Clinical Engineering professionals have realized for some time that the "preventive maintenance" (PM) that they have been performing for many years is no longer able to prevent any failures, although some safety and performance inspections (SPI’s) can help detect hidden and potential failures that affect patient safety. To help CE professionals decide whether they should continue to perform scheduled maintenance (SM) or not, a systematic method for determining maintenance effectiveness has been developed. This method uses a small set of codes to classify failures found during repairs and SM (PM’s and SPI’s). Analysis of the failure patterns and their effects on patients and users allows CE professionals to compare the effectiveness of different maintenance strategies, such as decreasing SM, deploying statistical sampling, or even eliminating SM.

So you must begin by defining your definition of a PM, preventive, predictive or planned and answer the question as to why you are doing the PM. Next you must define a thorough set of failure codes for both PM and Service to assure accurate data capture. Finally, is meeting the requirement and scrutiny of the Joint Commission, and CMS (Centers for Medicare and Medicaid Services), and justifying your maintenance strategies.

Evidence-Based Maintenance utilizes (PDSA) Plan, Do, Study, Act for all your implementations. Did modifying the PM strategy have an effect on equipment uptime, failure rates, and most importantly patient safety? The data collection before and after implementation is crucial to answering the question “How do you convince surveyors that your maintenance program is effective” [1]

Cont. (pg10)

http://www.aramarkhealthcare.com/

A diverse group of 30 industry professionals has recommended the "healthcare technology management" be the official name of the field responsible for servicing and maintaining medical technology. The group chose the name during a Future Forum on April 28 and 29 facilitated by AAMI, and attended by clinical engineers, biomedical equipment technicians, educators, and other industry professionals.

“We felt that this name was accurate, easily understood by the public and other healthcare workers, and allowed for expansion of the field in the future,” said Pat Lynch, CBET, CCE, a biomedical support specialist at Global Medical Imaging.

During the two-day meeting the group also spent considerable time crafting a vision for the future of the field, which includes the management of healthcare technologies that are highly integrated and interoperable.

“The event included animated discussions and passionate debates,” said Karen Waninger, the director of Clinical Engineering Department at Community Health Network in Indianapolis, IN, and a leader of AMMI’s Technology Management Council (TMC).

The group is now conducting a 90-day public comment period to allow all interested parties to express their comments about the recommended name and future of the profession.

Members of the group stressed that Cont. (pg 3)
Corinne was obtaining her BMET training while proudly serving in the U.S Army. Ironically this was the same time I was attending college obtaining mine as well. After being honorably discharged from the Army Corinne accepted a BMET position at St. Luke’s Hospital in Bluefield, WV. After completing my internship, I accepted a BMET position at New Hanover Regional Medical Center (NHRMC) in Wilmington, NC. Three years after I had been working at NHRMC a BMET position came available and Corinne was the applicant that secured the job. We worked very well together and shared a lot of the same interests. One year later we were married. Not long after, in the same hospital that we both worked, we were awaiting the arrival of our first child. While the birthplace O.R. staff were making Corinne comfortable in O.R. 3, the O.R. staff pulls me out of O.R. 3 to resolve a lighting issue in O.R. 2. Who says BMET’s don’t work well under pressure?

Later when I went up to see Corinne in the recovery room, there she was instructing the PACU on how to setup the new Philips monitors. A BMET’s work is never done. Ultimately we decided to move out West where we could both gain employment with Intermountain Healthcare. This is when it gets a little tricky; now we both work for different hospitals, now the on-call pager comes into play. It’s a rare occasion that we are both on the schedule at the same time, but it does happen. Thankfully we are among a terrific group of other BMET’s that are always willing to step in and trade call with us when we do have conflicting schedules. There are some real advantages about both of us being in the Biomed career field. One is that both of us can appreciate what the other has had to deal with each day. Another is that we both can bounce ideas off each other to find solutions on equipment problems.

In Recognition: The ICIS Board wishes to congratulate them both for their unique and rare situation and what they bring to the Biomed field.

For the complete press release go to: http://www.icis-biomed.org/
**ICIS Quarterly Meeting Schedule**

http://www.icis-biomed.org/calendar

<table>
<thead>
<tr>
<th>Date</th>
<th>Presenter</th>
<th>Topic</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 04, 2011</td>
<td>RPI (Replacement Parts Industries) By: Neil Blagman</td>
<td>An Introduction to the History and Current State of Tabletop Sterilizers</td>
<td>TBD</td>
</tr>
<tr>
<td>Nov 03, 2011</td>
<td>AAMI Technology Management</td>
<td>Topic: TBD</td>
<td>Location: TBD</td>
</tr>
<tr>
<td>Feb 02, 2012</td>
<td>TBA</td>
<td>Annual Meeting/TBA</td>
<td>TBD</td>
</tr>
<tr>
<td>May 03, 2012</td>
<td>TBA</td>
<td>Topic: TBD</td>
<td>Location: TBD</td>
</tr>
</tbody>
</table>

**ICIS News**

- The ICIS website is a wealth of knowledge, with access to free webinars and other news from the field and an array of links to our sponsors and other valuable sites, visit our website. [http://www.icis-biomed.org/](http://www.icis-biomed.org/)

- 28 attend the Spring ICIS meeting held at McKay-Dee Hospital Center, including 4 from St. Luke’s in Boise, ID. ICIS also offered its first ever webcast, with 5 attendees from around the country.

