In 2011, Intermountain Healthcare, an integrated delivery network (IDN) consisting of 23 hospitals and more than 185 clinics spread throughout Utah and Southern Idaho, began an initiative to replace its service contracts for imaging equipment (e.g., X-ray, magnetic resonance imaging, ultrasound) with in-house servicing. The project, spearheaded by Intermountain’s Clinical Engineering Support Services (CESS) department, saved the IDN more than $8 million and now employs 17 imaging engineers and three service coordinators.

The success of the imaging program inspired CESS, which leads Intermountain’s healthcare technology management (HTM) services in 14 different clinical engineering shops, to look at other means to leverage in-house services in ways that would save money, increase efficiency, and improve service. More far reaching than the first initiative, this journey would result in the establishment of a systemwide clinical engineering program that combines the best of in-house and centralized equipment servicing.

Challenge

The idea to centralize mobile medical device maintenance was a natural extension of Intermountain’s imaging equipment servicing initiative. From the beginning, however, the implementation faced two challenges. The first was distance. Although most Intermountain facilities are within a 100-mile radius of each other, some rural facilities are more isolated. How can these isolated facilities, which were performing on-site repairs, possibly perform better if equipment requiring repair has to be shipped to a distant location? The second, related issue was how to convince stakeholders that all of this was a good idea.

Mike Busdicker, system director for clinical engineering at Intermountain, admitted that the notion was met with a healthy dose of skepticism initially.

“We wanted to create some systemization that would gain us some efficiencies,” said Jeff Koford, imaging services program manager at Intermountain. “Fortunately, we were able to use the work that we had done in developing our imaging in-house program to move forward with our clinical engineering central project. The groundwork was already there.”

The initiative would result in enhanced specialization for the engineers working at a central depot, increased efficiency, and substantial cost savings for Intermountain. The beauty, though, is how all the pieces fit together.

At a Glance

**SUBJECT**
Intermountain Healthcare

**LOCATION**
Integrated delivery network spanning Utah and Southern Idaho

**SIZE**
23 hospitals and more than 185 clinics

**STAFF**
Key staff working in clinical engineering, central support, and compliance
caregivers within the organization at the table before implementation,” Busdicker said. “That way, we could take a look at the important milestones and the communication plan across the organization. Therefore, department heads and managers across the system, as well as the supply chain, were brought to the table.”

Laying out that gameplan in an open and transparent way would help Busdicker and colleagues answer the important questions that would come up: What were the preferred ways to move equipment from facility to facility? How would stakeholders get in touch when equipment needed repair? What level of service was expected?

“We began the communication process back when this idea was in conception, then carried it through to initialization and its current state,” Koford said. “We did that so we could roll out the program effectively and meet stakeholders’ needs.”

**Solution**

In Intermountain’s central services paradigm, when hospital clinical engineering shops need mobile medical devices to be repaired (e.g., syringe pumps, multichannel infusion pumps, compression therapy units), the equipment is placed in totes and picked up by supply chain trucks. Smaller facilities can request a courier pickup, while larger ones have scheduled stops. The totes are sent to a central depot location in Midvale, UT. Freshly repaired and loaner equipment then is ferried back to the facility where it’s needed.

“We leveraged courier services through the supply chain for our lower-end equipment. Using totes, mobile medical equipment is transported back to our central depot, where bench techs perform the repairs,” Busdicker said. “That allowed us to free up time for our in-house, on-site biomed or clinical engineering technicians to do higher-level repairs and focus on higher-end equipment within the hospitals.”

While the more commonly serviced or damaged devices can be repaired at the depot, the system also accommodates low-volume repairs. The number of bladder scanners in a single hospital may not be sufficient to justify training HTM professionals to fix them. But when considering a far-reaching IDN or healthcare delivery organization, the volume may be adequate to train a handful of centralized biomeds to do that work.

Therefore, Intermountain’s four central support clinical engineers also are trained to work on low-volume, complex equipment (e.g., lasers, phacoemulsifiers, lab and operating microscopes, simulation equipment) that would otherwise be taken care of under contract through an authorized service provider (ASP). In combination with the on-site clinical engineers, that means even more equipment is able to be serviced in house.

“While the depot supports the field through the servicing of mobile medical equipment, depot clinical engineers can also go on site and augment staff if needed,” said John Schafer, program manager for clinical engineering at Intermountain Healthcare, who leads the central depot. “For example, lasers and ultrasounds are repaired centrally out of the depot because there are not enough units in any one facility to make it worth training someone. But when you put the entire fleet of equipment together, it makes sense for them to take care of this for everyone in the field.”

But what if it’s just a knob that’s broken? Does it really make sense to ship a device all the way back to the central depot?
“No. If it’s a small repair of a half-hour or less, they’ll fix it at the in-house shop,” Busdicker said. “The devices that are being shipped to the depot are the ones that require a more extensive repair or are more specialized equipment.”

The in-house central support system comes with another big plus. Because the repairs are centralized, so too is the supply of parts. That allows Intermountain to purchase and manage its inventory at a large scale. The services are supported by a central dispatching group to handle the calls and a centralized parts room, which keeps on hand 715 different parts line items (e.g., liquid crystal displays, keypad assemblies, probes, valve kits, tubes, latches, hoses, switches) and 273 imaging parts line items (e.g., X-ray tubes). Parts needed by on-site biomeds can be received using the same courier system used to transport the equipment. This allows Intermountain to purchase high-use parts in bulk—a tactic that reduces shipping costs and allows for better price negotiations.

