

Section 5

Pump Refill

This section provides information that is critical to the safe and accurate refill of the SynchroMed® Infusion System. Complete refill instructions are provided with each refill kit and must be reviewed prior to performing the procedure.

The topics addressed in this section are:

| | |
|--|------|
| Preparing for refill | 5-2 |
| Key considerations for refill | 5-5 |
| Refill procedure | 5-6 |
| Concentration changes | 5-11 |
| Calculating a bridge bolus - lower to higher concentration | 5-12 |
| Calculating a bridge bolus - higher to lower concentration | 5-13 |
| Total drug volume reference tables | 5-14 |
| Programming a bridge bolus | 5-18 |
| Performing a reservoir rinse | 5-20 |

Medtronic supplies refill kits with complete directions for refill to assist you in a safe and accurate procedure.

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Preparing for Refill

The pump reservoir requires periodic, scheduled refilling. The refill interval depends on the:

- drug concentration,
- drug stability,
- pump reservoir volume,
- daily dose, and
- various treatment considerations.

Lioresal® Intrathecal (baclofen injection) remains stable in the pump for 90 days.

The Refill Kit

The refill procedure involves a specific set of tasks that must be followed precisely to help ensure patient safety. It is imperative to follow aseptic technique throughout the refill procedure to maintain sterility of the pump reservoir, fluid pathway, and device pocket. Medtronic-supplied refill kits contain complete directions for refill to help ensure safety and accuracy. Additionally, a Medtronic Representative will train you on the procedure.

There are three Medtronic Refill Kits that contain Lioresal Intrathecal for the SynchroMed pump. They differ only in the amount and concentration of Lioresal Intrathecal. All of the kits contain the items listed in **Table 5-1**, as well as one of the following:

- **One** ampule of 10 mg/20mL
(500 mcg/mL) of Lioresal Intrathecal.
- **Two** ampules of 10 mg/5mL
(2000 mcg/mL) of Lioresal Intrathecal.
- **Four** ampules of 10mg/5mL
(2000 mcg/mL) of Lioresal Intrathecal.

To determine which refill kit is appropriate for a patient, consider:

- Pump reservoir capacity
- Existing drug concentration
- Daily dose (for newly implanted pumps)

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Table 5-1
Lioresal Refill Kits
Sterile Reservoir Package

| <i>Component</i> | <i>Supplied</i> |
|--|-----------------|
| 20 cc syringe | ✓ |
| Pressure monitor with stopcock | ✓ |
| Extension tubing set with clamp | ✓ |
| 22-gauge, 1-1/2" and 2" non-coring needles | ✓ |
| 0.22 micron filter | ✓ |
| Template | ✓ |
| Fenestrated drape | ✓ |
| 4 x 4 gauze pad | ✓ |
| Alcohol prep | ✓ |
| Povidone iodine swabs | ✓ |
| Latex-free exam gloves | ✓ |
| Refill Kit Instructions for Use | ✓ |

Sterile Drug Preparation Package

| <i>Component</i> | <i>Supplied</i> |
|------------------------------------|-----------------|
| 20 cc syringe | ✓ |
| Syringe label | ✓ |
| Plastic bag | ✓ |
| Gauze pads | ✓ |
| Filter straw | ✓ |
| Syringe cap | ✓ |
| Drug Preparation Instruction Sheet | ✓ |

Lioresal Intrathecal

| <i>Component</i> | <i>Supplied</i> |
|---|-----------------|
| Lioresal Intrathecal (baclofen injection) ampule(s) | ✓ |
| Package insert | ✓ |

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Refill Kit Specifications

The standard size needle used for the refill procedure is a 22-gauge non-coring needle and is a component of the Medtronic Refill Kits. As a precaution, this needle will not pass through the catheter access port screen on pump models with that feature. The templates in the Refill Kit help to guide you to the correct location of the reservoir septum for refill (**Figure 5-1**).

Figure 5-1
Refill Kit Template



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Identify Pump Specifications

Before beginning the refill procedure, it is **critically important** to review the specifications of the pump. If the implanting physician recorded the pump specifications at implant (see **Section 4: Pump Implant**), the needed information should be located in the patient's record.

Refer to Technical Instructions in the Medtronic Refill Kit for the complete refill procedure.

Key Considerations for Refill

The following is a list of critical considerations in conducting the refill procedure.

- Ensure that you are using a Medtronic Kit specified for pump refill.
- Identify the pump model number, reservoir size, and the catheter access port (if present).
- Verify the pump's maximum reservoir volume.
- Confirm the location of the center reservoir fill port.
- Use the refill template provided in the kit.
- Perform a reservoir rinse when changing drugs or decreasing drug concentration.
- Program a bridge bolus to prevent under - or overdosing when changing drug concentrations (see concentration changes in this section or refer to the *SynchroMed Software and Programmer Technical Manuals*).

Reservoir Valve

In pumps containing a reservoir valve, extreme pressure during refill may cause valve activation. (For pump model features, refer to the Product Identification Chart in the **Appendix**.)

WARNING: To prevent activation of the reservoir valve:

- completely aspirate all contents of reservoir before filling,
- do not allow air into the pump's reservoir via an open needle or extension tubing,
- do not exceed the specified volume of 18 mL or 10 mL, and
- do not force fluid into the pump reservoir.

Refer to **Section 8: Troubleshooting** for more information or to the Reservoir Valve Troubleshooting Recommendations in the **Appendix**.

Emergency technical support for clinicians is available at (800) 707-0933.

Section Five: Pump Refill

Refill Procedure

The table below (steps 1-18) is an overview of the refill procedure. A single page Refill Programming Guide as well as the Refill Kit Technical Instructions can be found in the **Appendix**.

Table 5-2
Refilling An Implanted Pump

| | |
|-----|--|
| | WARNING: It is imperative to follow aseptic technique throughout the procedure to maintain sterility of the pump reservoir, fluid pathway, and device pocket. |
| 1. | Select a Medtronic Refill Kit according to the amount and concentration of Lioresal Intrathecal (baclofen injection) desired for refill. |
| 2. | Identify pump model, reservoir size, and location of the center reservoir fill port and catheter access port (if present). |
| 3. | Perform telemetry to check current pump status and determine the expected volume of fluid remaining in the pump reservoir. |
| 4. | Program the appropriate new parameters (e.g., reservoir volume, prescription, etc.) and perform telemetry to update the pump. Copy the printout on standard paper and save for patient's record. |
| 5. | Prepare the drug following the instructions in the Sterile Drug Preparation Package. Note: Lioresal ampules are not in a sterile package, however the remainder of the refill kit is. |
| 6. | Prepare injection site by cleansing area with an agent such as povidone-iodine. |
| 7. | Using sterile procedure, assemble the 22-gauge non-coring needle, extension tubing set with clamp and empty 20 mL syringe. |
| 8. | Select and place template over pump, aligning edges of template with edges of pump and catheter access port (if present). |
| 9. | Insert needle through TEMPLATE CENTER HOLE and into the pump septum until the needle touches the needle stop (Figure 5-2). Excessive force will damage the needle tip and possibly the septum when the needle is removed. |
| 10. | Withdraw fluid from the reservoir using gentle negative pressure. Empty the reservoir completely until air bubbles are present in the extension tubing. (Figure 5-2). Accessing the center fill port should create negative pressure upon complete aspiration of the reservoir contents. The amount of drug withdrawn should approximately equal the previously noted reservoir volume from the Pump Status Screen or the calculated residual volume. NOTE: Failure to withdraw all residual drug from the pump's reservoir and then attempting to fill the reservoir to capacity may lead to reservoir overpressurization or activation of the reservoir valve. NOTE: If decreasing drug concentrations or changing solutions, perform a reservoir rinse twice using sterile preservative-free 0.9% Sodium Chloride Injection, USP and program a bridge bolus. |

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Table 5-2 (cont.)
Refilling An Implanted Pump

| | |
|-----|---|
| 11. | Close the clamp and remove the 20 mL syringe with aspirated fluid. NOTE: Failure to close the clamp completely could result in pump contamination, reservoir valve activation, or overpressurization of the pump reservoir. |
| 12. | Attach the filter and the pressure monitor to the drug-filled syringe. |
| 13. | Turn the pressure monitor stopcock OFF to the PRESSURE MONITOR TUBING. |
| 14. | Purge air through the filter and pressure monitor. Confirm that the volume of prescribed fluid in the syringe does not exceed the pump's reservoir size (18mL or 10mL). |
| 15. | Attach pressure monitor securely to the extension tubing and open the clamp. Slowly inject at an infusion rate not greater than 1 mL every 3 seconds. Do not force the injection. During injection, check the pump pocket for swelling. <ul style="list-style-type: none"> Always use the pressure monitor device in the Refill Kit to check the pressure of the pump reservoir. NOTE: Do not attempt to force fluid into the reservoir if the reservoir valve has been activated. Extreme pressure following activation of the reservoir valve may result in procedural delays or pump damage. NOTE: If the reservoir valve has been activated, refer to Section 8: Troubleshooting . |
| 16. | When the syringe is empty, maintain slight, positive pressure on the syringe and turn the stopcock OFF to the SYRINGE. Check the position of the fluid meniscus in the pressure monitor (Figure 5-3). NOTE: If the meniscus is beyond the mark on the pressure monitor (refer to Figure 5-3), the reservoir valve has been activated and the pump must be emptied. Empty the pump completely and repeat the refill procedure with new, sterile components. |
| 17. | Remove the needle from the pump and discard all kit components. |
| 18. | Remove cleansing agent from the patient's skin and apply an adhesive bandage, if desired. |

NOTE: Alarms are not to be ignored, whether audible or noted on the programmer screen. A Low Reservoir Alarm occurs if the refill procedure is not completed before the pump reservoir reaches the low reservoir volume; this can only be resolved by programming (see **Section 6: Programming**). A Low Battery Alarm can occur intermittently in advance of anticipated depletion if the solution injected at refill is below body temp. If the alarm stops shortly after the procedure, check for battery status again at the next refill.