- For the complete publications of the articles in this and other newsletters visit our website.

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**McKay-Dee Hospital Center**  
Clinical Engineering

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[www.philips.com/MX800](http://www.philips.com/MX800)
BMET role in the hospital EC. The
(Needleman, Kurtzman, & Kizer, 2007), critical to nursing performance
Despite evidence that the BMET role is
infections and promote National Patient
issues such as hospital acquired
detection and prevention of systemic
multidisciplinary approach in the
recommendations point to a
Commission, 2001). These
directives (Baran, 2004; Joint
(TJC).
5+ years of experience) worked at large,
respondents (most of whom reported
had a national representation of 317
BMETs across the United States who
successfully completed the survey. The
respondents (most of whom reported
urban, non-profit facilities that were
accredited by The Joint Commission
(JIC).
Miss Fiedler, a trained BMET from
Florida State College who interned at
Flagler Hospital in St. Augustine and
applied training in Texas, developed the
questionnaire to determine the
BMET potential role in
response to TJC Infection Control
(IC.8.10) and Environment of Care (EC.4)
directives (Baran, 2004; Joint
Commission, 2001). These
recommendations point to a
multidisciplinary approach in the
detection and prevention of systemic
issues such as hospital acquired
infections and promote National Patient
Safety Goals through interdepartmental
communication.
Despite evidence that the BMET role is
critical to nursing performance
(Needleman, Kurtzman, & Kizer, 2007),
there is little documentation about the
BMET role in the hospital EC. The
overarching purpose of this research
was to find evidence to support the
general question of “Can BMET
integration in the general EC contribute
to improved quality performance by
reducing the likelihood of systemic
adverse events and compliance issues?”
Their potential to elevate their historic
role in patient safety through preventive
maintenance of medical equipment to a
health support service profession
actively engaged in addressing adverse
systemic events was analyzed using
Structural Equation Modeling (SEM).
Table 1, pg 7, provides the frequency
and distribution of responses in the
study variable of hospital Level of
Quality. The SEM analysis found that
several predictors of quality are
statistically significant in relation to the
level of quality as measured by clinical
engineering activities. When Regulatory
Application is held constant* in the data
model, results for quality indicators like
Acquisition Integration show that for
each instance that a BMET is allowed to
participate in the purchasing process, it
will more than double (1:2.166) the
impact of quality in relation to clinical
engineering effectiveness. A second
measure of clinical engineering
effectiveness—Job Reporting Satisfaction
also demonstrates a dynamic impact on
quality (1:2.026) when there is
consistency in reporting objectives
within Clinical Engineering. The first two
measures are consistent with previously
reported findings by Yadin and Rohe
(1986) and Mullally (2008). The third
measure of clinical engineering
effectiveness, Department Contribution
to Organization Objectives found that
each department goal that was linked to
broader organizational objectives such
as reduced medical errors or instance of
transmission of disease through medical
equipment led to increased positive
patient outcomes at a ratio of 1:1.737.
Only one predictor of quality in terms of
Clinical Engineering Efficiency remained
in the data model from the BEI Survey-
implemented Cost Assessment.
Response analysis indicates a slightly
better than one to one return (1:1.294)
for consistent cost tracking. Though this
survey considered a variety of cost
assessment methods, the overall
findings suggest that there could be
additional benefits from this aspect by
universal application of one cost
assessment system.
Regulatory Reporting represented the
only category of Regulatory Compliance
in the measure of the Level of Quality. In
this regard, results indicate that the
universal distribution of regulatory data
can elevate quality roughly at a rate of
1:1.139. This indicates that for each
single exchange, quality will increase
slightly more than one.
The hospital level of quality in this
model was strongly influenced by
indicators of Clinical Engineering
Effectiveness with individual
contributions from Clinical Engineering
Efficiency and Regulatory Compliance.
However, it is important to note that the
relevance of these measures may differ
when clinicians respond to the same
questions. Also, other questions from
these categories which did not appear
on the survey may contribute to the
final model in some unknown fashion.

ICIS Website:  http://www.icis-biomed.org/

Request for Articles/Comments – If you would like to write and submit an article or have an improvement, idea, or
comment, please submit to: editor@icis-biomed.org

Request for Volunteers – There are many more opportunities if you want to offer your time and expertise to the
Intermountain Clinical Instrumentation Society, please submit to: volunteer@icis-biomed.org

