pump operates on one to four batteries with a battery life from three to eight weeks (depends on make, model, and manufacturer). The pumps are designed where the patient can fill the reservoir without going to the hospital or doctors office.

HOW DOES THE PATIENT WEAR THE PUMP?

Due to the relatively small size of the pump the concealment is quite easy. This could be a major concern for prehospital providers. There is no set standard where the patient can or will wear the pump. It can be worn in a pocket, tucked into a bra or garter belt, or placed in a case and worn on the belt just to name a few. Also, with the new smaller designs, some of the insulin pumps look like a pager when worn on the belt. There are also tubeless pumps (OmniPod) that are even more difficult to identify. Most patients like to keep the pump within reach so that there is easier access for programming. It is important that on all decreased level of consciousness patients that a through search is made for an insulin pump or the tubing.



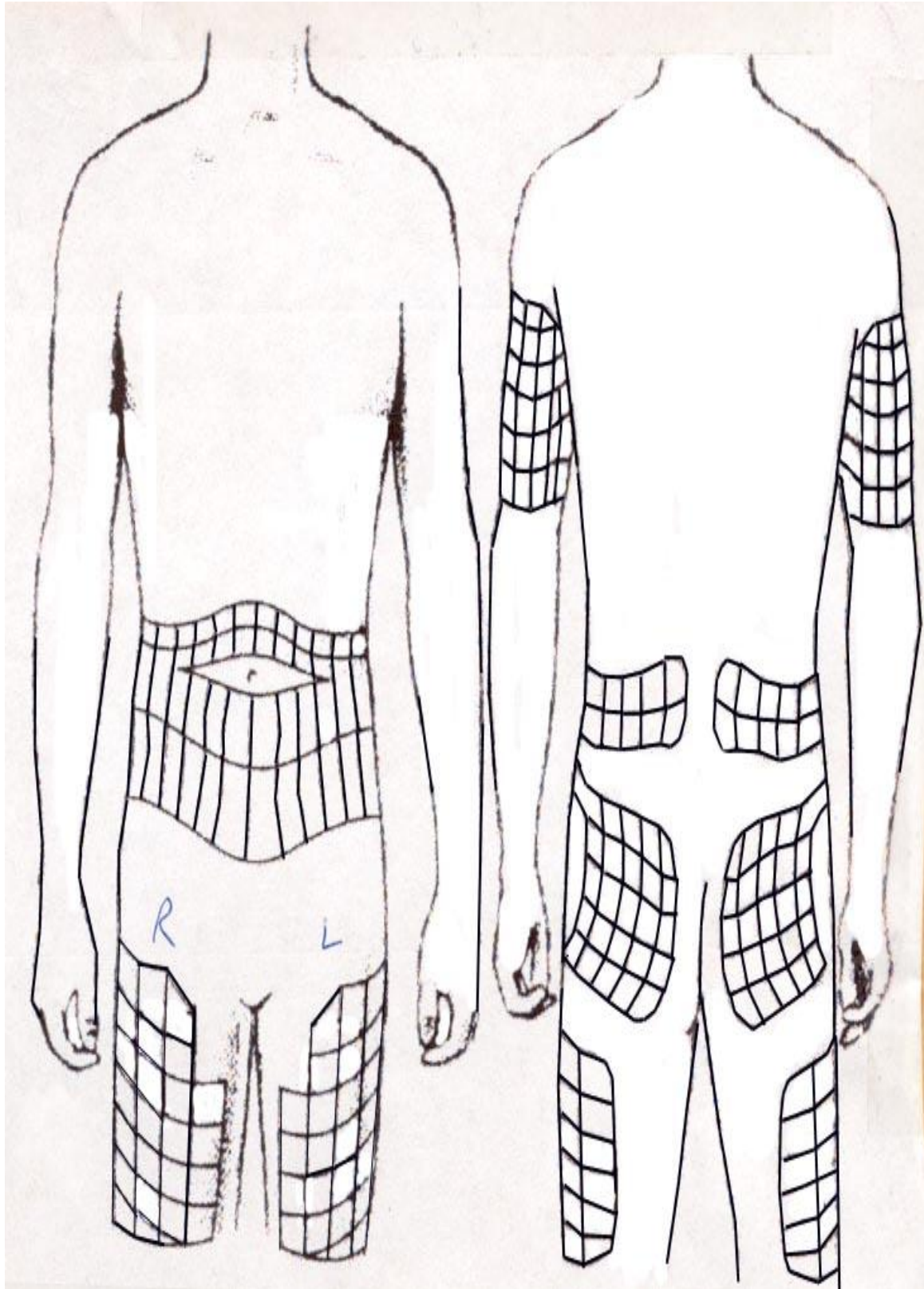
Examples of possible pump locations

WHAT ABOUT THE INFUSION SETS?