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Figure 5-2
Template Center Hole

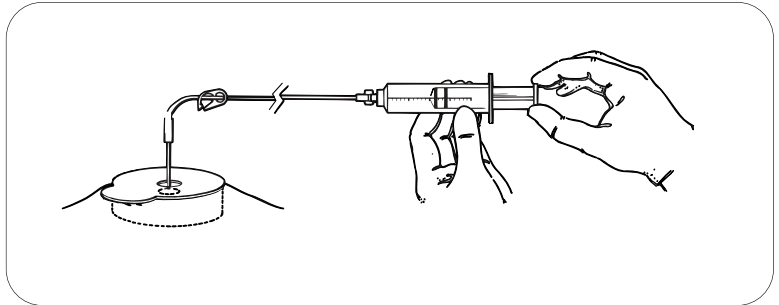
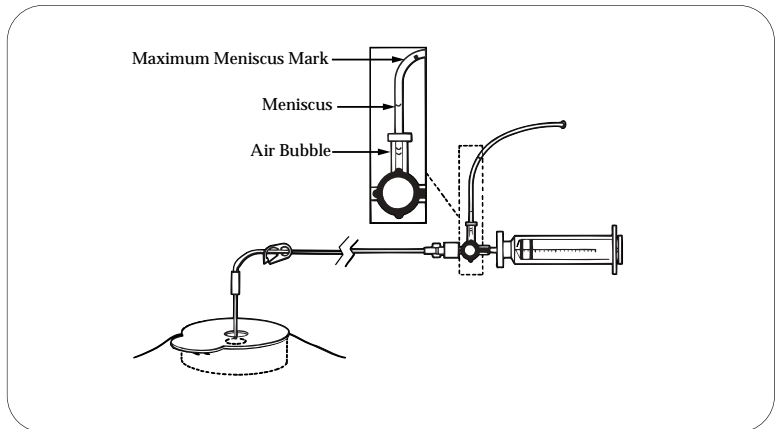


Figure 5-3
Checking Fluid Meniscus



Keep Appropriate Records

When the refill procedure is complete, be sure to record and save the appropriate patient information.

- Record these three volumes at time of refill:
 - Actual residual volume
 - Expected (calculated) residual volume
 - Refill volume
- Photocopy and save programmer printouts in the medical record.

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WARNING

Reservoir Valve Activation (Programmable Pumps) – Do not prematurely activate the pump reservoir valve. Activation of the pump reservoir valve seals the pump reservoir valve closed. Unusual resistance or the inability to inject the entire fill volume may indicate activation of the pump reservoir valve. If the valve closes, a portion of the reservoir contents must be delivered or removed before filling can be completed, and procedural delays can occur.

To prevent activation of the pump reservoir valve during emptying and filling procedures:

- Completely aspirate all contents of the pump reservoir before filling;
- Do not allow air into the pump reservoir through an open needle in the septum or an unclamped extension; and
- Do not exceed the maximum reservoir volume indicated in the pump labeling.

Injection Error – Be certain you are accessing the correct port when injecting fluids into the pump or accessing the catheter access port. ALWAYS:

- Identify the pump model and reservoir volume;
- Identify the location of the center reservoir port and the catheter access port;
- Use the instructions, needles, and other accessories provided in the appropriate kit;
- Verify the location of the correct port during needle insertion, using other medical procedures as appropriate; and
- Refer to the appropriate drug labeling for indications, contraindications, warnings, precautions, adverse events, and dosage and administration information.

Improper injection into the pump pocket or catheter access port can result in significant tissue damage or a clinically significant or fatal drug under- or overdose.

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Low Reservoir Volume

The refill interval represents the number of days until the pump reaches the low reservoir alarm level. For example, if the pump has been programmed with a low reservoir alarm volume of 2 mL, then the low reservoir alarm will sound when the reservoir is calculated to contain 2mL of drug.

If the actual reservoir volume falls below 2 mL, the pump will deliver less drug each day and the patient may exhibit a return of spasticity and/or other effects of withdrawal.

It is imperative that the patient returns on the scheduled refill date to ensure continuous therapy.

Refill Appointment

A refill appointment usually includes:

- an assessment of the patient's general condition, spasticity, and response to therapy,
- programming the pump,
- refilling the pump,
- determining the interval to the next refill,
- scheduling the next refill appointment, and
- reviewing patient education, such as alarms and potential adverse events.

Determining Refill Interval

The 'alarm date' is automatically calculated and displayed based on the reservoir volume, daily dose, and the low reservoir alarm volume. However, drug stability is not factored in. Therefore, remember to refill a patient before 90 days has passed if the calculated alarm date is longer than that.

To calculate the refill interval manually, see below:

$$\frac{\text{*Usable Reservoir Volume x Drug Concentration}}{\text{Daily Dose}} = \# \text{ days until alarm}$$

$$\text{Example} \quad \frac{16 \text{ mL x } 500\mu\text{g/mL}}{200 \mu\text{g/day}} = 40 \text{ days}$$

*Usable refers to the reservoir capacity less the low reservoir alarm volume.

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Concentration Changes

Whenever there is a change in drug concentration or solution, the remaining old drug in the pump tubing catheter must be accounted for to prevent under- or overdosing the patient while the old drug concentration is being cleared from the fluid pathway. This procedure is referred to as a bridge bolus.

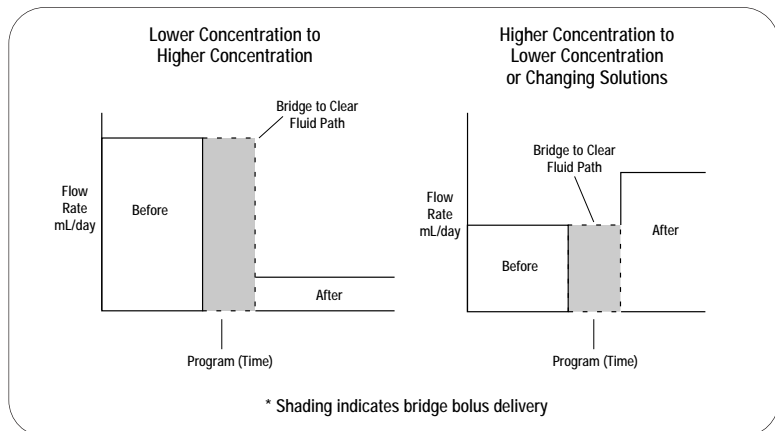
The following methods offer guidelines for calculating and programming a bridge bolus. If further review is needed on the procedures presented in this section, contact your local Medtronic Representative or contact Medtronic, Inc. for technical assistance at (800) 707-0933.

Table 5-3 shows the basic steps involved in changing drug concentration. Follow the procedures carefully *to minimize the occurrence of under- or overdosing the patient*. **Figure 5-4** illustrates the difference in the two procedures.

Table 5-3
Changing Drug Concentrations

| | |
|----|--------------------------------------|
| 1. | Determine the bolus amount. |
| 2. | Determine the bolus duration. |
| 3. | Program the bolus. |
| 4. | Refill the pump. |

Figure 5-4
Changing Drug Concentrations



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Lower to Higher
Concentration

Whenever changing from a lower to higher drug concentration, the drug remaining in the pump tubing and catheter must be accounted for to prevent underdosing the patient.

Table 5-4 outlines the procedure for calculating a bolus from lower to higher concentrations. By referring to **Table 5-6** or **5-7**, you can bypass calculating the Total Drug Volume—it is already calculated and presented in the table. It is critical to reference the correct table and to know the catheter model that is implanted in the patient. For a worksheet to do the calculation, refer to the **Appendix**.

Total Drug Volume

Total Drug Volume = Combined Pump Tubing and Catheter Volume

Table 5-4
Calculating the Bolus:
Lower to Higher Concentration

| | |
|----|--|
| 1. | <p>Determine the bolus amount. Bolus Amount =</p> $\text{Total Drug Volume}^{**} \times \text{new Drug Concentration}$ <p>NOTE: To determine the **Total Drug Volume, refer to Table 5-6 or 5-7.</p> <p>Be sure to reference the correct table: Calculating the bolus from Lower to Higher Concentrations. The difference in the procedures (lower to higher and higher to lower) lies in the pump tubing volume used to calculate the Total Drug Volume. Each table provides a different set of numbers.</p> |
| 2. | <p>Determine the bolus duration. Duration of Bolus =</p> $\frac{\text{Total Drug Volume} \times \text{old Drug Concentration}}{\text{Desired Hourly Dose}}$ |
| 3. | <p>Program the bolus. Refer to the <i>SynchroMed Software and Programmer Technical Manuals</i> for detailed programming instructions. Basic programming steps are outlined in Table 5-10.</p> <p>NOTE: Do not perform telemetry to the pump while a bolus dose is in progress; telemetry will terminate the bolus.</p> |



The bridge bolus information provided here pertains only when programming a SynchroMed or SynchroMed EL pump with Programmer Version 5.0 Software or earlier.

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Higher to Lower
Concentration

Whenever changing from a higher to lower drug concentration, the drug remaining in the pump tubing and catheter must be accounted for to prevent overdosing the patient.

Table 5-5 outlines the procedure for calculating a bolus from higher to lower concentrations. By referring to **Table 5-8** or **5-9**, you can bypass calculating the Total Drug Volume—it is already calculated and presented in the table. It is critical to reference the correct table and to know the catheter model that is implanted in the patient. For a worksheet to do the calculation, refer to the **Appendix**.

Total Drug Volume

Total Drug Volume = Combined Pump Tubing and Catheter Volume

Table 5-5
Calculating the Bolus:
Higher to Lower Concentration

| | |
|----|---|
| 1. | <p>Determine the bolus amount. Bolus Amount =</p> $\frac{\text{Total Drug Volume}^{**} \times \text{new Drug Concentration}}{\text{Desired Hourly Dose}}$ <p>NOTE: To determine the **Total Drug Volume, refer to Table 5-8 or 5-9.</p> <p>Be sure to reference the correct table: Calculating the bolus from Higher to Lower Concentrations. The difference in the procedures (lower to higher and higher to lower) lies in the pump tubing volume used to calculate the Total Drug Volume. Each table provides a different set of numbers.</p> |
| 2. | <p>Determine the bolus duration. Duration of Bolus =</p> $\frac{\text{Total Drug Volume} \times \text{old Drug Concentration}}{\text{Desired Hourly Dose}}$ |
| 3. | <p>Program the bolus. Refer to the <i>SynchroMed Software and Programmer Technical Manuals</i> for detailed programming instructions. Basic programming steps are outlined in the tables referred to below:</p> <ul style="list-style-type: none"> • If the bolus is less than 99 hours, go to Table 5-11. • If the bolus is greater than 99 hours, go to Table 5-12. <p>NOTE: Do not perform telemetry to the pump while a bolus dose is in progress; telemetry will terminate the bolus.</p> |



The bridge bolus information provided here pertains only when programming a SynchroMed or SynchroMed EL pump with Programmer Version 5.0 Software or earlier.

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Table 5-6 Lower to Higher Concentration InDura™ Catheter Models 8703W, 8709, and 8711

Use this table to calculate the combined pump tubing and catheter volume (**Total Drug Volume**) when changing from **Lower** to **Higher** Concentrations.