Cont. Pg 7
# Murphy's Laws of Biomed

## Anything that Can Go Wrong, Will Go Wrong.

<table>
<thead>
<tr>
<th>For each and every action, there is an equal and opposite reaction.</th>
<th>The serial number is always on the back, at the bottom, and there isn’t any light.</th>
<th>The one day you wear a tie will be the day you will have to solder something.</th>
<th>If you are wearing good pants, you have to crawl around on the floor to fix something.</th>
<th>The legibility of a service report is inversely proportional to your need to read it.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast, Cheap, Accurate. Pick two.</td>
<td>Your not as smart as you think you are.</td>
<td>Whichever cleaner you use will remove the coating from a control panel.</td>
<td>If you have no problems, then you have no clue to what is going on.</td>
<td>Multi-million dollar technology is worthless in the hands of morons.</td>
</tr>
<tr>
<td>The Joint Commission always finds the one item out of 10,000 tested that you could not find to perform a PM.</td>
<td>When all else fails, read the instructions.</td>
<td>You are always doing something marginal when the boss drops by your desk.</td>
<td>Getting the job done is not an excuse for not following the rules.</td>
<td>If you are not thoroughly confused, you’ve obviously missed something.</td>
</tr>
<tr>
<td>There’s never an empty locker in the surgery dressing room.</td>
<td>No matter how detailed the tech support FAQ is, nobody has ever heard of your problem.</td>
<td>Your desk is a great place to stack stuff while you are on vacation.</td>
<td>Your merit increase will always be less than the increase in the parking fees and cafeteria food prices.</td>
<td>The more urgent the failure, the thicker the tech support’s accent.</td>
</tr>
<tr>
<td>The company whose website you need to download the critical patch will be blocked by your hospital’s porn filter.</td>
<td>Whenever there is a crowd watching your every movement, the problem is always something you have never seen before.</td>
<td>The Biomed Shop is always in the basement, has no cell phone coverage, and shares a common wall with the employee dumpsters (Duke).</td>
<td>Slog all day and no-one notices, take a 5 minute breather to play Windows’ Solitaire and the boss silently appears behind you.</td>
<td></td>
</tr>
</tbody>
</table>

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Five Structural Complexity predictors of the organization culture, level of coordination, and interdepartmental device management were found to positively contribute to the explanation of Process Adequacy and the Level of Quality in the hospital EC while Interdepartmental Work was held constant in the model (Table 2, pg 11). They were Uniform Standards, Inter-Professional Training, Coordination Evidence, Appropriate Professional Training, and Device Failure Recognition. These indicators are derived from Organizational Culture, Level of Coordination, and Interdepartmental Medical Device Management known in literature as elements that help define the structural characteristics of an organization. Table 2 lists the frequency and distribution of the statistically significant variables that were used in the final model.

Process Adequacy, an intervening latent variable, had four indicators that were found to positively contribute to the explanation of Level of Quality (Table 3, pg 11). With Available Operational Equipment (“I receive and/or provide clean, operational equipment in a timely fashion”) held constant, the were Regular Meetings (“Nursing and biomedical engineering conduct regularly scheduled meetings on equipment issues”), Equipment Purchasing Involvement (“I receive an/or provide advice on the new equipment purchases”), Formal Equipment Training (“I receive and/or provide training on the proper way to operate equipment”), and Formal Department Information (“I have access to formal knowledge within the department”). These indicators are comprised of elements known to contribute to work process flow and are derived from Knowledge Management, Interdepartmental Teamwork, Communication, and Collaboration concepts. Table 3, pg 11, lists the frequency and distribution of the statistically significant variables that were used in the final model.

Some interesting findings that were not in the model include the elimination of the variables in the study for Medical Equipment Complexity and Complexity of Sanitation Methods because of the lack of testable variation, due to the similarity of response that did not allow for the analysis of the data using normal distribution methods. Although the increase in the use of technology in medical equipment and the development of new sanitation methods that are moving away from typical manual methods have been topics of interest in the clinical community, they could not be tested in this model. One element of Clinical Engineering Effectiveness—Management Integration (“Biomedical engineers are integrated into facility management (e.g., Central Sterile, Infection Control, Management Information Systems)” was tested for statistical significance but the data distribution was not normal. However, future analysis of these and other items that were eliminated in this model using nonparametric techniques under the Poisson distribution may reveal further results.

In summary, the BEI Survey results were analyzed in the SEM model and indicated that the clinical and/or biomedical engineering department can help to increase the overall hospital level of quality. A review of the various predictors shown in this study has the potential to reveal multiple action items that can be applied in the EC to increase quality. The frequency and cumulative distributions listed for those items that appeared in the final SEM model can be used as a guideline to help determine changes that may impact your department significantly. Some of these items include the incorporation of weekly meetings between nursing and BMETs in order to discuss equipment issues, determining equipment training requirements for clinicians and BMETs, budgeting for Original Equipment Manufacturer manuals, and creating opportunities to identify conflicts in regulatory and/or organization objectives that will help reduce systemic errors.

