Home Remote Monitoring in Patients with LVADs
Can it Lead to Improved Outcomes?

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MCS Got Better
The Pumps got Better (CF 2nd gen VADs)
• More durable
• More livable
• Less catastrophic complications

More Pumps Implanted
Kirklin JK et al. J Heart Lung Transplant. 2015;34:1495-1504

Patients are Living Longer
Kirklin JK et al. J Heart Lung Transplant. 2015;34:1495-1504

Patient photos used with permission
The Pumps Got Better…
But Have We?

Readmission Post Implant Seriously Impacts Survival

- The number of 90-day post CF-VAD placement readmissions is strongly associated with increasing mortality in the INTERMACS registry.

Kirklin JK et al. J Heart Lung Transplant. 2015;34:1495-1504

Post VAD Hospitalizations

- Bleeding (GI) was the most common cause for readmission.


Can We Decrease Readmission Rate Using Home Remote Monitoring?

**Preventing**
- Bleeding (GI & Others)
- Stroke
- Pump Thrombosis
- Heart Failure
- Arrhythmias
- Infections (DL)

**Monitoring**
- INR
- INR, BP
- INR, VAD
- VAD, BP, Weight
- ICD
- DL Exit Photos

Post VAD Hospitalizations
UCSF Remote Monitoring Experience

- 118 consecutive patients implanted with VAD at UCSF (2012 - 2016) and survived 6 months post D/C
- Alere VADWatch® Remote Monitoring ('15-'16): daily weights, BP and VAD parameters, and biweekly INR
- Standard Care ('12-'14): INR q 1-2 wks, BP q 1-3 months, weight and VAD parameters when outside the range
- We assessed hospital admissions and VAD-associated preventable complications (heart failure, GI bleed, stroke, arrhythmia, pump thrombosis, hypertension)
- Time in therapeutic range (TTR): % of days with INR 2-2.5 (Rosendaal method)
- Time in therapeutic range (TTR): % of days with SBP 90-100 mmHg or MAP 65-85 mmHg

Remote Monitoring Prevents VAD Patient Readmission (All Causes)

- Overall readmission rate: 1.16 admission/pt-year
  - Alere RM: 53% (95% CI 37-72%)
  - SC: 77% (95% CI 61-91%)

Remote Monitoring Prevents VAD Patient GI Bleeding

- VAD-associated readmission rate: 0.73 admission/pt-year
  - Alere RM: 30% (95% CI 17-49%)
  - SC: 69% (95% CI 52-84%)

Klein L et al. AHA Scientific Sessions 2016
UCSF VAD RM Summary

- RM: significantly longer TTR for INR 2-2.5: 82% vs. 39%
- RM: significantly longer TTR for BP (MAP 65-85 or SBP 90-100): 85% vs. 30%
- RM: 54% reduction in risk of CVA/ Pump Thrombosis
- RM: 21% reduction in risk of GI Bleed
- RM: 22% reduction in risk of all-cause readmissions and a 39% reduction in risk of VAD-related readmissions

Here’s What Made Us Better

   - Standardizes care to common AEs (no matter who’s on)
   - Make part of new coordinator orientation
   - Educate staff RNs
   - Reference in your documentation

2. Teach Patients What to Look For
   - Bleeding
   - Infection
   - Stroke

3. Autologs / HVAD Waveform Analysis
   - Instant feedback
   - Routine analysis
   - Always download at clinic
   - Documents baseline
   - Always download at clinic
   - Instructive for Coordinators
Here's What Made Us Better

4. Remote Monitoring Program – Decreased Readmissions
   • Increased TTR for BP and INR
   • 20% Reduction GIB
   • 52% Reduction in LVAD-associated hospital readmission

Remote Monitoring Program
It Doesn't Run Itself

- It requires commitment from Program Leadership to allocate staff, time and resources to properly utilize it
- Staff member(s) must be designated to monitoring outpatients – it will only hurt your program if nobody looks at it
- Organize a work-flow for it

Remote Monitoring Program
Here’s How We’ve Made it Work for Us

1. Developed Interface between RM website & EMR (Epic)
   - Decreased work-time for Coordinators
   - More accessible to providers
   - Utilization in clinic much more efficient

Remote Monitoring Program
Here’s How We’ve Made it Work for Us

Magic Happens When Computers Talk
2. Smart Alert Setting – make alerts meaningful

Remote Monitoring Program
Here’s How We’ve Made it Work for Us

<table>
<thead>
<tr>
<th>Value</th>
<th>Expected</th>
<th>High Threshold</th>
<th>Low Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4.00</td>
<td>6.00</td>
<td>6.90</td>
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Meaningful Alerts = Early Intervention

Tight monitoring of Pump Power with Remote Monitoring can mean the difference between Observation & Heparin, or IV Thrombolytic vs Pump Exchange

3. Teach Patient & Caregiver Before Discharge

- Get in the habit before leaving hospital
- Focus on correctly obtaining INR and BP measurement
- More accurate data reporting
- Less frustration and fatigue from patients/caregivers

Remote Monitoring Program
Here’s How We’ve Made it Work for Us

4. Utilizing iPad/Tablet for Education

- Upload Educational Documents (example: Stroke/GIB education or patient training slides PPT)
- Upload Manufacturer Videos assign patient to view
- Upload “Home Grown” Videos (example: Dressing change)
Remote Monitoring Program
Added Educational Features – ActiCare Health

5. Avoid the Pitfalls
- Nobody looks at it
- Nobody has time for it
- Giving up on it b/c patient can’t get INR sample
- Alerts are not well set = Alert Overload
- Outsourcing too much to the RM Company
- Everybody gets RM (don’t let patients opt out without a fight)

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