To prevent underdosing the patient, the minimum volume of the pump tubing is used in this calculation:

- .23 mL for pumps without catheter access ports
- .26 mL for pumps with a catheter access port



| Implanted Catheter Length | Pump Without Catheter Access Port | Pump With Catheter Access Port | Implanted Catheter Length | Pump Without Catheter Access Port | Pump With Catheter Access Port |
|---------------------------|-----------------------------------|--------------------------------|---------------------------|-----------------------------------|--------------------------------|
| 41.0" | .46 | .49 | 25.5" | .37 | .40 |
| 40.5" | .46 | .49 | 25.0" | .37 | .40 |
| 40.0" | .46 | .49 | 24.5" | .37 | .40 |
| 39.5" | .45 | .48 | 24.0" | .37 | .40 |
| 39.0" | .45 | .48 | 23.5" | .36 | .39 |
| 38.5" | .45 | .48 | 23.0" | .36 | .39 |
| 38.0" | .44 | .47 | 22.5" | .36 | .39 |
| 37.5" | .44 | .47 | 22.0" | .35 | .38 |
| 37.0" | .44 | .47 | 21.5" | .35 | .38 |
| 36.5" | .44 | .47 | 21.0" | .35 | .38 |
| 36.0" | .43 | .46 | 20.5" | .35 | .38 |
| 35.5" | .43 | .46 | 20.0" | .34 | .37 |
| 35.0" | .43 | .46 | 19.5" | .34 | .37 |
| 34.5" | .42 | .45 | 19.0" | .34 | .37 |
| 34.0" | .42 | .45 | 18.5" | .33 | .36 |
| 33.5" | .42 | .45 | 18.0" | .33 | .36 |
| 33.0" | .42 | .45 | 17.5" | .33 | .36 |
| 32.5" | .41 | .44 | 17.0" | .33 | .36 |
| 32.0" | .41 | .44 | 16.5" | .32 | .35 |
| 31.5" | .41 | .44 | 16.0" | .32 | .35 |
| 31.0" | .40 | .43 | 15.5" | .32 | .35 |
| 30.5" | .40 | .43 | 15.0" | .31 | .34 |
| 30.0" | .40 | .43 | 14.5" | .31 | .34 |
| 29.5" | .40 | .43 | 14.0" | .31 | .34 |
| 29.0" | .39 | .42 | 13.5" | .31 | .34 |
| 28.5" | .39 | .42 | 13.0" | .30 | .33 |
| 28.0" | .39 | .42 | 12.5" | .30 | .33 |
| 27.5" | .39 | .42 | 12.0" | .30 | .33 |
| 27.0" | .38 | .41 | 11.5" | .29 | .32 |
| 26.5" | .38 | .41 | 11.0" | .29 | .32 |
| 26.0" | .38 | .41 | 10.5" | .29 | .32 |
| | | | 10.0" | .29 | .32 |

WARNING: The precise catheter model number, implanted catheter length, and pump model number are of critical importance in preventing a drug under - or overdose when calculating and programming a bridge bolus. Attempting to program a bridge bolus without precise information may result in a clinically significant or fatal under - or overdose. A universal value does not exist which can be used as a perfect substitute for this knowledge. A universal value does not exist which can be used as a perfect substitute for this knowledge.

Section Five: Pump Refill

Table 5-7 Lower to Higher Concentration 8703 Catheter

Use this table to calculate the combined pump tubing and catheter volume (**Total Drug Volume**) when changing from **Lower** to **Higher** Concentrations.

To prevent underdosing the patient, the minimum volume of the pump tubing is used in this calculation:

- .23 mL for pumps without catheter access ports
- .26 mL for pumps with a catheter access port



| Implanted Catheter Length 8703 Catheter | Pump Without Catheter Access Port | Pump With Catheter Access Port | Implanted Catheter Length 8703 Catheter | Pump Without Catheter Access Port | Pump With Catheter Access Port |
|---|-----------------------------------|--------------------------------|---|-----------------------------------|--------------------------------|
| 41.0" | .56 | .59 | 25.5" | .44 | .47 |
| 40.5" | .56 | .59 | 25.0" | .43 | .46 |
| 40.0" | .55 | .58 | 24.5" | .43 | .46 |
| 39.5" | .55 | .58 | 24.0" | .42 | .45 |
| 39.0" | .55 | .58 | 23.5" | .42 | .45 |
| 38.5" | .54 | .57 | 23.0" | .42 | .45 |
| 38.0" | .54 | .57 | 22.5" | .41 | .44 |
| 37.5" | .53 | .56 | 22.0" | .41 | .44 |
| 37.0" | .53 | .56 | 21.5" | .40 | .43 |
| 36.5" | .52 | .55 | 21.0" | .40 | .43 |
| 36.0" | .52 | .55 | 20.5" | .40 | .43 |
| 35.5" | .52 | .55 | 20.0" | .39 | .42 |
| 35.0" | .51 | .54 | 19.5" | .39 | .42 |
| 34.5" | .51 | .54 | 19.0" | .38 | .41 |
| 34.0" | .50 | .53 | 18.5" | .38 | .41 |
| 33.5" | .50 | .53 | 18.0" | .38 | .41 |
| 33.0" | .50 | .53 | 17.5" | .37 | .40 |
| 32.5" | .49 | .52 | 17.0" | .37 | .40 |
| 32.0" | .49 | .52 | 16.5" | .36 | .39 |
| 31.5" | .48 | .51 | 16.0" | .36 | .39 |
| 31.0" | .48 | .51 | 15.5" | .36 | .39 |
| 30.5" | .48 | .51 | 15.0" | .35 | .38 |
| 30.0" | .47 | .50 | 14.5" | .35 | .38 |
| 29.5" | .47 | .50 | 14.0" | .34 | .37 |
| 29.0" | .46 | .49 | 13.5" | .34 | .37 |
| 28.5" | .46 | .49 | 13.0" | .33 | .37 |
| 28.0" | .46 | .49 | 12.5" | .33 | .36 |
| 27.5" | .45 | .48 | 12.0" | .33 | .36 |
| 27.0" | .45 | .48 | 11.5" | .32 | .35 |
| 26.5" | .44 | .47 | 11.0" | .32 | .35 |
| 26.0" | .44 | .47 | 10.5" | .31 | .34 |
| | | | 10.0" | .31 | .34 |

WARNING: The precise catheter model number, implanted catheter length, and pump model number are of critical importance in preventing a drug under - or overdose when calculating and programming a bridge bolus. Attempting to program a bridge bolus without precise information may result in a clinically significant or fatal under - or overdose. A universal value does not exist which can be used as a perfect substitute for this knowledge. A universal value does not exist which can be used as a perfect substitute for this knowledge.

Emergency technical support for clinicians is available at (800) 707-0933.

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Table 5-8 Higher to Lower Concentration InDura Catheter Models 8703W, 8709, and 8711

Use this table to calculate the combined pump tubing and catheter volume (**Total Drug Volume**) when changing from **Higher** to **Lower** Concentrations.

To prevent underdosing the patient, the maximum volume of the pump tubing is used in this calculation:

- .32 mL for pumps without catheter access ports
- .36 mL for pumps with a catheter access port



| Implanted Catheter Length | Pump Without Catheter Access Port | Pump With Catheter Access Port | Implanted Catheter Length | Pump Without Catheter Access Port | Pump With Catheter Access Port |
|---------------------------|-----------------------------------|--------------------------------|---------------------------|-----------------------------------|--------------------------------|
| 41.0" | .55 | .59 | 25.5" | .46 | .50 |
| 40.5" | .55 | .59 | 25.0" | .46 | .50 |
| 40.0" | .55 | .59 | 24.5" | .46 | .50 |
| 39.5" | .54 | .58 | 24.0" | .46 | .50 |
| 39.0" | .54 | .58 | 23.5" | .45 | .49 |
| 38.5" | .54 | .58 | 23.0" | .45 | .49 |
| 38.0" | .53 | .57 | 22.5" | .45 | .49 |
| 37.5" | .53 | .57 | 22.0" | .44 | .48 |
| 37.0" | .53 | .57 | 21.5" | .44 | .48 |
| 36.5" | .53 | .57 | 21.0" | .44 | .48 |
| 36.0" | .52 | .56 | 20.5" | .44 | .48 |
| 35.5" | .52 | .56 | 20.0" | .43 | .47 |
| 35.0" | .52 | .56 | 19.5" | .43 | .47 |
| 34.5" | .51 | .55 | 19.0" | .43 | .47 |
| 34.0" | .51 | .55 | 18.5" | .42 | .46 |
| 33.5" | .51 | .55 | 18.0" | .42 | .46 |
| 33.0" | .51 | .55 | 17.5" | .42 | .46 |
| 32.5" | .50 | .54 | 17.0" | .42 | .46 |
| 32.0" | .50 | .54 | 16.5" | .41 | .45 |
| 31.5" | .50 | .54 | 16.0" | .41 | .45 |
| 31.0" | .49 | .53 | 15.5" | .41 | .45 |
| 30.5" | .49 | .53 | 15.0" | .40 | .44 |
| 30.0" | .49 | .53 | 14.5" | .40 | .44 |
| 29.5" | .49 | .53 | 14.0" | .40 | .44 |
| 29.0" | .48 | .52 | 13.5" | .40 | .44 |
| 28.5" | .48 | .52 | 13.0" | .39 | .43 |
| 28.0" | .48 | .52 | 12.5" | .39 | .43 |
| 27.5" | .48 | .52 | 12.0" | .39 | .43 |
| 27.0" | .47 | .51 | 11.5" | .38 | .42 |
| 26.5" | .47 | .51 | 11.0" | .38 | .42 |
| 26.0" | .47 | .51 | 10.5" | .38 | .42 |
| | | | 10.0" | .38 | .42 |

WARNING: The precise catheter model number, implanted catheter length, and pump model number are of critical importance in preventing a drug under - or overdose when calculating and programming a bridge bolus. Attempting to program a bridge bolus without precise information may result in a clinically significant or fatal under - or overdose. A universal value does not exist which can be used as a perfect substitute for this knowledge. A universal value does not exist which can be used as a perfect substitute for this knowledge.

Section Five: Pump Refill

Table 5-9 Higher to Lower Concentration 8703 Catheter

Use this table to calculate the combined pump tubing and catheter volume (**Total Drug Volume**) when changing from **Higher to Lower** Concentrations.