Cont. Pg 9
Allen Burnside began his career in the 1970s working as a Biomedical Technician within the Biophysics department at LDS Hospital. These were the early days before many hospitals even had Biomeds and the Biophysics Team performed several medical research projects, developing the predecessor to today’s HELP system, hemodynamic monitoring, cardiac output technology and installing & maintaining all computers & printers before Information Systems was even an entity. Many of these projects were affiliated with the University of Utah utilizing graduate students that rotated through the department. Dr. Homer Warner was the Director of this Biophysics program and was assisted by Dr. Alan Pryor, Dr. Paul Clayton, Dr. Reed Gardener, Peter Haag and many others whose work has had such a huge impact on healthcare as we know it today in Utah and beyond. As the utilization of medical equipment continued to grow in our hospitals, the workloads grew along with the Bioinstrumentation department. William Hawley became the Team Leader in the late 1970s of this Biomed group, where Allen began specializing on anesthesia and ventilator maintenance and all of the new technology coming into our Respiratory Therapy areas. Other Team members of Bioinstrumentation group back then included Dallas Clark, Steven Lewis, Ray Tsuchida, Ted Laveder, Richard Dorrans, Noel Shuldber and many others. During the early 1980s of Bioinstrumentation, the team still installed and maintained all computers, printers, patient care equipment, as well as pulling all the data cables throughout the entire hospital, which included managing all the computer mainframe I/O ports. During the mid 1980’s, the Bioinstrumentation department changed their name to Clinical Engineering. Information Systems began evolving at that point and became a separate department covering computer mainframes, PCs, printers, embossers, barcode readers and telephones. Allen continued learning all the latest technology emerging in our Surgery and Respiratory care areas and has continued serving these areas his entire career, as well as developing new technologies needed in hyperbaric medicine. Allen Burnside’s last day with UCR Clinical Engineering was 4-1-11 and we all wish him the best as he enters this new chapter in his life. He really can’t be replaced easily and will truly be missed by everyone that has ever worked with him over the 40 years he’s been in this field. Good Luck Burny! ✍

Dallas Clark CBET – Director of Urban Central Region Clinical Engineering – Intermountain Healthcare.

In Recognition: The ICIS Board wishes to congratulate Allen on a stellar career
Complete SEM statistical regression analysis of the BEI survey data are reported in Miss Fiedler’s dissertation titled, “Effects of Hospital Structural Complexity and Process Adequacy on the Prevalence of Systemic Adverse Events and Compliance Issues: A Biomedical Engineering Technician Perspective”. She successfully defended her research on July 6th in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Doctoral Program in Public Affairs in the College of Health and Public Affairs at the University of Central Florida. Graduation is scheduled for Aug 6th. Since the questionnaire was found to be statistically reliable, she plans to use the instrument on clinical professionals such as nursing and quality personnel in order to perform individual and comparative analysis across professions. Subsequent journal articles are expected to be released that indicate greater analysis detail of results.

*The survey questions held constant were based on preliminary analysis that showed that they had significant but the least contribution to explanation of the study variables of Structural Complexity, Process Adequacy, or the hospital Level of Quality.

Acknowledgements: I would like to extend my personal thanks to the BMET community for taking the time to complete the survey. In particular, Mr. Patrick Lynch, Biomedical Support Specialist at Global Medical Imaging in Charlotte, NC for providing a national personal contact list from which I was able to draw participants.

References


Evidence-Based Maintenance
How to Evaluate the Effectiveness of your Maintenance Strategies

What is your definition of PM?

- Preventive Maintenance (or Preventative Maintenance)
- Predictive Maintenance
- Planned Maintenance or Proactive Maintenance
- Percussive Maintenance: the fine art of whacking the crap out of an electronic device (or anything else) to get it to work again. (Manny Roman, DTEC Ink)

How do you convince surveyors that your maintenance program is effective?

- Adopted “risk”-based inclusion criteria
  - Good intentions (plans) do not guarantee good results (outcomes)
- PM completion per TJC requirements
  - Most “PMs” do not prevent failures but only find failures that already occurred. Process # outcome.
- Fast repair turnaround time
  - Depending on mission criticality and the availability of back-ups, some failures and turnaround times are NOT acceptable to users
- Repeat work orders < certain threshold
  - Reasonable threshold depends on the type of failure
- Failed PMs < certain threshold
  - idem

Good News and Bad News

- Good News
  - No significant changes to TJC Med Equip Mgmt standards from 2010
- Even Better News
  - CMS accepted TJC standards in lieu of “according to OEM recommendations”
- Bad News
  - Both CMS and TJC are going to scrutinize more carefully maintenance programs (strategies)
  - How do you prove your non-OEM maintenance strategy is not shortchanging patient safety?!

A. Maintenance Strategies Comparison

Two ways to compare maintenance strategies:

- Data from different sites (lateral comparisons)
  - Advantage: no need to wait for data collection (assuming the same failure codes are adopted)
  - Disadvantage: there could be differences in brand/model and/or accessories, user care, etc.
- Data from same site (longitudinal studies)
  - Advantage: no differences in brand/model and/or accessories, user care, etc.
  - Disadvantage: need to wait for data collection

Using Failure Codes Data

- Analyses performed in two ways:
  A. Comparing data obtained using different maintenance strategies within each equipment class -> determine effectiveness of maintenance strategies
  B. Considering all data for each class of equipment (regardless of maintenance strategy adopted) -> evaluating the effectiveness of CE activities, comparing current activities (SPI/PM, repairs, etc.) versus potential activities (i.e., impact of CE on equipment failures)

