Hospitals face many challenges today, including the financial challenge of planning for the acquisition and/or replacement of their equipment. Decisions to replace medical devices are often subjective. Hospital administrators, medical staff, purchasing, capital development, and clinical engineering all provide input into recommendations to purchase and/or replace equipment based on several factors. Recommendations may then be adjusted by factors deemed more political, financial, and/or perceptual. As a result, we have a list of equipment targeted for replacement based largely on perception rather than factual data. This process can be made less subjective by assessing the existing inventory, assigning a score to each criterion, and then presenting it in order of replacement priority. From this, an estimate of capital funding, justification of items already perceived to be at end-of-life, and high-priority items for replacement, can be objectively identified.

Many institutions are currently faced with a reduction in funding or revenue. In these scenarios, it is not unusual to see processes of contingency funding where equipment requests are individual and based on merit. For departments that participate in this kind of process, a list accurately indicating the priority of replacement is invaluable. Senior leaders and administrators look for this and appreciate the assistance it provides for decision making. To date, several systems have been devised that incorporate quantitative and qualitative analysis to determine priority. These include scoring systems and elaborate schemes that utilize equipment databases and other information sources. The success of these systems varies based on the complexity and relevance of information. If the techniques are too complex, it would be difficult to manage, maintain on an ongoing basis, and to minimize bias.

When considering a comprehensive planning technique, the resulting information must be easy to understand and navigate. The merits of simplicity can be appreciated when one considers the resources required to accomplish a detailed analysis. Engaging the services of clinical engineering provides the best alternative. By leveraging the data contained in their equipment database, objective and defendable recommendations can be made.
This article will describe the specific criteria developed to create a tool for Hamilton Health Sciences (HHS) in Hamilton, Ontario, a major academic teaching hospital, to review its existing equipment and to make recommendations for the acquisition of replacement items.

**Building Criteria**

When deciding on equipment for replacement, ECRI Institute recommends considering factors such as use, physical condition, risk, and failure/repair history. They also recommend that only qualified individuals assess the condition of medical devices. These include clinical engineers, nurses, and physicians. Clinical engineering is best suited to assess most items because they have both technical and clinical knowledge. The process described in the case study utilizes this valuable resource.

Presenting the data in a format that is easy to understand has been done before. An early pioneer in this regard is Larry Fennigkoh, PhD, CCE. He developed a scheme recommending and prioritizing equipment using a numerical output. Similar to the case study with this article, he warns that these models should not be used as absolute measures of replacement needs. They are simply frameworks or starting points for further evaluation and scrutiny. For example, from a subjective standpoint, two devices may appear to have equal justification for replacement. A prioritization scheme will, in most cases, distinguish the two. This is the influence such a scheme provides to decision makers. Prioritizing “all” devices provides a means to relate each device among the rest for importance of replacement.

A combination of several factors must be taken into account in order to provide an accurate assessment. Some have assigned “current replacement cost” as a factor. That information is not commonly maintained in an equipment database and therefore requires the task of working collaboratively with purchasing to obtain replacement quotes for all items on the list. Alternatively, using existing price values from the equipment database is close enough to determine category, urgency of funding, and priority.

Items with higher capital value should be flagged sooner since obtaining funding for these items may be particularly challenging. Higher capital values usually indicate higher levels of relative importance. Occasionally, a certain amount of funding is allocated to specific areas for capital. In these cases, a cumulative or accrued price value is beneficial. For those areas, it is just a matter of submitting all items from the top of the prioritized list down to the accrued amount that matches the allocation.
Conversely, you can set your “cut-line” below the top 20 items. The resulting amount (and its related devices) could roughly be a first pass request or starting point.

When these priorities are presented, it is a good idea to segment the lists by price group based upon an institution’s processes to obtain funding based on the acquisition cost. For example, items under $15,000 or over $100,000 may require that requests be sent to different committees.

Equipment condition is an accepted factor in most replacement prioritization schemes and is understandable to most non-technical individuals (primarily healthcare executive and finance). For example, a score of 1 to 5 would satisfactorily represent the range of condition descriptions such as very good to very poor. Very poor would usually indicate either an unsafe or poor performing device.

Support or product discontinuation is an important and well-accepted factor in determining priority. This criterion is the most labor intensive as vendors must be contacted or searches performed for letters indicating end-of-support dates. Some organizations stretch capital dollars by continuing to maintain equipment after product support has ended. This is done if aftermarket parts are readily available or if there are ample numbers of decommissioned units. This practice is acceptable but only for short periods. It should not hinder a program’s need to plan sensibly and to stay current. If funding is an issue now, it is likely not going to get better later. Therefore, it is prudent to avoid this scenario where possible.