To prevent underdosing the patient, the maximum volume of the pump tubing is used in this calculation:

- .32 mL for pumps without catheter access ports
- .36 mL for pumps with a catheter access port



| Implanted Catheter Length 8703 Catheter | Pump Without Catheter Access Port | Pump With Catheter Access Port | Implanted Catheter Length 8703 Catheter | Pump Without Catheter Access Port | Pump With Catheter Access Port |
|---|-----------------------------------|--------------------------------|---|-----------------------------------|--------------------------------|
| 41.0" | .65 | .69 | 25.5" | .53 | .56 |
| 40.5" | .64 | .68 | 25.0" | .52 | .55 |
| 40.0" | .64 | .67 | 24.5" | .52 | .55 |
| 39.5" | .64 | .67 | 24.0" | .51 | .54 |
| 39.0" | .64 | .67 | 23.5" | .51 | .54 |
| 38.5" | .63 | .66 | 23.0" | .51 | .54 |
| 38.0" | .63 | .66 | 22.5" | .50 | .53 |
| 37.5" | .62 | .65 | 22.0" | .50 | .53 |
| 37.0" | .62 | .65 | 21.5" | .49 | .52 |
| 36.5" | .61 | .64 | 21.0" | .49 | .52 |
| 36.0" | .61 | .64 | 20.5" | .49 | .52 |
| 35.5" | .61 | .64 | 20.0" | .48 | .51 |
| 35.0" | .60 | .63 | 19.5" | .48 | .51 |
| 34.5" | .60 | .63 | 19.0" | .47 | .50 |
| 34.0" | .59 | .62 | 18.5" | .47 | .50 |
| 33.5" | .59 | .62 | 18.0" | .47 | .50 |
| 33.0" | .59 | .62 | 17.5" | .46 | .49 |
| 32.5" | .58 | .61 | 17.0" | .46 | .49 |
| 32.0" | .58 | .61 | 16.5" | .45 | .48 |
| 31.5" | .57 | .60 | 16.0" | .45 | .48 |
| 31.0" | .57 | .60 | 15.5" | .45 | .48 |
| 30.5" | .57 | .60 | 15.0" | .44 | .47 |
| 30.0" | .56 | .59 | 14.5" | .44 | .47 |
| 29.5" | .56 | .59 | 14.0" | .43 | .46 |
| 29.0" | .55 | .58 | 13.5" | .43 | .46 |
| 28.5" | .55 | .58 | 13.0" | .43 | .46 |
| 28.0" | .55 | .58 | 12.5" | .42 | .45 |
| 27.5" | .54 | .57 | 12.0" | .42 | .45 |
| 27.0" | .54 | .57 | 11.5" | .41 | .44 |
| 26.5" | .53 | .56 | 11.0" | .41 | .44 |
| 26.0" | .53 | .56 | 10.5" | .40 | .43 |
| | | | 10.0" | .40 | .43 |

WARNING: The precise catheter model number, implanted catheter length, and pump model number are of critical importance in preventing a drug under - or overdose when calculating and programming a bridge bolus. Attempting to program a bridge bolus without precise information may result in a clinically significant or fatal under - or overdose. A universal value does not exist which can be used as a perfect substitute for this knowledge. A universal value does not exist which can be used as a perfect substitute for this knowledge.

Emergency technical support for clinicians is available at (800) 707-0933.

Section Five: Pump Refill

Programming a Bridge Bolus

The next step is to program a bridge bolus. Refer to **Table 5-10** for an overview or to the *SynchroMed Software Technical Manual* for more detail.

Table 5-10 Programming a Bridge Bolus (Lower to Higher Concentrations)

| | |
|----|--|
| 1. | On the Changes Screen, enter the new drug concentration. A warning will appear reminding you to perform a bridge bolus. Press F6 once you have acknowledged the warning. |
| 2. | On the Infusion line, select Single Bolus + Simple Continuous Mode and enter the desired dose and duration. |
| 3. | Program the calculated bolus dose and bolus duration, and the Simple Continuous Mode at the desired daily dose. <ul style="list-style-type: none"> The programmer calculates and displays the dose/hour. Enter leading zeros, e.g., for 5 minutes, enter 00:05:(00). <p>NOTE: Depending upon the calibration constant, some pumps do not accept a single bolus dose larger than 0.52 mL. If this should happen, two boluses may need to be programmed in succession. Contact Medtronic, Inc., for technical assistance at (800) 707-0933.</p> <p>NOTE: If you are using a Complex Continuous Mode, remember that you cannot program a bolus and a Complex Continuous infusion. Therefore, when you want to change the drug concentration with this bridging program, you must convert to a Simple Continuous Mode for the time duration calculated for the bridge bolus. The patient may then be programmed to the Complex Continuous Mode.</p> |
| 4. | Verify prescription and bolus dose on the Verify Prescription Screen. Press Y or N. |
| 5. | Update pump via telemetry. |
| 6. | Verify the new prescription on the Pump Status after Update Screen. |



Table 5-11 Programming a Bridge Bolus (Higher to Lower) < 99 HOURS

| | |
|----|--|
| 1. | On the Changes Screen, enter the new drug concentration and prescription. |
| 2. | Select Single Bolus + Simple Continuous Mode from the infusion line. |
| 3. | Program the bolus dose, the bolus duration, and the Simple Continuous dose/day. <ul style="list-style-type: none"> The programmer calculates and displays the dose/hour. Enter leading zeros, e.g., for 5 minutes, enter 00:05:(00). <p>NOTE: If you are using a Complex Continuous Mode, remember that you cannot program a bolus and a complex continuous infusion. Therefore, when you want to change the pump drug concentration with this bridging program, you must convert to a Simple Continuous Mode for the time duration calculated for the bridge bolus. The patient may then be programmed to the Complex Continuous Mode.</p> |
| 4. | Verify prescription and bolus dose on the Verify Prescription Screen. |
| 5. | Update pump via telemetry. |
| 6. | Verify the new prescription on the Pump Status After Update Screen. |



Section Five: Pump Refill

Boluses > 99 Hours

Boluses > 99 hours cannot be programmed, rather, the SynchroMed Infusion System is cleared of the old drug concentration over time, using the procedure in **Table 5-12**.

The pump must be programmed to deliver the **new hourly rate** using the **old drug concentration**.

Table 5-12
Programming a Bridge Bolus
(Higher to Lower) > 99 Hours

| | |
|----|---|
| 1. | Enter the reservoir volume and desired dose on the Changes Screen. <ul style="list-style-type: none"> Leave the old drug concentration entered (do not program new drug concentration). |
| 2. | Verify the reservoir volume, old drug concentration, and desired drug dose on the Verify Prescription Screen and the Pump Status After Update Screen. |
| 3. | Perform reservoir rinse twice. See page 5-20. |
| 4. | Refill the pump with the new drug concentration. |
| 5. | Schedule the patient for programming after the period of time calculated to clear system (bolus duration). <p>Caution: When the old drug is through the catheter, the patient will begin to receive the new lower drug concentration at the slow rate of the previous concentration. The patient's pump needs to be programmed to prevent under-dosing; however, never program the pump early; this could result in clinically significant or fatal drug overdose.</p> |
| 6. | When the time duration is complete, enter the new drug concentration and any changes in daily dose; update the pump via telemetry. |
| 7. | Verify the drug concentration and daily dose on the Pump Status After Changes Screen. |



Have the patient return at the calculated time to clear the system for re-programming with the new drug concentration. When the old drug is through the catheter, the patient will begin to receive the new lower drug concentration at the rate of the previous concentration. Again, refer to the *SynchroMed Software and Programmer Technical Manuals* for detailed programming instructions.

Section Five: Pump Refill

Performing a Reservoir Rinse

There is a residual volume in the dead space of the reservoir that cannot be completely removed by emptying the pump. The residual volume will depend on the pump model and reservoir size. To avoid a potential overdose when reducing drug concentration, or changing drug solutions, a reservoir rinse must be performed (**Table 5-13**).

Perform the reservoir rinse **twice** (in addition to programming a bridge bolus) to remove the drug that remains in the reservoir after emptying the pump. For detailed instructions on the reservoir rinse procedure, consult the *SynchroMed Pump Technical Manual*.

Table 5-13
Performing a Reservoir Rinse

| | |
|----|---|
| 1. | Empty the pump. |
| 2. | Fill pump reservoir to capacity with preservative-free 0.9% Sodium Chloride for Injection, USP. |
| 3. | Empty the pump. |
| 4. | Repeat Steps 2 and 3. |
| 5. | Fill pump with prescribed solution. |

WARNING

Changing Drug or Decreasing Drug Concentrations – Rinse the reservoir twice between solutions when changing drug or decreasing drug concentrations in the pump reservoir. Refer to the “Performing a Reservoir Rinse” section of this manual. A significant amount of drug may be present in the pump reservoir after emptying the pump. This residual volume cannot be removed by emptying the pump. Rinsing the reservoir between solutions minimizes the amount of drug in this residual volume but does not eliminate it. Failure to account for residual drug in the pump reservoir can result in a concentration that is different than intended and a clinically significant or fatal drug under- or overdose.

LIORESAL® INTRATHECAL (baclofen injection)

Abrupt discontinuation of intrathecal baclofen, regardless of the cause, has resulted in sequelae that include high fever, altered mental status, exaggerated rebound spasticity, and muscle rigidity, that in rare cases has advanced to rhabdomyolysis, multiple organ-system failure and death.

Prevention of abrupt discontinuation of intrathecal baclofen requires careful attention to programming and monitoring of the infusion system, refill scheduling and procedures, and pump alarms. Patients and caregivers should be advised of the importance of keeping scheduled refill visits and should be educated on the early symptoms of baclofen withdrawal. Special attention should be given to patients at apparent risk (e.g. spinal cord injuries at T-6 or above, communication difficulties, history of withdrawal symptoms from oral or intrathecal baclofen). Consult the technical manual of the implantable infusion system for additional postimplant clinician and patient information (see WARNINGS).

DESCRIPTION

LIORESAL INTRATHECAL (baclofen injection) is a muscle relaxant and antispastic. Its chemical name is 4-amino-3-(4-chlorophenyl) butanoic acid, and its structural formula is:

Baclofen is a white to off-white, odorless or practically odorless crystalline powder, with a molecular weight of 213.66. It is slightly soluble in water, very slightly soluble in methanol, and insoluble in chloroform.

LIORESAL INTRATHECAL is a sterile, pyrogen-free, isotonic solution free of antioxidants, preservatives or other potentially neurotoxic additives indicated only for intrathecal administration. The drug is stable in solution at 37° C and compatible with CSF. Each milliliter of LIORESAL INTRATHECAL contains baclofen U.S.P. 50 mcg, 500 mcg or 2000 mcg and sodium chloride 9 mg in Water for Injection; pH range is 5.0 - 7.0. Each ampule is intended for SINGLE USE ONLY. Discard any unused portion. **DO NOT AUTOCLAVE.**

CLINICAL PHARMACOLOGY

The precise mechanism of action of baclofen as a muscle relaxant and antispasticity agent is not fully understood. Baclofen inhibits both monosynaptic and polysynaptic reflexes at the spinal level, possibly by decreasing excitatory neurotransmitter release from primary afferent terminals, although actions at supraspinal sites may also occur and contribute to its clinical effect. Baclofen is a structural analog of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA), and may exert its effects by stimulation of the GABA_A receptor subtype.