Binseng Wang
Clinical Technology Services

For the complete slide presentation:
Please visit our website: http://www.icis-biomed.org/
Table 2: Frequency and Distribution of Structural Complexity Predictors in the Biomedical Engineering Interdepartmental Survey

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Ordinal Response Scale</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdepartmental Work*</td>
<td>Strongly Agree</td>
<td>97</td>
<td>30.6</td>
</tr>
<tr>
<td>&quot;I receive and/or provide interdepartmental input in order to successfully complete work.&quot;</td>
<td>Agree</td>
<td>170</td>
<td>56.2</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>24</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>16</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>2</td>
<td>.8</td>
<td></td>
</tr>
<tr>
<td>Uniform Standards*</td>
<td>Strongly Agree</td>
<td>55</td>
<td>17.4</td>
</tr>
<tr>
<td>&quot;Standards are applied equally across all departments.&quot;</td>
<td>Agree</td>
<td>110</td>
<td>34.7</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>46</td>
<td>14.5</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>83</td>
<td>26.2</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>23</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>Inter-Professional Training</td>
<td>Strongly Agree</td>
<td>96</td>
<td>30.3</td>
</tr>
<tr>
<td>&quot;The organization values contributions to other staff members’ professional development.&quot;</td>
<td>Agree</td>
<td>162</td>
<td>51.1</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>35</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>17</td>
<td>5.4</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>7</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>Coordination Evidence</td>
<td>Strongly Agree</td>
<td>94</td>
<td>29.7</td>
</tr>
<tr>
<td>&quot;Inter-departmental coordination has resulted in usable positive benefits.&quot;</td>
<td>Agree</td>
<td>150</td>
<td>47.3</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>51</td>
<td>16.1</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>20</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>2</td>
<td>.8</td>
<td></td>
</tr>
<tr>
<td>Appropriate Professional Job Training</td>
<td>Strongly Agree</td>
<td>72</td>
<td>22.7</td>
</tr>
<tr>
<td>&quot;I have been provided clear training to perform my job function.&quot;</td>
<td>Agree</td>
<td>165</td>
<td>53.0</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>44</td>
<td>13.9</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>30</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>3</td>
<td>.9</td>
<td></td>
</tr>
<tr>
<td>Device Failure Recognition</td>
<td>Strongly Agree</td>
<td>55</td>
<td>17.4</td>
</tr>
<tr>
<td>&quot;I received training to recognize medical device failure.&quot;</td>
<td>Agree</td>
<td>187</td>
<td>59.0</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>45</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>25</td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>5</td>
<td>1.6</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Frequency and Distribution of Process Adequacy Predictors in the Biomedical Engineering Interdepartmental Survey

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Ordinal Response Scale</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available Operational Equipment*</td>
<td>Strongly Agree</td>
<td>83</td>
<td>19.9</td>
</tr>
<tr>
<td>&quot;I receive and/or provide clean, operational equipment in a timely fashion.&quot;</td>
<td>Agree</td>
<td>181</td>
<td>47.4</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>52</td>
<td>13.8</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>21</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>4</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Regular Meetings</td>
<td>Strongly Agree</td>
<td>28</td>
<td>8.8</td>
</tr>
<tr>
<td>&quot;Nursing and biomedical engineering conduct regularly scheduled meetings on equipment issues.&quot;</td>
<td>Agree</td>
<td>95</td>
<td>30.0</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>46</td>
<td>14.5</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>101</td>
<td>31.9</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>47</td>
<td>14.8</td>
<td></td>
</tr>
<tr>
<td>Equipment Purchasing Involvement</td>
<td>Strongly Agree</td>
<td>79</td>
<td>24.9</td>
</tr>
<tr>
<td>&quot;I receive and/or provide advice on new equipment purchases.&quot;</td>
<td>Agree</td>
<td>147</td>
<td>46.4</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>36</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>38</td>
<td>12.0</td>
<td></td>
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<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>17</td>
<td>5.4</td>
<td></td>
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<tr>
<td>Formal Equipment Training</td>
<td>Strongly Agree</td>
<td>74</td>
<td>23.3</td>
</tr>
<tr>
<td>&quot;I receive and/or provide training on the proper way to operate equipment.&quot;</td>
<td>Agree</td>
<td>178</td>
<td>50.2</td>
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<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>41</td>
<td>12.9</td>
<td></td>
</tr>
<tr>
<td>&quot;Disagree&quot;</td>
<td>18</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>&quot;Strongly Disagree&quot;</td>
<td>6</td>
<td>.9</td>
<td></td>
</tr>
<tr>
<td>Formal Department Information</td>
<td>Strongly Agree</td>
<td>97</td>
<td>30.6</td>
</tr>
<tr>
<td>&quot;I have access to formal knowledge within the department.&quot;</td>
<td>Agree</td>
<td>189</td>
<td>53.3</td>
</tr>
<tr>
<td>&quot;Neither Agree or Disagree&quot;</td>
<td>39</td>
<td>12.3</td>
<td></td>
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<td>&quot;Disagree&quot;</td>
<td>9</td>
<td>2.8</td>
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</tr>
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<td>3</td>
<td>.9</td>
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Landscape Changing for Medical Devices:

2011 has the potential to be a game changer for the medical technology field. Whether it’s the implementation of a sweeping new standard on network risk management or the FDA looking at how it reviews products coming to market, there is already a host of issues that are coloring the year, promising to challenge both the makers and users of medical devices.

