Effects of Left Ventricular Assist Devices (LVAD) on St. Jude Medical Implantable Cardiac Rhythm Devices

Background
A ventricular assist device (VAD) is a mechanical circulatory device that is used to increase cardiac output in patients with reduced cardiac function. Some VADs are intended for short term use, typically for patients recovering from heart attacks or heart surgery, while others are intended for long-term use, typically for patients suffering from advanced congestive heart failure. The majority of VADs on the market are designed to assist the left ventricle.

Potential Effects
There have been reports of telemetry interference occurring while attempting to communicate with some implanted devices, concurrently with patients who have been implanted with a Left Ventricular Assist Devices (LVAD). Generally, the LVAD operates at pump speeds around 9,000 RPM. The combination of this speed and the electromagnetic interference (EMI) generated by the pump’s electronic circuitry can cause interference when communicating with an implanted device. Testing has shown that both devices individually meet the required standards for EMI emissions. Patients who typically require an LVAD device are commonly implanted with an ICD.

St. Jude Medical introduced high speed telemetry starting with the Epic II/Atlas II and Current RF/Promote RF families of ICDs and CRT-D devices. These devices have the capability to communicate with the programmers at telemetry speeds of 64 kHz and/or the RF-MICS frequency band, for RF enabled devices, respectively. For devices communicating with a programmer via 64kHz (non RF-MICS) telemetry, if the clinician desires to perform either induction testing or HVLIC measurements, the devices must switch to 8kHz telemetry to perform these tests. In these cases, telemetry may be interrupted, thereby making the performance of these tests in the presence of an operating LVAD system difficult. For devices that utilize RF telemetry, once RF communication is established, all interrogation, programming, induction testing and measurements are performed in the RF mode, unaffected by the LVAD system.

In rare cases, inhibition of pacing, noise reversion pacing, and inappropriate therapy delivery have been noted on ICDs during use of an LVAD. In the unlikely event that a St. Jude Medical pacemaker recipient receives an LVAD, it is possible that the clinician may experience similar telemetry difficulties as mentioned above.

A summary of potential effects is provided in the table below and is based on device testing at St. Jude Medical, clinical experience and/or a review of the scientific literature.
### Potential Effect

<table>
<thead>
<tr>
<th>Potential Effect</th>
<th>Estimated Frequency</th>
<th>Pacemakers</th>
<th>ICDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhibition of pacing</td>
<td>None</td>
<td>Rare</td>
<td></td>
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<tr>
<td>Asynchronous pacing/noise reversion</td>
<td>None</td>
<td>Rare</td>
<td></td>
</tr>
<tr>
<td>Inappropriate therapy delivery</td>
<td>Not applicable</td>
<td>Rare</td>
<td></td>
</tr>
<tr>
<td>Difficulty with telemetry</td>
<td>Rare</td>
<td>Rare*</td>
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</table>

* Older devices that utilize only 8K telemetry may have a higher frequency of telemetry difficulty.

### Recommendations when RF telemetry is not available

- Shield the device from the electromagnetic interference (EMI) generated by the LVAD. A Faraday cage, such as an iron plate or pan, can be used as shielding.
- With the physician’s guidance, either increasing or decreasing the pump speed on the LVAD will alter the EMI frequency and may allow telemetry.
- The patient should lie down flat and have the programmer, telemetry cable, and telemetry wand superior to the patient’s head keeping the LVAD’s power pack as far as possible from the programmer cabling. Both the telemetry wand and telemetry cable can be susceptible to EMI.
- Although not a viable option in most cases, increasing the spacing between the device and the implanted LVAD to 6 inches or more may help with the telemetry signal reception.

If you have any questions on this topic, please contact CRM Technical Services.