Age and vendor support are likely more relevant than a standardized lifespan indicator. Although an important criterion, “condition” may be too difficult to determine accurately. Therefore, age in years of a device becomes an important factor because components may fail based on wear and age.

Lifespan has been a factor included in several techniques. Many consider this an exclusive indicator to prioritize equipment for replacement or to date its removal. However, it may not be clear as to what a piece of equipment’s actual lifespan is. Organizations such as the American Hospital Association (AHA) and the American Society for Healthcare Engineering (ASHE) publish this data for guidance. To determine a replacement date, some advocate adding a standard lifespan figure to the date of manufacture. The problem with this approach is that, again, we really do not know the actual lifespan of a device.

It is proposed here that vendor support life is a key factor in prioritizing replacement. Today’s technology rarely allows for sustaining technologies with discrete or off-the-shelf components. The ability of the item’s vendor to support the product’s use, service, and parts availability determines the practical life expectancy.

Most certified public accountants use a seven-year recovery period for medical and dental equipment. This is used to claim the value of depreciation in any given year within the recovery period. It offers little leverage for the replacement of equipment.

Other factors determining lifespan include identifying how the device is used, how much it is used, the quality of the product, whether it remains supported by the vendor, and whether it is similarly efficacious to new products on the market. Increased efficacy or efficiency of new technologies may offer justification to replace. These criteria add an element of subjectivity and are also labor intensive to determine. Separate technology assessment activities should take place specifically to address these issues on the basis of their own merit. It would be unwise to replace equipment because there are new and different technologies out there. These technologies may be more expensive to operate, perform the same (or worse), and may not increase throughput.

Failure rate is also an important factor. Since zero failures are always the users’ objective, replacing equipment may be the best way to achieve no failures. Developing criteria to include the number of repairs and/or hours spent on repair becomes a logical alternative.

Accumulated hours can identify devices that repeatedly cause frustration and consume human resources. The number of biomed or vendor labor hours spent on a device is an indication of the attention the device has required for repair and/or maintenance. Many hours can be spent on a device without parts being replaced. It may also indicate how problematic a device might be. They contribute to increased downtime, increased patient length of stay, and become a burden to the clinical engineering department. Accumulated cost of parts will also raise the red flag. It may be an indication of a poorly chosen device or an expensive device to fix. Continued use may be unjustified.
Risk factors have, in some cases, been used to prioritize equipment for replacement. The risk level of devices in the hospital environment is usually documented in the equipment database. At HHS, it is derived using factors such as function, consequence, lethality, frequency of use, required maintenance, and protective safeguards. A score of 1 to 5 where 5 indicates very serious injury or death may be used. Some use an indicator or weighting factor that takes into account technology-related incidents. This could be too complex for what needs to be done. Also, the incident may add to the score but in reality have no relevance with equipment replacement. Subjectivity must be kept to a minimum.

Whether a device is mission-critical may be a factor. This has been seen in previously published articles using a score of 1 to 5 where 5 relates to a shutdown of service. The level of backup was also considered. These add some complexity and subjectivity. For this reason, they are omitted in this case study as well.1,11

The amount of use or utilization a piece of equipment receives should be proportional to its priority of replacement. More use adds wear and tear, demand for use, and better justifies money spent on replacement.

There are certain factors that are not time-dependent. They are price, labor, parts, risk, and utilization. By eliminating these, a strictly practical method of prioritization can be realized. This might be suitable for those individuals who are more skeptical of the numerical approach and focus only on condition, support, and age.

Using equipment replacement to recruit and retain clinicians has become a common practice among institutions. When capital funds are scarce, this paradox is sometimes the only justification or driver used to replace equipment. Boosting an institution's image might also be a factor. These are political factors and have no place in an objective prioritization scheme and therefore are omitted in the following case study's scoring method.2,4,6

What follows is an examination of the development of a master equipment list for the Perioperative Services Program and a summary conclusion.

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Case Study: Hamilton Health Sciences

Hamilton Health Sciences (HHS) is a teaching hospital affiliated with the McMaster University Faculty of Health Sciences in Hamilton, Ontario. It operates close to 1,000 beds serving approximately 2.3 million people in the region. Specialties include cardiovascular surgery, trauma, neurosurgery, comprehensive children’s hospital, orthopedic surgery, regional cancer centre, long-term rehabilitation, research, and comprehensive geriatric care. The hospital operates four acute care tertiary centers and works with six smaller associate hospitals. The HHS Biomedical Technology department has a staff of 25 (21 biomedical technicians) supporting close to 15,000 devices including equipment in 30 operations rooms at HHS. The operating rooms, along with Same Day Surgery (SDS), and Post Anaesthetic Recovery Unit (PACU), belong to the Perioperative Services Program. This program operates within a $53 million budget treating approximately 24,000 patients per year. The Biomedical Technology Department reports to the director of the Perioperative Services Program and also provides dedicated staff to this program in the way of on-site (satellite) service rooms with biomedical equipment technicians assigned as appropriate.