It’s hard to say how many of these issues will play out, but it’s apparent there’s one common theme – change. Whether you’re a biomed or manufacturer, a regulator or one of the regulated, a researcher or a technician, you’ll find a changing landscape this year.

Here’s a Look at, the AAMI News, top issues for 2011:

1. 510(k) Pathway and User Fees - FDA is reviewing comments on its recommendations to change the 510(k) premarket notification process — the pathway to market for more than 90% of medical devices sold in the United States. The proposed changes stem from concerns that some medical devices get to market without sufficient scrutiny.

2. Implementation of 80001-1 - 80001-1 focuses on the application of risk management for IT networks that incorporate medical devices.

3. Fire Safety Standard Nearing Approval - The NFPA standard for healthcare facilities — NFPA 99 — is expected to be approved in September 2011. The standard establishes the criteria for how to minimize the hazards of fire, explosions, and electrical accidents in healthcare facilities. The standard also includes requirements for testing medical devices.

4. Tackling Tubing Misconnections - The standard provides a clear pathway on how to ensure safety, and make sure your device won’t interconnect with a device it wasn’t intended to.

5. Alarming Trends with Alarms - Alarm systems warn caregivers of danger to the patients, but sometimes alarms can malfunction, be accidentally turned off, bypassed, or even ignored by clinicians.

6. Infusion Devices - In 2011, AAMI will continue to implement the findings from an unprecedented summit in October on improving the safety of infusion devices.

7. ‘Meaningful Use’ of EHRs Begins - 2011 marks the first stage of a government program to get hospitals and physician offices to implement electronic health records (EHR) into their everyday practices. In 2015, hospitals will have to integrate medical devices with EHRs. For more information on the meaningful use requirements.

8. Convergence of CE and IT - Throughout this year, CE and information technology (IT) professionals can expect to see their responsibilities and roles blur together.

9. Creating a Core Curriculum - AAMI is looking into developing its own core curriculum for use by any biomed program.

10. Naming the Profession - It may seem like a small thing, but having a uniform name for the biomed profession can lead to big dividends in getting the profession noticed and appreciated.

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Intermountain Clinical Instrumentation Society
Equipment Training: do it now to save later

William Gulley is the executive director for Axess Ultrasound, an Indianapolis-based company that provides comprehensive ultrasound services, including parts, equipment, service, and training.

Sending technicians to a proper training class shows the value the organization sees in its technicians and demonstrates a level of commitment to career development...

It’s well known that proper imaging equipment maintenance will extend the usable life of equipment, increase revenue generating uptime and decrease the total cost of ownership. The question then becomes, what is the most cost-effective method to develop qualified technicians to maintain the equipment at peak efficiency? Technical training provides clinical engineering departments the skills and techniques needed to maintain and preserve the equipment. Properly trained technicians ensure patient safety by maintaining equipment to operating specifications and assist in compliance with all relevant accreditations. Benefits of training include:

1) Recognize potential issues before they become problems. Technicians trained to perform preventative maintenance can recognize issues before they become catastrophic events. For example, trans-esophageal transducers (TEEs), used in cardiac imaging, have potentially high repair costs. Properly trained technicians can detect early signs of damage due to improper use or storage. If caught in time, the device can then simply undergo low-level repair, instead of requiring a costly complete rebuild.

Cont Pg 15
2) Repair, don’t replace. Trained technicians develop troubleshooting abilities narrowing issues down to one or two areas. They can diagnose, determine parts requirements and repair the issues themselves, thereby reducing or even eliminating OEM service calls. This increased internal capability will save the hospital thousands, even hundreds of thousands of dollars, on potential equipment replacement costs. A new ultrasound machine, for example, may cost upwards of $150,000 to replace.

3) Increased uptime. A medical device exists for two very specific purposes inside a hospital. The first is patient care; the second is to generate revenue. Every day a piece of equipment is out for maintenance is a day not spent generating revenue. A well-trained technician with the ability to diagnose and repair equipment internally significantly reduces downtime, allowing for higher patient throughput and more revenue for the organization.

4) Patient safety. This is arguably the primary purpose of all equipment maintenance. Compromising patient safety can expose the organization to many risks. Beyond possible litigation, when equipment is not in working order or maintenance of the equipment is improperly documented, your organization may fall out of compliance with regulatory agencies such as The Joint Commission.

Getting the training you need, even with tight budgets

Department managers and other administrators must provide more services with fewer resources. Hospitals recognizing the value of proper training must not only budget for the cost of training, but also budget for travel to attend the training. Understandably, “free” training seems like an attractive option. Of course, there’s often a catch. While many of these courses can increase a technician’s knowledge, it’s unlikely they’re being provided for altruistic reasons. In many cases, they may be used to advance areas of the provider’s business, such as parts sales or repair contracts. Quality training teaches the technicians troubleshooting techniques as well as preventative maintenance steps to reduce the dependence on OEM service contracts and service calls.