LIORESAL INTRATHECAL when introduced directly into the intrathecal space permits effective CSF concentrations to be achieved with resultant plasma concentrations 100 times less than those occurring with oral administration.

In people, as well as in animals, baclofen has been shown to have general CNS depressant properties as indicated by the production of sedation with tolerance, somnolence, ataxia, and respiratory and cardiovascular depression.

Pharmacodynamics of LIORESAL INTRATHECAL:

Intrathecal Bolus:

Adult Patients: The onset of action is generally one-half hour to one hour after an intrathecal bolus. Peak spasmolytic effect is seen at approximately four hours after dosing and effects may last four to eight hours. Onset, peak response, and duration of action may vary with individual patients depending on the dose and severity of symptoms.

Pediatric Patients: The onset, peak response and duration of action is similar to those seen in adult patients.

Continuous Infusion:

LIORESAL INTRATHECAL'S antispastic action is first seen at 6 to 8 hours after initiation of continuous infusion. Maximum activity is observed in 24 to 48 hours.

Continuous Infusion: No additional information is available for pediatric patients.

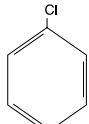
Pharmacokinetics of LIORESAL INTRATHECAL:

The pharmacokinetics of CSF clearance of LIORESAL INTRATHECAL calculated from intrathecal bolus or continuous infusion studies approximates CSF turnover, suggesting elimination is by bulk-flow removal of CSF.

Intrathecal Bolus: After a bolus lumbar injection of 50 or 100 mcg LIORESAL INTRATHECAL in seven patients, the average CSF elimination half-life was 1.51 hours over the first four hours and the average CSF clearance was approximately 30 ml/hour.

Continuous Infusion: The mean CSF clearance for LIORESAL INTRATHECAL (baclofen injection) was approximately 30 ml/hour in a study involving ten patients on continuous intrathecal infusion.

Concurrent plasma concentrations of baclofen during intrathecal administration are expected to be low (0-5 ng/ml).



Limited pharmacokinetic data suggest that a lumbar-cisternal concentration gradient of about 4:1 is established along the neuroaxis during baclofen infusion. This is based upon simultaneous CSF sampling via cisternal and lumbar tap in 5 patients receiving continuous baclofen infusion at the lumbar level at doses associated with therapeutic efficacy; the interpatient variability was great. The gradient was not altered by position.

Six pediatric patients (age 8-18 years) receiving continuous intrathecal baclofen infusion at doses of 77-400 mcg/day had plasma baclofen levels near or below 10 ng/ml.

INDICATIONS

LIORESAL INTRATHECAL is indicated for use in the management of severe spasticity. Patients should first respond to a screening dose of intrathecal baclofen prior to consideration for long term infusion via an implantable pump. For spasticity of spinal cord origin, chronic infusion of LIORESAL INTRATHECAL via an implantable pump should be reserved for patients unresponsive to oral baclofen therapy, or those who experience intolerable CNS side effects at effective doses. Patients with spasticity due to traumatic brain injury should wait at least one year after the injury before consideration of long term intrathecal baclofen therapy. LIORESAL INTRATHECAL (baclofen injection) is intended for use by the intrathecal route in single bolus test doses (via spinal catheter or lumbar puncture) and, for chronic use, only in implantable pumps approved by the FDA specifically for the administration of LIORESAL INTRATHECAL into the intrathecal space.

Spasticity of Spinal Cord Origin: Evidence supporting the efficacy of LIORESAL INTRATHECAL was obtained in randomized, controlled investigations that compared the effects of either a single intrathecal dose or a three day intrathecal infusion of LIORESAL INTRATHECAL to placebo in patients with severe spasticity and spasms due to either spinal cord trauma or multiple sclerosis. LIORESAL INTRATHECAL was superior to placebo on both principal outcome measures employed: change from baseline in the Ashworth rating of spasticity and the frequency of spasms.

Spasticity of Cerebral Origin: The efficacy of LIORESAL INTRATHECAL was investigated in three controlled clinical trials; two enrolled patients with cerebral palsy and one enrolled patients with spasticity due to previous brain injury. The first study, a randomized controlled cross-over trial of 51 patients with cerebral palsy, provided strong, statistically significant results; LIORESAL INTRATHECAL was superior to placebo in reducing spasticity as measured by the Ashworth Scale. A second cross-over study was conducted in 11 patients with spasticity arising from brain injury. Despite the small sample size, the study yielded a nearly significant test statistic (p=0.066) and provided directionally favorable results. The last study, however, did not provide data that could be reliably analyzed.

LIORESAL INTRATHECAL therapy may be considered an alternative to destructive neurosurgical procedures. Prior to implantation of a device for chronic intrathecal infusion of LIORESAL INTRATHECAL, patients must show a response to LIORESAL INTRATHECAL in a screening trial (see Dosage and Administration).

CONTRAINDICATIONS

Hypersensitivity to baclofen. LIORESAL INTRATHECAL is not recommended for intravenous, intramuscular, subcutaneous or epidural administration.

WARNINGS

LIORESAL INTRATHECAL is for use in single bolus intrathecal injections (via a catheter placed in the lumbar intrathecal space or injection by lumbar puncture) and in implantable pumps approved by the FDA specifically for the intrathecal administration of baclofen. Because of the possibility of potentially life-threatening CNS depression, cardiovascular collapse, and/or respiratory failure, physicians must be adequately trained and educated in chronic intrathecal infusion therapy.

The pump system should not be implanted until the patient's response to bolus LIORESAL INTRATHECAL injection is adequately evaluated. Evaluation (consisting of a screening procedure: see Dosage and Administration) requires that LIORESAL INTRATHECAL be administered into the intrathecal space via a catheter or lumbar puncture. Because of the risks associated with the screening procedure and the adjustment of dosage following pump implantation, these phases must be conducted in a medically supervised and adequately equipped environment following the instructions outlined in the Dosage and Administration section.

Resuscitative equipment should be available.

Following surgical implantation of the pump, particularly during the initial phases of pump use, the patient should be monitored closely until it is certain that the patient's response to the infusion is acceptable and reasonably stable.

On each occasion that the dosing rate of the pump and/or the concentration of LIORESAL INTRATHECAL (baclofen injection) in the reservoir is adjusted, close medical monitoring is required until it is certain that the patient's response to the infusion is acceptable and reasonably stable.

It is mandatory that the patient, all patient caregivers, and the physicians responsible for the patient receive adequate information regarding the risks of this mode of treatment. All medical personnel and caregivers should be instructed in 1) the signs and symptoms of overdose, 2) procedures to be followed in the event of overdose and 3) proper home care of the pump and insertion site.

Overdose: Signs of overdose may appear suddenly or insidiously. Acute massive overdose may present as coma. Less sudden and/or less severe forms of overdose may present with signs of drowsiness, lightheadedness, dizziness, somnolence, respiratory depression, seizures, rostral progression of hypotonia and loss of consciousness progressing to coma. Should overdose appear likely, the patient should be taken immediately to a hospital for assessment and emptying of the pump reservoir. In cases reported to date, overdose has generally been related to pump malfunction or dosing error. (See Drug Overdose Symptoms and Treatment.)

Extreme caution must be used when filling an FDA approved implantable pump. Such pumps should only be refilled through the reservoir refill septum. However, some pumps are also equipped with a catheter access port that allows direct access to the intrathecal catheter. Direct injection into this catheter access port may cause a life-threatening overdose.

Withdrawal: Abrupt withdrawal of intrathecal baclofen, regardless of the cause, has resulted in sequelae that included high fever, altered mental status, exaggerated rebound spasticity and muscle rigidity, that in rare cases progressed to rhabdomyolysis, multiple organ-system failure, and death. In the first 9 years of post-marketing experience, 27 cases of withdrawal temporally related to the cessation of baclofen therapy were reported; six patients died. In most cases, symptoms of withdrawal appeared within hours to a few days following interruption of baclofen therapy. Common reasons for abrupt interruption of intrathecal baclofen therapy included malfunction of the catheter (especially disconnection), low volume in the pump reservoir, and end of pump battery life; human error may have played a causal or contributing role in some cases. Prevention of abrupt discontinuation of intrathecal baclofen requires careful attention to programming and monitoring of the infusion system, refill scheduling and procedures, and pump alarms. Patients and caregivers should be advised of the importance of keeping scheduled refill visits and should be educated on the early symptoms of baclofen withdrawal.

All patients receiving intrathecal baclofen therapy are potentially at risk for withdrawal. Early symptoms of baclofen withdrawal may include return of baseline spasticity, pruritus, hypotension, and paresthesias. Some clinical characteristics of the advanced intrathecal baclofen withdrawal syndrome may resemble autonomic dysreflexia, infection (sepsis), malignant hyperthermia, neuroleptic-malignant syndrome, or other conditions associated with a hypermetabolic state or widespread rhabdomyolysis.

Rapid, accurate diagnosis and treatment in an emergency-room or intensive-care setting are important in order to prevent the potentially life-threatening central nervous system and systemic effects of intrathecal baclofen withdrawal. The suggested treatment for intrathecal baclofen withdrawal is the restoration of intrathecal baclofen at or near the same dosage as before therapy was interrupted. However, if restoration of intrathecal delivery is delayed, treatment with GABA-ergic agonist drugs such as oral or enteral baclofen, or oral, enteral, or intravenous benzodiazepines may prevent potentially fatal sequelae. Oral or enteral baclofen alone should not be relied upon to halt the progression of intrathecal baclofen withdrawal.

Seizures have been reported during overdose and with withdrawal from LIORESAL INTRATHECAL as well as in patients maintained on therapeutic doses of LIORESAL INTRATHECAL.

Fatalities:

Spasticity of Spinal Cord Origin: There were 16 deaths reported among the 576 U.S. patients treated with LIORESAL INTRATHECAL (baclofen injection) in pre- and post-marketing studies evaluated as of December 1992. Because these patients were treated under uncontrolled clinical settings, it is impossible to determine definitively what role, if any, LIORESAL INTRATHECAL played in their deaths.

As a group, the patients who died were relatively young (mean age was 47 with a range from 25 to 63), but the majority suffered from severe spasticity of many years duration, were nonambulatory, had various medical complications such as pneumonia, urinary tract infections, and decubiti, and/or had received multiple concomitant medications. A case-by-case review of the clinical course of the 16 patients who died failed to reveal any unique signs, symptoms, or laboratory results that would suggest that treatment with LIORESAL INTRATHECAL caused their deaths. Two patients, however, did suffer sudden and unexpected death within 2 weeks of pump implantation and one patient died unexpectedly after screening.