Results
The combination of a hybrid, in-house central support program with a central depot paid off for Intermountain Healthcare by allowing for more efficient parts management and purchasing. The improvements in efficiency, availability of loaner equipment, and continued use of on-site clinical engineers more than made up for the increased distance that devices travel to the central depot.

Central depot services began in March 2015. By 2016, savings exceeded $1 million, more than half due to contract reduction (Figure 1). In the first six months of 2017, the depot saved Intermountain $325,000. But the dividends go beyond financial savings. Reducing the reliance on ASPs also improved responsiveness. In 2016, for example, the time needed to arrive on site was about two-thirds lower when using in-house staff (Table 1) compared with the vendor’s engineers (Table 2).

“In the first half of 2017, we gave back 30 eight-hour shifts to our frontline caregiver staff, because they didn’t have to handle service calls anymore. They make one call and

![Figure 1](https://via.placeholder.com/150)

**Figure 1.** Financial benefits of central depot implementation for Intermountain Healthcare in 2016. Abbreviations used: CA, cost avoidance; CS, cost saved.
then it’s taken care of by our staff internally. That time goes right back to direct patient care,” Busdicker said.

Despite initial hesitancy from stakeholders who were concerned about how the program would work, feedback has been positive both outside of and within HTM.

“Implementing the in-house central support program has greatly helped with balancing workload at the facilities. Technicians and engineers at the different facilities have commented that they can rely on the central depot engineers for their expertise and fast turnover with equipment repair and services,” said Priya Upendra, clinical engineering compliance manager at Intermountain.

**Looking Ahead**

Making a big change—such as moving mobile medical device maintenance sometimes hundreds of miles away—can be scary, particularly when those devices are needed for patient care. But if fear is an illness that plagues change, the inoculation is a big dose of transparency and dialogue.

Keeping track of all the devices that are in motion is a challenge that CESS readily admits to. A bar code system logs the device’s location and status in a computerized maintenance management system (CMMS). But that log stops when the equipment reaches an ASP. Dustin Smith, central support manager at Intermountain, has been trialing methods to work within the CMMS’s limitations to keep customers in the loop, such as putting information status updates in the work order.

“Everybody wants to know where their assets are in the process because there is going to be some stuff that is sent to the central depot that will still get sent out to the ASPs or elsewhere,” Smith said. “We’ve been trying to figure out what reports we need and how to kick those out to facilities so they know where their assets are. Because if you don’t have that communication and you don’t have a great business process in place to kick that out, then some of these things get lost.”

An important key to long-term success has been staying in touch with stakeholders and department leaders, ensuring the success of bioms and demonstrating through data and rigorous benchmarking how the program is working. Central depot engineers sit on several corporate-level committees (e.g., radiation safety, laser safety, simulation guidance, equipment standardization).

### Table 1

<table>
<thead>
<tr>
<th>Location</th>
<th>Call Acknowledged (Minutes)</th>
<th>Caregiver Contacted (Minutes)</th>
<th>Arrival On Site (Minutes)</th>
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</thead>
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<tr>
<td>Central region</td>
<td>20.6</td>
<td>33.8</td>
<td>284.0</td>
</tr>
<tr>
<td>North region</td>
<td>35.6</td>
<td>41.9</td>
<td>506.7</td>
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<tr>
<td>Primary children's</td>
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<td>53.3</td>
<td>508.1</td>
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<tr>
<td>South region</td>
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<td>34.8</td>
<td>342.9</td>
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<tr>
<td>Southwest region</td>
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<td>36.6</td>
<td>285.8</td>
</tr>
<tr>
<td>Total</td>
<td>25.2</td>
<td>36.9</td>
<td>337.9</td>
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</table>

Table 1. Average response times for an Intermountain Healthcare in-house imaging engineer to acknowledge a call for service, contact the clinical caregiver, and arrive on site in 2016

### Table 2

<table>
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<tr>
<th>Location</th>
<th>Call Acknowledged (Minutes)</th>
<th>Caregiver Contacted (Minutes)</th>
<th>Arrival On Site (Minutes)</th>
</tr>
</thead>
<tbody>
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<tr>
<td>South region</td>
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<tr>
<td>Southwest region</td>
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<tr>
<td>Total</td>
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<td>233.3</td>
<td>1089.1</td>
</tr>
</tbody>
</table>

Table 2. Average response times for a vendor’s imaging engineer to acknowledge a call for service, contact the clinical caregiver, and arrive on site at Intermountain Healthcare in 2016
“We hold quarterly business reviews within each one of our regions and our department managers and directors. So, we’re going beyond the clinical engineering side to put information in front of stakeholders to show them what we are doing,” Busdicker said. “We let them know what we think isn’t quite working and what the adjustments are, so we can get their input.”

Finally, the last piece of transparency is with the on-site technicians themselves, to ensure that they understand that their jobs aren’t being replaced by staff at the central depot.

“It’s important to be clear that we want them to focus on higher-end equipment that we currently don’t service in house, and in order to do that and reduce contract costs, we needed to take those mobile medical devices off their plate,” Busdicker said.

CESS is looking to apply the lessons learned from its central depot/loaner program to other areas, such as a quality assurance and validation program for flexible and rigid scopes.

“I’ve had physicians come up to me after presenting our idea and say, ‘Can you start this like yesterday?’” Busdicker said. “That’s the level of confidence we’ve inspired by demonstrating through our metrics and benchmarking on the depot program. People are now asking, ‘What can we do next?’”

Mobile medical devices from throughout the Intermountain Healthcare integrated delivery network are repaired by four clinical engineers at a central depot in Midvale, UT.

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