What to look for in a training program

A technician’s work is not limited to looking up items in a service manual. A good technician works with his hands and figures out solutions to the problems presented to him. Therefore, you should look for a hands-on training program—if the training is book-only, it won’t be complete. Also, don’t overlook the experience of the trainer. During your conversations with the training provider, be sure to ask about the trainer’s qualifications.

Helpful questions include:
- Is the trainer a current or former technician?
- How many training classes has the instructor conducted?
- How many years experience does the instructor have in the service field?

Training as a retention tool

All businesses measure costs and their impact on budgets. However, a stealth area of increased costs exists inside a clinical engineering department that does not show up clearly on a budget analysis: turnover. There are real and tangible costs to losing a valuable technician, such as increased workload on others causing overtime, recruiting costs, basic orientation costs, and the hardest cost to calculate—a reputation inside the industry as a department to be avoided by qualified technicians. Sending technicians to a proper training class shows the value the organization sees in its technicians and demonstrates a level of commitment to career development recognized and valued by technicians.

Training as an investment

Training the clinical engineering department generates significant ROI. That’s good news to the financial experts at a facility, so a manager must understand how to speak the language when discussing the value equation for training. The ROI is based on the revenue lost (or cost avoided) if that equipment is not available for revenue generation or the cost of replacing a technician. The calculation for ROI is:

\[
\text{ROI} = \frac{\text{Revenue lost} - \text{Training Costs}}{\text{Training Costs}} \times 100
\]

An example of this calculation demonstrates the ROI on a hypothetical training class. The tuition for the class is $2,000 and a day’s lost revenue for the device is $10,000. The ROI for just one instance of reducing the downtime on a device one day is:

\[
\text{ROI} = \frac{\$10,000 - \$2,000}{\$2,000} \times 100 = 400\%
\]
An ROI of 400 percent will convince the most stringent financial professional that training is worth the investment in the organization.

In summary, proper training provides benefits addressing numerous pain points inside a department:
- Recognizing issues before becoming significant problems
- Repairing not replacing
- Increased uptime of devices
- Patient safety

Training brings other tangible benefits to the department such as increased technician retention and an ROI a hardened financial professional will appreciate. Conduct due diligence, research the content and understand the training philosophy of the provider to ensure all the areas needed for your department are addressed to immediately improve your department. Training exists to help you; please ensure it does.

24x7 – Feb 2010:

A Tall Order – Joe Divito Director Clinical Engineering Jordan Valley and Pioneer Valley Hospitals – Iasis Healthcare (pictured)

Discusses meeting increased demands through talent and hard work

Recognition:

- Have you been recognized in a national publication?
- Have you written an article and been published in a periodical, magazine or journal?
- Is your team providing extraordinary care within your facility or organization?
- Is an individual on your team providing exemplary service or initiated an improvement idea that you feel should be recognized outside the scope of your management?
- Are you aware of a recognizable event or article that may not be your own?

Don’t miss an opportunity to recognize you co-workers

Like Joe Divito above, the ICIS Newsletter is a great place to be recognized and to recognize those on your team.

Please submit your recognition article to: editor@icis-biomed.org
Biomed and CE
the Tools I Highly Recommend
by Dustin Telford CBET, CRES, CLES

Information and tools are often hard to come by in this profession. Biomed and clinical engineers struggle with simply obtaining service manuals. When it comes to managing healthcare technology, we need resources at ready disposal to navigate our day-to-day, varied roles and responsibilities.

Thanks to many colleagues input over my twenty years in the field, I would like to share the following five resources which I find useful, sometimes invaluable in my career.

As you read my recommendations, I am sure you will have others to add. Consider sending your recommendations directly to webteam@icis-biomed.org so that we may include them in our site.

Best Way to Advance Yourself and Support the Biomed / CE Career Field

Here is a shameless plug for getting involved. If you are not a member – an active member – of one Biomed or Clinical Engineering association, you are doing yourself and your profession a disservice.

I have had the pleasure of working with many different personalities in this field. With so much talent and diversity of opinion and backgrounds in our field, we can only make it better by contributing to our community.

Best Safety and Equipment Evaluations

The ECRI Institute
(www.ecri.org)

With so many unique devices in your medical equipment inventory, the best way to keep up on the risks and implement new technology is undoubtedly The ECRI Institute. Healthcare technology managers would benefit to know what I affectionately call the consumer reports for medical equipment. ECRI collects recalls and alerts from sources such as the FDA, UK Medical Devices, equipment owners, and manufacturers. ECRI does a lot more such as providing capital equipment planning and assessment guidance, consultation, and evaluation tips.