One patient, a 44 year-old male with MS, died in the hospital on the second day following pump implantation. An autopsy demonstrated severe fibrosis of the coronary conduction system. A second patient, a 52 year-old woman with MS and a history of an inferior wall myocardial infarction, was found dead in bed 12 days after pump implantation, 2 hours after having had documented normal vital signs. An autopsy revealed pulmonary congestion and bilateral pleural effusions. It is impossible to determine whether LIORESAL INTRATHECAL contributed to these deaths. The third patient underwent three baclofen screening trials. His medical history included SCI, aspiration pneumonia, septic shock, disseminated intravascular coagulopathy, severe metabolic acidosis, hepatic toxicity, and status epilepticus. Twelve days after screening (he was not implanted), he again experienced status epilepticus with subsequent significant neurological deterioration. Based upon prior instruction, extraordinary resuscitative measures were not pursued and the patient died.

Spasticity of Cerebral Origin: There were three deaths occurring among the 211 patients treated with LIORESAL INTRATHECAL in pre-marketing studies as of March 1996. These deaths were not attributed to the therapy.

PRECAUTIONS

Children should be of sufficient body mass to accommodate the implantable pump for chronic infusion. Please consult pump manufacturer's manual for specific recommendations.

Safety and effectiveness in pediatric patients below the age of 4 have not been established.

Screening

Patients should be infection-free prior to the screening trial with LIORESAL INTRATHECAL (baclofen injection) because the presence of a systemic infection may interfere with an assessment of the patient's response to bolus LIORESAL INTRATHECAL.

Pump Implantation

Patients should be infection-free prior to pump implantation because the presence of infection may increase the risk of surgical complications. Moreover, a systemic infection may complicate dosing.

Pump Dose Adjustment and Titration

In most patients, it will be necessary to increase the dose gradually over time to maintain effectiveness; a sudden requirement for substantial dose escalation typically indicates a catheter complication (i.e., catheter kink or dislodgement).

Reservoir refilling must be performed by fully trained and qualified personnel following the directions provided by the pump manufacturer. Refill intervals should be carefully calculated to prevent depletion of the reservoir, as this would result in the return of severe spasticity and possibly symptoms of withdrawal.

Strict aseptic technique in filling is required to avoid bacterial contamination and serious infection. A period of observation appropriate to the clinical situation should follow each refill or manipulation of the drug reservoir.

Extreme caution must be used when filling an FDA approved implantable pump equipped with an injection port that allows direct access to the intrathecal catheter. Direct injection into the catheter through the catheter access port may cause a life-threatening overdose.

Additional considerations pertaining to dosage adjustment: It may be important to titrate the dose to maintain some degree of muscle tone and allow occasional spasms to: 1) help support circulatory function, 2) possibly prevent the formation of deep vein thrombosis, 3) optimize activities of daily living and ease of care.

Except in overdose related emergencies, the dose of LIORESAL INTRATHECAL should ordinarily be reduced slowly if the drug is discontinued for any reason.

An attempt should be made to discontinue concomitant oral antispasticity medication to avoid possible overdose or adverse drug interactions, either prior to screening or following implant and initiation of chronic LIORESAL INTRATHECAL infusion. Reduction and discontinuation of oral antispasmodics should be done slowly and with careful monitoring by the physician. Abrupt reduction or discontinuation of concomitant antispastics should be avoided.

Drowsiness: Drowsiness has been reported in patients on LIORESAL INTRATHECAL. Patients should be cautioned regarding the operation of automobiles or other dangerous machinery, and activities made hazardous by decreased alertness. Patients should also be cautioned that the central nervous system depressant effects of LIORESAL INTRATHECAL (baclofen injection) may be additive to those of alcohol and other CNS depressants.

Precautions in special patient populations: Careful dose titration of LIORESAL INTRATHECAL is needed when spasticity is necessary to sustain upright posture and balance in locomotion or whenever spasticity is used to obtain optimal function and care.

Patients suffering from psychotic disorders, schizophrenia, or confusional states should be treated cautiously with LIORESAL INTRATHECAL and kept under careful surveillance, because exacerbations of these conditions have been observed with oral administration.

LIORESAL INTRATHECAL should be used with caution in patients with a history of autonomic dysreflexia. The presence of nociceptive stimuli or abrupt withdrawal of LIORESAL INTRATHECAL (baclofen injection) may cause an autonomic dysreflexic episode.

Because LIORESAL is primarily excreted unchanged by the kidneys, it should be given with caution in patients with impaired renal function and it may be necessary to reduce the dosage.

LABORATORY TESTS

No specific laboratory tests are deemed essential for the management of patients on LIORESAL INTRATHECAL.

DRUG INTERACTIONS

There is inadequate systematic experience with the use of LIORESAL INTRATHECAL in combination with other medications to predict specific drug-drug interactions. Interactions attributed to the combined use of LIORESAL INTRATHECAL and epidural morphine include hypotension and dyspnea.

CARCINOGENESIS, MUTAGENESIS, AND IMPAIRMENT OF FERTILITY

No increase in tumors was seen in rats receiving LIORESAL (baclofen USP) orally for two years at approximately 30-60 times on a mg/kg basis, or 10-20 times on a mg/m² basis, the maximum oral dose recommended for human use. Mutagenicity assays with LIORESAL have not been performed.

PREGNANCY CATEGORY C

LIORESAL (baclofen USP) given orally has been shown to increase the incidence of omphaloceles (ventral hernias) in fetuses of rats given approximately 13 times on a mg/kg basis, or 3 times on a mg/m² basis, the maximum oral dose recommended for human use; this dose also caused reductions in food intake and weight gain in the dams.

This abnormality was not seen in mice or rabbits. There are no adequate and well-controlled studies in pregnant women. LIORESAL should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

NURSING MOTHERS

In mothers treated with oral LIORESAL (baclofen USP) in therapeutic doses, the active substance passes into the breast milk. It is not known whether detectable levels of drug are present in breast milk of nursing mothers receiving LIORESAL INTRATHECAL. As a general rule, nursing should be undertaken while a patient is receiving LIORESAL INTRATHECAL only if the potential benefit justifies the potential risks to the infant.

PEDIATRIC USE

Children should be of sufficient body mass to accommodate the implantable pump for chronic infusion. Please consult pump manufacturer's manual for specific recommendations.

Safety and effectiveness in pediatric patients below the age of 4 have not been established.

Considerations based on experience with oral LIORESAL (baclofen USP)

A dose-related increase in incidence of ovarian cysts was observed in female rats treated chronically with oral LIORESAL. Ovarian cysts have been found by palpation in about 4% of the multiple sclerosis patients who were treated with oral LIORESAL for up to one year. In most cases these cysts disappeared spontaneously while patients continued to receive the drug. Ovarian cysts are estimated to occur spontaneously in approximately 1% to 5% of the normal female population.

ADVERSE DRUG EVENTS

Spasticity of Spinal Cord Origin:

Commonly Observed in Patients with Spasticity of Spinal Origin — In pre- and post-marketing clinical trials, the most commonly observed adverse events associated with use of LIORESAL INTRATHECAL (baclofen injection) which were not seen at an equivalent incidence among placebo-treated patients were: somnolence, dizziness, nausea, hypotension, headache, convulsions and hypotonia.

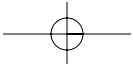
Associated with Discontinuation of Treatment — 8/474 patients with spasticity of spinal cord origin receiving long term infusion of LIORESAL INTRATHECAL in pre- and post-marketing clinical studies in the U.S. discontinued treatment due to adverse events. These include: pump pocket infections (3), meningitis (2), wound dehiscence (1), gynecological fibroids (1) and pump overpressurization (1) with unknown, if any, sequelae. Eleven patients who developed coma secondary to overdose had their treatment temporarily suspended, but all were subsequently re-started and were not, therefore, considered to be true discontinuations.

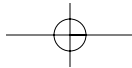
Fatalities — See Warnings.

Incidence in Controlled Trials — Experience with LIORESAL INTRATHECAL (baclofen injection) obtained in parallel, placebo-controlled, randomized studies provides only a limited basis for estimating the incidence of adverse events because the studies were of very brief duration (up to three days of infusion) and involved only a total of 63 patients. The following events occurred among the 31 patients receiving LIORESAL INTRATHECAL (baclofen injection) in two randomized, placebo-controlled trials: hypotension (2), dizziness (2), headache (2), dyspnea (1). No adverse events were reported among the 32 patients receiving placebo in these studies.

Events Observed during the Pre- and Post-marketing Evaluation of LIORESAL INTRATHECAL — Adverse events associated with the use of LIORESAL INTRATHECAL reflect experience gained with 576 patients followed prospectively in the United States. They received LIORESAL INTRATHECAL for periods of one day (screening) (N = 576) to over eight years (maintenance) (N = 10). The usual screening bolus dose administered prior to pump implantation in these studies was typically 50 mcg. The maintenance dose ranged from 12 mcg to 2003 mcg per day. Because of the open, uncontrolled nature of the experience, a causal linkage between events observed and the administration of LIORESAL INTRATHECAL cannot be reliably assessed in many cases and many of the adverse events reported are known to occur in association with the underlying conditions being treated. Nonetheless, many of the more commonly reported reactions—hypotonia, somnolence, dizziness, paresthesia, nausea/vomiting and headache—appear clearly drug-related.

Adverse experiences reported during all U.S. studies (both controlled and uncontrolled) are shown in the following table. Eight of 474 patients who received chronic infusion via implanted pumps had adverse experiences which led to a discontinuation of long term treatment in the pre- and post-marketing studies.