Until the early 1980's, the only infusion sets available for insulin pumps were straight metal needle sets. Manufacturers soon offered bent needle sets but these sets may move the skin with activity and were not

acceptable for some people. There is now Teflon catheters and slant insertion needles that allow the patient to participate in nearly activities.

As shown on the drawing below, the infusion site can be in many different locations:



Here are examples of the needle or cannula size:



Here are some of the infusions sets available:



Twist by
Simple Choice®



Cleo 90 by
Smiths Medical®



Orbit 90 by
ICU Medical®



Ultra Flex
By Accu-Check®



Quick-set
by Medtronic Minimed®
Minimed



Sof-set Micro
Ultimate QR,
by Medtronic Minimed®
Minimed



Soft Release
by Dana



Inset by
Unomedical®



Thinset by
Applied Diabetes Research®

Teflon Sets - Slanted Insertion



Tender
By Accu-Check®
★★★★★



Tender
By Accu-Check® "mini"
★★★★★



Silhouette
by Medtronic Minimed®
★★★★★



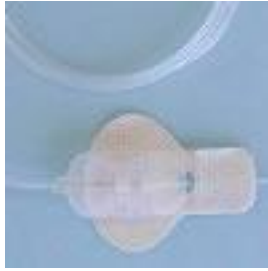
Easy
by Choice® Simple
★★★★



Easy
by Choice® Pro Simple
★★★★



Comfort
by Unomedical®
★★★★★



Soft Release
by Dana

Metal Sets - Straight Insertion



Rapid
By Accu-Check®
★★★
Not in US



Rapid D
By Accu-Check®
★★★★★



Contact Detach by
Unomedical®
★★★★★



Easy Release
by Dana®

Metal Sets - Slanted Insertion



Basic By
Unomedical®
★★



WHAT ARE THE BRANDS OF INSULIN PUMPS?

There are many different makes and models of insulin pumps. Research found 7 major manufacturers of insulin pumps. Here is a list of the manufacturers and models:

Animas Corporation:



IR-1250



IR-1200



IR-1000

Smith Medical / Deltec Cozmo:



Cozmo Pump

Disetronic:



Accu-Chek Spirit



D-TRONplus



H-TRONplus

Insulet Corporation:



OmniPod

Medtronic's MiniMed's:



Model 522/722



Model 515/715



Model 712



Model 512

Model 512/712



Model 511



Model 508



Model 507 and 507C



Model 506



Model 404SP

Dana:



DANA Diabecare II

Nipro Diabetes Systems:



Amigo

What do we do with the insulin pump in the case of pump problems?

All of the above insulin pump manufacturers were contacted via e-mail with 2 questions regarding possible problems with their insulin pumps and what they requested to correct these problems. Although not all companies responded to the request the ones that did had the same basic answers.

The two main questions were:

1. What do you recommend to do with the insulin pump in a patient with a hypoglycemic episode?

2. What do you recommend in the event that a pump may malfunction due to damage or mechanical problems?

The answer was the same to both questions:

“It is recommended that the patient stay connected to the pump if at all possible. However, the pump will continue to deliver insulin (the basal rate) unless this is stopped. You can either “suspend” the pump or disconnect the infusion set. There should be a quick release on most sets. The quick release may be along the tubing (like the Sof-Set) or right at the site portion (like the Quick-Set or Silhouette). As a last resort, if the pump needs to be removed, you can remove the infusion set from the patient’s body.”

It was also expressed that there are minimal chances of a pump delivering an excessive amount of insulin unless there is some type of damage to the unit. The manufacturers cannot control the patient when the unit settings are made or what the patient eats. The unit should not be turned off or the batteries removed if at all possible to keep the patients setting and doses administered by the pump. If you do disconnect the pump tubing at the pump or injection site, try to use an aseptic technique if possible. Try to keep the open ends clean by wrapping them in sterile gauze or other sterile items to help the patient reduce infection when reconnecting the pump. If it is necessary to completely remove the pump and infusion set then continue to use aseptic technique and apply a sterile dressing to the insertion site on the patient’s body. You should also remember that when the insulin pump is removed that the patient is no longer getting a continuous dose of insulin which could cause hyperglycemic complications in long term situations.