The issue of capital equipment funding for Perioperative Services required the director to determine the priority of all equipment in the program. This was assigned to the HHS Biomedical Technology Department to investigate. Discussions with the director resulted in an agreement to conduct a comprehensive review of all medical devices including those not supported in-house. Along with this, a method of prioritizing was to be developed and applied to the list as well. The task was completed in about two months and resulted in the creation of what we call the Periop Master Equipment List. This could not have been accomplished without the assistance of the biomedical staff assigned to the ORs.

The Periop Master Equipment List provides replacement priority guidance for the Periop program. It contains 50 fields of information on 1,883 devices. The list was developed as a result of a comprehensive review of the biomedical database records and a physical inventory of devices in the Perioperative Services program. The inventory included a review of the condition of each device. The equipment database was then updated to provide better and more accurate baseline data. The review also included efforts to obtain information from vendors regarding out-of-support dates and information related to prices and acquisition dates. The database was then exported to a spreadsheet file. The simplicity of a spreadsheet is valuable because it is familiar, allows sorting flexibility, and is easily shared. The list is static, unlike a database, and is a snapshot which can be relevant for years because the equipment is already prioritized.

As comprehensive as the initiative was, the list still contained a small number of empty fields. Some of them came from the database and some as a result of difficulties in obtaining information during the review. The sorting function of the spreadsheet allowed comprehensive field-type matching which allowed the completion of many fields based on similar information (device type, manufacturer, model, acquisition date, control number, etc). A very small number of remaining fields required an estimation or best guess in order to complete the list.

The Periop Master Equipment List serves as a simple tool to determine the order of priority based on the criteria used in this document. In order to provide guidance on replacement planning, an indexing scheme called the Priority Index was devised. The Priority Index (PI) is a relative number used to compare the priority of replacement between one device and another among a total of 1,883 devices in the Perioperative Services program. The following values represent information used in the review:

**Priority Index**
The Priority Index (PI) is calculated as follows:

\[ PI = P + C + S + A + L + PT + R + U \]

Where:  
- PI = Priority Index  
- P = Price Factor  
- C = Condition Factor  
- S = Support Factor  
- A = Age Factor  
- L = Labor Factor  
- PT = Parts Factor  
- R = Risk Factor  
- U = Utilization Factor

**Scoring Legend**
Values are translated for scoring as follows:

**Priority index:** Maximum Value = 23.27

**Price factor:** 1 to 5 (5 is highest)

**Condition factor:** 1 to 5 (5 is very poor)
### Support Factor: 1 to 5 (5 is out of support)

- Age factor: 1 to 6 (6 is oldest)
- Labor factor: 0 to 5 (based on relative average hours labor)
- Parts factor: 0 to 5 (based on average parts cost as % cap value)
- Risk factor: 0 to 5 (based on relative risk levels)
- Utilization factor: 0 to 5 (5 is very frequent use)

Factors starting with 1 indicate an absolute value (always something there). Factors starting with 0 indicate possibility of no value.

### Price Factor

Items with higher capital value should be flagged sooner based on difficulty in obtaining funding and also indicates relative importance.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>&gt;$100,000</td>
</tr>
<tr>
<td>4</td>
<td>&gt;$50,000</td>
</tr>
<tr>
<td>3</td>
<td>&gt;$25,000</td>
</tr>
<tr>
<td>2</td>
<td>&gt;$10,000</td>
</tr>
<tr>
<td>1</td>
<td>&gt;$0</td>
</tr>
</tbody>
</table>

### Condition

The current condition of an item indicates possible need for replacement based on function, safety, and efficacy.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>very poor</td>
</tr>
<tr>
<td>4</td>
<td>poor</td>
</tr>
<tr>
<td>3</td>
<td>fair</td>
</tr>
<tr>
<td>2</td>
<td>good</td>
</tr>
<tr>
<td>1</td>
<td>very good</td>
</tr>
</tbody>
</table>

### Support

The ability of the item’s vendor to support the product’s use, service, and parts availability determines the practical life expectancy.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>out of support</td>
</tr>
<tr>
<td>4</td>
<td>nearing end of support</td>
</tr>
<tr>
<td>3</td>
<td>nearing end of manufacturer/sale</td>
</tr>
<tr>
<td>2</td>
<td>supported</td>
</tr>
<tr>
<td>1</td>
<td>fully supported</td>
</tr>
</tbody>
</table>