INCIDENCE OF MOST FREQUENT (≥1%) ADVERSE EVENTS IN PATIENTS WITH SPASTICITY OF SPINAL ORIGIN IN PROSPECTIVELY MONITORED CLINICAL TRIALS

| Adverse Event | Percent of Patients Reporting Events | | |
|----------------------|--------------------------------------|-----------------------------------|-------------------------------------|
| | N = 576 Screening ^a | N = 474 Titration ^b | N = 430 Maintenance ^c |
| Hypotonia | 5.4 | 13.5 | 25.3 |
| Somnolence | 5.7 | 5.9 | 20.9 |
| Dizziness | 1.7 | 1.9 | 7.9 |
| Paresthesia | 2.4 | 2.1 | 6.7 |
| Nausea and Vomiting | 1.6 | 2.3 | 5.6 |
| Headache | 1.6 | 2.5 | 5.1 |
| Constipation | 0.2 | 1.5 | 5.1 |
| Convulsion | 0.5 | 1.3 | 4.7 |
| Urinary Retention | 0.7 | 1.7 | 1.9 |
| Dry Mouth | 0.2 | 0.4 | 3.3 |
| Accidental Injury | 0.0 | 0.2 | 3.5 |
| Asthenia | 0.7 | 1.3 | 1.4 |
| Confusion | 0.5 | 0.6 | 2.3 |
| Death | 0.2 | 0.4 | 3.0 |
| Pain | 0.0 | 0.6 | 3.0 |
| Speech Disorder | 0.0 | 0.2 | 3.5 |
| Hypotension | 1.0 | 0.2 | 1.9 |
| Amblyopia | 0.5 | 0.2 | 2.3 |
| Diarrhea | 0.0 | 0.8 | 2.3 |
| Hypoventilation | 0.2 | 0.8 | 2.1 |
| Coma | 0.0 | 1.5 | 0.9 |
| Impotence | 0.2 | 0.4 | 1.6 |
| Peripheral Edema | 0.0 | 0.0 | 2.3 |
| Urinary Incontinence | 0.0 | 0.8 | 1.4 |
| Insomnia | 0.0 | 0.4 | 1.6 |
| Anxiety | 0.2 | 0.4 | 0.9 |
| Depression | 0.0 | 0.0 | 1.6 |
| Dyspnea | 0.3 | 0.0 | 1.2 |
| Fever | 0.5 | 0.2 | 0.7 |
| Pneumonia | 0.2 | 0.2 | 1.2 |
| Urinary Frequency | 0.0 | 0.6 | 0.9 |
| Urticaria | 0.2 | 0.2 | 1.2 |
| Anorexia | 0.0 | 0.4 | 0.9 |
| Diplopia | 0.0 | 0.4 | 0.9 |
| Dysautonomia | 0.2 | 0.2 | 0.9 |
| Hallucinations | 0.3 | 0.4 | 0.5 |
| Hypertension | 0.2 | 0.6 | 0.5 |

^a Following administration of test bolus

^b Two month period following implant

^c Beyond two months following implant

N=total number of patients entering each period

%=% of patients evaluated

In addition to the more common (1% or more) adverse events reported in the prospectively followed 576 domestic patients in pre- and post-marketing studies, experience from an additional 194 patients exposed to LIORESAL INTRATHECAL (baclofen injection) from foreign studies has been reported. The following adverse events, not described in the table, and arranged in decreasing order of frequency, and classified by body system, were reported:

Nervous System: Abnormal gait, thinking abnormal, tremor, amnesia, twitching, vasodilatation, cerebrovascular accident, nystagmus, personality disorder, psychotic depression, cerebral ischemia, emotional lability, euphoria, hypertonia, ileus, drug dependence, incoordination, paranoid reaction and ptosis.

Digestive System: Flatulence, dysphagia, dyspepsia and gastroenteritis.

Cardiovascular: Postural hypotension, bradycardia, palpitations, syncope, arrhythmia ventricular, deep thrombophlebitis, pallor and tachycardia.

Respiratory: Respiratory disorder, aspiration pneumonia, hyperventilation, pulmonary embolus and rhinitis.

Urogenital: Hematuria and kidney failure.

Skin and Appendages: Alopecia and sweating.

Metabolic and Nutritional Disorders: Weight loss, albuminuria, dehydration and hyperglycemia.

Special Senses: Abnormal vision, abnormality of accommodation, photophobia, taste loss and tintus.

Body as a Whole: Suicide, lack of drug effect, abdominal pain, hypothermia, neck rigidity, chest pain, chills, face edema, flu syndrome and overdose.

Hemic and Lymphatic System: Anemia.

Spasticity of Cerebral Origin:

Commonly Observed — In pre-marketing clinical trials, the most commonly observed adverse events associated with use of LIORESAL INTRATHECAL (baclofen injection) which were not seen at an equivalent incidence among placebo-treated patients included: agitation, constipation, somnolence, leukocytosis, chills, urinary retention and hypotonia.

Associated with Discontinuation of Treatment — Nine of 211 patients receiving LIORESAL INTRATHECAL in pre-marketing clinical studies in the U.S. discontinued long term infusion due to adverse events associated with intrathecal therapy.

The nine adverse events leading to discontinuation were: infection (3), CSF leaks (2), meningitis (2), drainage (1), and unmanageable trunk control (1).

Fatalities — Three deaths, none of which were attributed to LIORESAL INTRATHECAL, were reported in patients in clinical trials involving patients with spasticity of cerebral origin. See *Warnings* on other deaths reported in spinal spasticity patients.

Incidence in Controlled Trials — Experience with LIORESAL INTRATHECAL (baclofen injection) obtained in parallel, placebo-controlled, randomized studies provides only a limited basis for estimating the incidence of adverse events because the studies involved a total of 62 patients exposed to a single 50 mcg intrathecal bolus. The following events occurred among the 62 patients receiving LIORESAL INTRATHECAL in two randomized, placebo-controlled trials involving cerebral palsy and head injury patients, respectively: agitation, constipation, somnolence, leukocytosis, nausea, vomiting, nystagmus, chills, urinary retention, and hypotonia.

Events Observed during the Pre-marketing Evaluation of LIORESAL INTRATHECAL — Adverse events associated with the use of LIORESAL INTRATHECAL reflect experience gained with a total of 211 U.S. patients with spasticity of cerebral origin, of whom 112 were pediatric patients (under age 16 at enrollment). They received LIORESAL INTRATHECAL for periods of one day (screening) (N=211) to 84 months (maintenance) (N=1). The usual screening bolus dose administered prior to pump implantation in these studies was 50-75 mcg. The maintenance dose ranged from 22 mcg to 1400 mcg per day. Doses used in this patient population for long term infusion are generally lower than those required for patients with spasticity of spinal cord origin.

Because of the open, uncontrolled nature of the experience, a causal linkage between events observed and the administration of LIORESAL INTRATHECAL cannot be reliably assessed in many cases. Nonetheless, many of the more commonly reported reactions—somnolence, dizziness, headache, nausea, hypotension, hypotonia and coma—appear clearly drug-related.

The most frequent (≥ 1%) adverse events reported during all clinical trials are shown in the following table. Nine patients discontinued long term treatment due to adverse events.

INCIDENCE OF MOST FREQUENT (≥1%) ADVERSE EVENTS IN PATIENTS WITH SPASTICITY OF CEREBRAL ORIGIN IN PROSPECTIVELY MONITORED CLINICAL TRIALS

| Adverse Event | Percent of Patients Reporting Events | | |
|----------------------|--------------------------------------|-----------------------------------|-------------------------------------|
| | N = 211 Screening ^a | N = 153 Titration ^b | N = 150 Maintenance ^c |
| Hypotonia | 2.4 | 14.4 | 34.7 |
| Somnolence | 7.6 | 10.5 | 18.7 |
| Headache | 6.6 | 7.8 | 10.7 |
| Nausea and Vomiting | 6.6 | 10.5 | 4.0 |
| Vomiting | 6.2 | 8.5 | 4.0 |
| Urinary Retention | 0.9 | 6.5 | 8.0 |
| Convulsion | 0.9 | 3.3 | 10.0 |
| Dizziness | 2.4 | 2.6 | 8.0 |
| Nausea | 1.4 | 3.3 | 7.3 |
| Hypoventilation | 1.4 | 1.3 | 4.0 |
| Hypertonia | 0.0 | 0.7 | 6.0 |
| Paresthesia | 1.9 | 0.7 | 3.3 |
| Hypotension | 1.9 | 0.7 | 2.0 |
| Increased Salivation | 0.0 | 2.6 | 2.7 |
| Back Pain | 0.9 | 0.7 | 2.0 |
| Constipation | 0.5 | 1.3 | 2.0 |
| Pain | 0.0 | 0.0 | 4.0 |
| Pruritus | 0.0 | 0.0 | 4.0 |
| Diarrhea | 0.5 | 0.7 | 2.0 |
| Peripheral Edema | 0.0 | 0.0 | 3.3 |
| Thinking Abnormal | 0.5 | 1.3 | 0.7 |
| Agitation | 0.5 | 0.0 | 1.3 |
| Asthenia | 0.0 | 0.0 | 2.0 |
| Chills | 0.5 | 0.0 | 1.3 |
| Coma | 0.5 | 0.0 | 1.3 |
| Dry Mouth | 0.5 | 0.0 | 1.3 |
| Pneumonia | 0.0 | 0.0 | 2.0 |
| Speech Disorder | 0.5 | 0.7 | 0.7 |
| Tremor | 0.5 | 0.0 | 1.3 |
| Urinary Incontinence | 0.0 | 0.0 | 2.0 |
| Urination Impaired | 0.0 | 0.0 | 2.0 |

^a Following administration of test bolus

^b Two month period following implant

^c Beyond two months following implant

N=Total number of patients entering each period. 211 patients received drug;

(1 of 212) received placebo only.

The more common (1% or more) adverse events reported in the prospectively followed 211 patients exposed to LIORESAL INTRATHECAL (baclofen injection) have been reported. In the total cohort, the following adverse events, not described in the table, and arranged in decreasing order of frequency, and classified by body system, were reported:

Nervous System: Akathisia, ataxia, confusion, depression, opisthotonos, amnesia, anxiety, hallucinations, hysteria, insomnia, nystagmus, personality disorder, reflexes decreased, and vasodilatation.

Digestive System: Dysphagia, fecal incontinence, gastrointestinal hemorrhage and tongue disorder.

Cardiovascular: Bradycardia.

Respiratory: Apnea, dyspnea and hyperventilation.

Urogenital: Abnormal ejaculation, kidney calculus, oliguria and vaginitis.

Skin and Appendages: Rash, sweating, alopecia, contact dermatitis and skin ulcer.

Special Senses: Abnormality of accommodation.

Body as a Whole: Death, fever, abdominal pain, carcinoma, malaise and hypothermia.

Hemic and Lymphatic System: Leukocytosis and petechial rash.

DRUG OVERDOSE

Special attention must be given to recognizing the signs and symptoms of overdose, especially during the initial screening and dose-titration phase of treatment, but also during re-introduction of LIORESAL INTRATHECAL after a period of interruption in therapy.

Symptoms of LIORESAL INTRATHECAL Overdose: Drowsiness, lightheadedness, dizziness, somnolence, respiratory depression, seizures, rostral progression of hypotonia and loss of consciousness progressing to coma of up to 72 hr. duration. In most cases reported, coma was reversible without sequelae after drug was discontinued.

Symptoms of LIORESAL INTRATHECAL overdose were reported in a sensitive adult patient after receiving a 25 mcg intrathecal bolus.