Regardless of if the patient has an insulin pump or not the treatment will remain the same as any other decreased level of consciousness patient. The

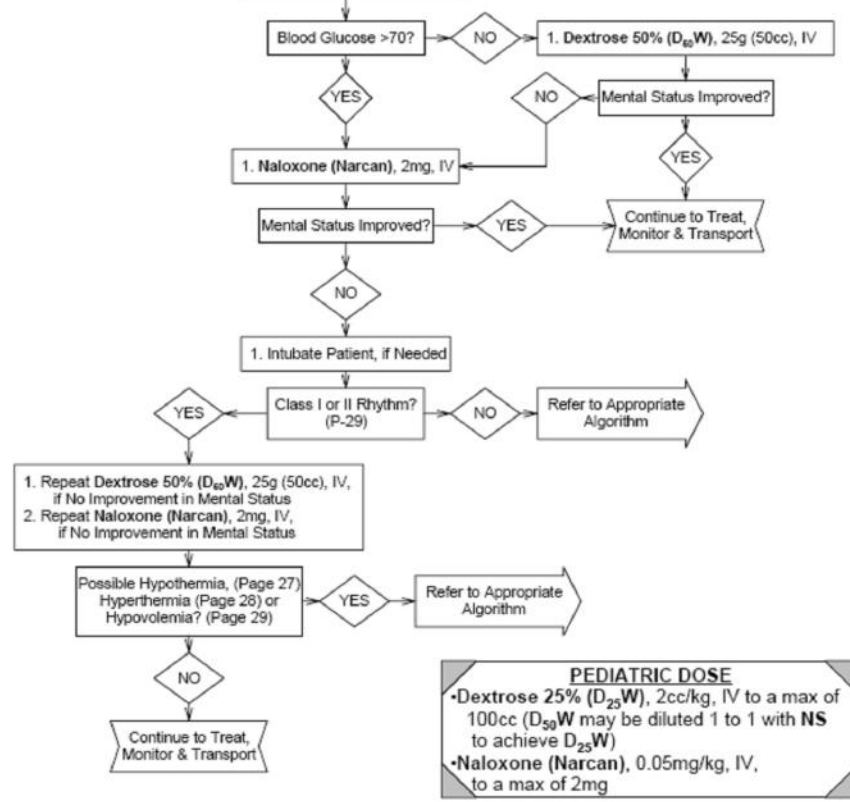
decreased Level of Consciousness protocol is located on page 21 of the South Plains Emergency Medical Services protocols. If you have questions or confusion as to how to deal with the diabetic and their insulin pump you should always contact medical for direction. The following is a copy of the SPEMS Decreased Level of Consciousness protocol:

DECREASED LEVEL OF CONSCIOUSNESS or NEUROLOGIC SYMPTOMS* (NON-TRAUMATIC)



1. ABCs
2. Oxygen
3. Assist Ventilations if Respirations Inadequate (Insert OPA/NPA if needed)
4. Monitor EKG
5. IV, NS, TKO
6. Obtain Blood Sample
7. Determine Blood Glucose

- NEUROLOGIC SYMPTOMS**
1. Any Motor or Sensory Deficit
 2. Any Altered Level of Consciousness



- PEDIATRIC DOSE**
- Dextrose 25% (D₂₅W), 2cc/kg, IV to a max of 100cc (D₅₀W may be diluted 1 to 1 with NS to achieve D₂₅W)
 - Naloxone (Narcan), 0.05mg/kg, IV, to a max of 2mg

The information for this article and photographs are for the use of Lubbock EMS as educational materials only and was obtained from the following sources via written communication, e-mail, or from their websites:

www.mysimplechoice.com

www.Smiths-Medical.com

www.Icumed.com

www.Disetronic-usa.com

www.Minimed.com

www.theinsulinpump.com

www.unomedical.com

www.applieddiabetesresearch.org

The Animas Corporation

Smith Medical

Disetronic

Insulet Corporation

Medtronic Corporation

Dana Corporation

Nipro Diabetes Systems

South Plains Emergency Medical Services Treatment Protocols

www.diabetesnet.com