Best Publications Resource and Annual Conference

The Association for the Advancement of Medical Instrumentation
(www.aami.org)

With a large collection of standards and publications ranging from computer maintenance management systems to clinical engineering handbooks, AAMI offers Biomed and Clinical Engineers a great center for resources. The Annual Conference and Expo is well worth the expense if one wants to understand the evolving field and develop a rich network of contacts from various organizations.
**Best All-Around Trade Publication**

24 X 7 Magazine  
([www.24x7mag.com](http://www.24x7mag.com))

With a simple yet great site, an e-mail newsletter, and the print publication, 24 x 7 provides insightful articles on studying for the CBET, preparing for The Joint Commission, and spotlighting practices from biomed teams around the country. There are other notable mentions in this category such as Technation ([www.1technation.com](http://www.1technation.com)), Biomedical Instrumentation & Technology ([www.aami.org/publications/bit](http://www.aami.org/publications/bit)), and The Journal of Clinical Engineering ([www.journals.lww.com/jcejournal](http://www.journals.lww.com/jcejournal)).

**Best Biomed / CE Support Network**

BiomedTalk-L  
([www.ecri.org/biomedtalk](http://www.ecri.org/biomedtalk))

With members from all other the planet who share common problems, BiomedTalk stands out above the rest. If you need a readily accessible response on just about any healthcare technology management topic, you can’t go wrong by joining BiomedTalk. BiomedTalk offers responses to your technical questions, exchanges on medical equipment management plans, and job opportunities. There are lively debates on the issues of licensure, best practices, and the value of certification. One may sign up for a digest of the daily topics or immediate e-mails delivered on each post. If BiomedTalk interests you, you may find ImageTalk ([www.medicalparts.org/imagetalk.htm](http://www.medicalparts.org/imagetalk.htm)), Technation ([www.1technation.com](http://www.1technation.com)), and AAMI ([www.aami.org/communities](http://www.aami.org/communities)).

**Best Education Delivered to Your Door**

American College of Clinical Engineering  
Teleconference Series  
([www.accenet.org](http://www.accenet.org))

With the constraints of shrinking budgets and an expansive list of roles we hold in the healthcare field, the ACCE delivers excellent web and teleconferences throughout the year. This last teleconference year, the ACCE doubled their hour-long session adding a CE-IT track. While some other associations at this level do deliver great presentations, the ACCE delivers relatively inexpensive, professional content on timely, and sometimes, timeless topics such as managing your budget, new paradigms in scheduling maintenance, and understanding roles in information technology.

**Best Current Biomed and Clinical Engineering Desk References**

Biomed: A Practicum for Biomedical Engineering and Technology Management Issues, Les Atles ([www.amazon.com](http://www.amazon.com))


Whether due to personal or organization budget constraints, I recommend that these two books are your first picks for overviews and specifics on a variety of Biomed and CE topics. The information is as up-to-date as one can find right now in this evolving field, both books have contributions from leaders in our industry, and the writing is fluid and easy to read whether you are new to the field, mid-career, or consider yourself a battle-scarred healthcare technology management veteran.
On Point with ICIS
Coming Soon!

The Joint Commission Blotter – Updates from recent facility inspections, new NPSG (National Patient Safety Goals) applicable to CE and Sentinel Event Alerts.
1. Who was inspected in 2010? – Share your experience
2. Who is up for inspection in 2011? – We will look for your feedback
3. How has your institution managed the Joint Commissions Alert 42?

From The Front Line – Input from your front line CE staff
1. Tech tips/Device Troubleshooting Advise
2. Training Needs
3. Forums

Joint Commission Blotter
Joint Commission Survey Timeframe Change

Full Survey Timeframe to change from 39 to 36 months for accreditation
Effective January 1, 2011 for all accreditation programs (except the laboratory program) The Joint Commission will conduct an organization’s full survey within 36 months instead of 39 months after its previous full survey. For example, if an organization’s last survey was June 15th, 2010, the survey window now would be between December 15, 2011, and June 15th, 2013. This change is being made in accordance with the Centers for Medicare & Medicaid Services’ requirement for surveys conducted for home health care agencies, advanced diagnostic imaging facilities and DMEPOS (durable medical equipment, prosthetics, orthotics, and supplies) providers; The Joint Commission is making the change to most accreditation programs in order to maintain consistency in the timing of the survey window. Information collected by The Joint Commission about an organization (for example, Priority Focus Process data, accountability performance measures and complaints) contribute to the determination of the time frame for the organization’s next full survey. Thus, an organization experiencing more challenges than others in the same accreditation program may have a survey scheduled earlier.

Recent Surveys - LDS Hospital - March 2011
As far as the Medical Equipment Management portion of the review, the surveyor focus was on the 2010 Annual Evaluation and the Quarterly Safety Report. The surveyor complimented us on both documents, found them well organized, easy to read and understand. She asked about our SR count and how the current age of the equipment affected repair work loads. We mentioned how our data helps us identify capital replacement planning strategies. She was also curious as to our trends regarding the “Abuse”. What is the definition of abuse, what are we seeing and where does it seem to be happening the most in the facility. We were not requested to provide SR & PM data regarding any specific devices, she seemed satisfied with the overall summary reports that stated facility-wide data.

Dallas Clark – Urban Central Region Director, Intermountain Healthcare