Treatment Suggestions for Overdose:

There is no specific antidote for treating overdoses of LIORESAL INTRATHECAL (baclofen injection); however, the following steps should ordinarily be undertaken:

- Residual LIORESAL INTRATHECAL solution should be removed from the pump as soon as possible.
- Patients with respiratory depression should be intubated if necessary, until the drug is eliminated.

Anecdotal reports suggest that intravenous physostigmine may reverse central side effects, notably drowsiness and respiratory depression. Caution in administering physostigmine is advised, however, because its use has been associated with the induction of seizures and bradycardia.

Physostigmine Doses for Adult Patients: Administer 2 mg of physostigmine intramuscularly or intravenously at a slow controlled rate of no more than 1 mg per minute. Dosage may be repeated if life-threatening signs, such as arrhythmia, convulsions or coma occur.

Physostigmine Doses for Pediatric Patients: Administer 0.02 mg/kg physostigmine intramuscularly or intravenously, do not give more than 0.5 mg per minute. The dosage may be repeated at 5 to 10 minute intervals until a therapeutic effect is obtained or a maximum dose of 2 mg is attained.

Physostigmine may not be effective in reversing large overdoses and patients may need to be maintained with respiratory support.

If lumbar puncture is not contraindicated, consideration should be given to withdrawing 30-40 ml of CSF to reduce CSF baclofen concentration.

DOSAGE AND ADMINISTRATION

Refer to the manufacturer's manual for the implantable pump approved for intrathecal infusion for specific instructions and precautions for programming the pump and/or refilling the reservoir. There are various pumps with varying reservoir volumes and there are various refill kits available. It is important to be familiar with all of these products in order to select the appropriate refill kit for the particular pump in use.

Screening Phase: Prior to pump implantation and initiation of chronic infusion of LIORESAL INTRATHECAL (baclofen injection), patients must demonstrate a positive clinical response to a LIORESAL INTRATHECAL bolus dose administered intrathecally in a screening trial. The screening trial employs LIORESAL INTRATHECAL at a concentration of 50 mcg/ml. A 1 ml ampule (50 mcg/ml) is available for use in the screening trial. The screening procedure is as follows. An initial bolus containing 50 micrograms in a volume of 1 milliliter is administered into the intrathecal space by barbotage over a period of not less than one minute. The patient is observed over the ensuing 4 to 8 hours. A positive response consists of a significant decrease in muscle tone and/or frequency and/or severity of spasms. If the initial response is less than desired, a second bolus

injection may be administered 24 hours after the first. The second screening bolus dose consists of 75 micrograms in 1.5 milliliters. Again, the patient should be observed for an interval of 4 to 8 hours. If the response is still inadequate, a final bolus screening dose of 100 micrograms in 2 milliliters may be administered 24 hours later.

Pediatric Patients: The starting screening dose for pediatric patients is the same as in adult patients, i.e., 50 mcg. However, for very small patients, a screening dose of 25 mcg may be tried first.

Patients who do not respond to a 100 mcg intrathecal bolus should not be considered candidates for an implanted pump for chronic infusion.

Post-Implant Dose Titration Period: To determine the initial total daily dose of LIORESAL INTRATHECAL following implant, the screening dose that gave a positive effect should be doubled and administered over a 24-hour period, unless the efficacy of the bolus dose was maintained for more than 8 hours, in which case the starting daily dose should be the screening dose delivered over a 24-hour period. No dose increases should be given in the first 24 hours (i.e., until the steady state is achieved).

Adult Patients with Spasticity of Spinal Cord Origin: After the first 24 hours, for adult patients, the daily dosage should be increased slowly by 10-30% increments and only once every 24 hours, until the desired clinical effect is achieved.

Adult Patients with Spasticity of Cerebral Origin: After the first 24 hours, the daily dose should be increased slowly by 5-15% only once every 24 hours, until the desired clinical effect is achieved.

Pediatric Patients: After the first 24 hours, the daily dose should be increased slowly by 5-15% only once every 24 hours, until the desired clinical effect is achieved.

If there is not a substantive clinical response to increases in the daily dose, check for proper pump function and catheter patency.

Patients must be monitored closely in a fully equipped and staffed environment during the screening phase and dose-titration period immediately following implant. Resuscitative equipment should be immediately available for use in case of life-threatening or intolerable side effects.

Maintenance Therapy:

Spasticity of Spinal Cord Origin Patients: The clinical goal is to maintain muscle tone as close to normal as possible, and to minimize the frequency and severity of spasms to the extent possible, without inducing intolerable side effects. Very often, the maintenance dose needs to be adjusted during the first few months of therapy while patients adjust to changes in life style due to the alleviation of spasticity. During periodic refills of the pump, the daily dose may be increased by 10-40%, but no more than 40%, to maintain adequate symptom control. The daily dose may be reduced by 10-20% if patients experience side effects. Most patients require gradual increases in dose over time to maintain optimal response during chronic therapy. A sudden large requirement for dose escalation suggests a catheter complication (i.e., catheter kink or dislodgement).

Maintenance dosage for long term continuous infusion of LIORESAL INTRATHECAL (baclofen injection) has ranged from 12 mcg/day to 2003 mcg/day, with most patients adequately maintained on 300 micrograms to 800 micrograms per day. There is limited experience with daily doses greater than 1000 mcg/day. Determination of the optimal LIORESAL INTRATHECAL dose requires individual titration. The lowest dose with an optimal response should be used.

Spasticity of Cerebral Origin Patients: The clinical goal is to maintain muscle tone as close to normal as possible and to minimize the frequency and severity of spasms to the extent possible, without inducing intolerable side effects, or to titrate the dose to the desired degree of muscle tone for optimal functions. Very often the maintenance dose needs to be adjusted during the first few months of therapy while patients adjust to changes in life style due to the alleviation of spasticity. During periodic refills of the pump, the daily dose may be increased by 5 - 20%, but no more than 20%, to maintain adequate symptom control. The daily dose may be reduced by 10-20% if patients experience side effects. Many patients require gradual increases in dose over time to maintain optimal response during chronic therapy. A sudden large requirement for dose escalation suggests a catheter complication (i.e., catheter kink or dislodgement).

Maintenance dosage for long term continuous infusion of LIORESAL INTRATHECAL (baclofen injection) has ranged from 22 mcg/day to 1400 mcg/day, with most patients adequately maintained on 90 micrograms to 703 micrograms per day. In clinical trials, only 3 of 150 patients required daily doses greater than 1000 mcg/day.

Pediatric Patients: Use same dosing recommendations for patients with spasticity of cerebral origin. Pediatric patients under 12 years were recommended to require a lower daily dose in clinical trials. Average daily dose for patients under 12 years was 274 mcg/day, with a range of 24 to 1199 mcg/day. Dosage requirement for pediatric patients over 12 years does not seem to be different from that of adult patients. Determination of the optimal LIORESAL INTRATHECAL dose requires individual titration. The lowest dose with an optimal response should be used.

Potential need for dose adjustments in chronic use: During long term treatment, approximately 5% (28/627) of patients become refractory to increasing doses. There is not sufficient experience to make firm recommendations for tolerance treatment; however, this "tolerance" has been treated on occasion, in hospital, by a "drug holiday" consisting of the gradual reduction of LIORESAL INTRATHECAL over a 2 to 4 week period and switching to alternative methods of spasticity management. After the "drug holiday," LIORESAL INTRATHECAL may be restarted at the initial continuous infusion dose.

Stability

Parenteral drug products should be inspected for particulate matter and discoloration prior to administration, whenever solution and container permit.

Delivery Specifications

The specific concentration that should be used depends upon the total daily dose required as well as the delivery rate of the pump. LIORESAL INTRATHECAL may require dilution when used with certain implantable pumps. Please consult manufacturer's manual for specific recommendations.

Preparation Instruction:
Screening

Use the 1 ml screening ampule only (50 mcg/ml) for bolus injection into the subarachnoid space.

For a 50 mcg bolus dose, use 1 ml of the screening ampule. Use 1.5 ml of 50 mcg/ml baclofen injection for a 75 mcg bolus dose. For the maximum screening dose of 100 mcg, use 2 ml of 50 mcg/ml baclofen injection (2 screening ampules).

Maintenance

For patients who require concentrations other than 500 mcg/ml or 2000 mcg/ml, LIORESAL INTRATHECAL **must be diluted**.

LIORESAL INTRATHECAL **must be diluted** with sterile preservative free Sodium Chloride for Injection, U.S.P.

Delivery Regimen:

LIORESAL INTRATHECAL is most often administered in a continuous infusion mode immediately following implant. For those patients implanted with programmable pumps who have achieved relatively satisfactory control on continuous infusion, further benefit may be attained using more complex schedules of LIORESAL INTRATHECAL delivery. For example, patients who have increased spasms at night may require a 20% increase in their hourly infusion rate. Changes in flow rate should be programmed to start two hours before the time of desired clinical effect.

HOW SUPPLIED

LIORESAL INTRATHECAL (baclofen injection) is available in single use ampules of 10 mg/20 ml (500 mcg/ml) or 10 mg/5 ml (2000 mcg/ml) or 40 mg/20 ml (2000 mcg/ml) packaged in a Refill Kit for intrathecal administration. For screening, LIORESAL INTRATHECAL is available in a single use ampule of 0.05 mg/1 ml.

Model 8561 LIORESAL INTRATHECAL Refill Kit contains one ampule of 10 mg/20 ml (500 mcg/ml) (NDC 58281-560-01).

Model 8562 LIORESAL INTRATHECAL Refill Kit contains two ampules of 10 mg/5 ml (2000 mcg/ml) (NDC 58281-561-02).

Model 8563s LIORESAL INTRATHECAL contains one ampule of 0.05 mg/1 ml (50 mcg/ml) (NDC 58281-562-01).

Model 8564 LIORESAL INTRATHECAL Refill Kit contains four ampules of 10 mg/5 ml (2000 mcg/ml) (NDC 58281-561-04) or one ampule of 40 mg/20 ml (2000 mcg/ml) (NDC 58281-563-01).

Model 8565 LIORESAL INTRATHECAL Refill Kit contains two ampules of 10 mg/20 ml (500 mcg/ml) (NDC 58281-560-02).

Model 8566 LIORESAL INTRATHECAL Refill Kit contains eight ampules of 10 mg/5 ml (2000 mcg/ml) (NDC 58281-561-08) or two ampules of 40 mg/20 ml (2000 mcg/ml) (NDC 58281-563-02).

STORAGE

Does not require refrigeration.

Do not store above 86°F (30°C).

Do not freeze.

Do not heat sterilize.

Manufactured by Novartis Pharma Stein AG, Stein, Switzerland, for Medtronic, Inc., Minneapolis, MN 55432-5604 USA.



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