### Age Factor

Although an important criterion, “condition” may be difficult to determine accurately. The age in years of a device is an important factor because device components may become prone to failure based on wear and age. The maximum factor of 6 was incorporated in order to address the few devices that have extraordinary life spans of greater than 20 years. To include these in a 1 to 5 range would be inappropriate.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>&gt;= 20 yrs</td>
</tr>
<tr>
<td>4</td>
<td>&gt;= 15 yrs</td>
</tr>
<tr>
<td>3</td>
<td>&gt;= 10 yrs</td>
</tr>
<tr>
<td>2</td>
<td>&gt;= 5 yrs</td>
</tr>
<tr>
<td>1</td>
<td>&gt;= 3 yrs</td>
</tr>
<tr>
<td>0</td>
<td>&lt; 3 yrs</td>
</tr>
</tbody>
</table>

### Labor Factor (average hours)

The number of biomed or vendor labor hours spent on a device is an indication of the attention the device has required for repair and/or maintenance. Many hours can be spent on a device without parts being replaced. It may also indicate how problematic a device might be.

It is calculated by taking the life to date hours divided by the age in years and is adjusted to factors of 0 to 5 as follows:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>&gt;4 avg hrs</td>
</tr>
<tr>
<td>4</td>
<td>&gt;3 avg hrs</td>
</tr>
<tr>
<td>3</td>
<td>&gt;2 avg hrs</td>
</tr>
<tr>
<td>2</td>
<td>&gt;1 avg hrs</td>
</tr>
<tr>
<td>1</td>
<td>&gt;0 avg hrs</td>
</tr>
<tr>
<td>0</td>
<td>0 avg hrs</td>
</tr>
</tbody>
</table>

### Parts Factor (% capital cost)

The accumulated cost of parts purchased for the item may be an indication of its replacement priority. To address this, the value is represented as a % of the capital cost and then given a factor of 0 to 5 based on the avg %.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>&gt;4 %</td>
</tr>
<tr>
<td>4</td>
<td>&gt;3 %</td>
</tr>
<tr>
<td>3</td>
<td>&gt;2 %</td>
</tr>
<tr>
<td>2</td>
<td>&gt;1 %</td>
</tr>
<tr>
<td>1</td>
<td>&gt;0 %</td>
</tr>
<tr>
<td>0</td>
<td>0 %</td>
</tr>
</tbody>
</table>

### Risk Factor

The risk level of devices in the hospital environment is usually documented in the equipment database. At HHS, it is derived using factors such as function, consequence, lethality, frequency of use, required mainte-
nance, and protective safeguards. It ranges from 0 to 89 and is adjusted to factors of 0 to 5 as follows:

0 = 0
1 = >0
2 = >20
3 = >40
4 = >60
5 = >80

Utilization Factor (Frequency of Use)

The amount of use a piece of equipment receives is proportionate with its priority of replacement. More use adds wear and tear, demand for use, and better justifies money spent to replace it. The clinical managers were asked to assign a number to each piece of equipment relative to the amount of use it receives (very infrequent to very frequent) as follows:

1 = Very infrequent
2 = Infrequent
3 = Moderate
4 = Frequent
5 = Very frequent

Frequency of use is subjective. The managers were asked to consider the type of device it is. Is its use minimal or excessive based on what it is? Combine that with number of times used in a week. Five times could be considered frequent and once infrequent. More or less might be considered very frequent or very infrequent; something in between can be considered moderate.

Weighting of Criteria (Weighted Index)

The Priority Index number assumes a linear distribution of equally weighted criteria related to importance. If one assumes that this is not so and wishes to apply relative importance to each criterion, the tool is included. There are eight criterions. With equal importance applied to all of them, a portion the equivalent of .125 is assigned to each criterion by default (1/8th). In order to apply weight, each contributing factor (score) is multiplied by this decimal value (e.g., .125). The resulting product becomes the Weighted Contributing Factor (e.g., Weighted Risk). The sum of all of the Weighted Contributing Factors is the Weighted Priority Index (WPI).

The Weighted Contributing Factor is calculated as follows:

\[ \text{Weighted Contributing Factor (WCF)} = \text{Contributing Factor} \times \text{Weight Applied} \]

The Weighted Priority Index (WPI) is calculated as follows:

\[ \text{WPI} = \text{WP} + \text{WC} + \text{WS} + \text{WA} + \text{WL} + \text{WPT} + \text{WR} + \text{WU} \]

Where: WPI = Weighted Priority Index
WP = Price Factor
WC = Condition Factor
WS = Support Factor
WA = Age Factor
WL = Labor Factor
WPT = Parts Factor
WR = Weighted Risk Factor
WU = Weighted Utilization Factor

Weighting Table

Based on a simple survey sent to biomed technologists and the Perioperative program clinical managers, a distribution of weight obtained from 14 respondents, was applied as shown in Table 1. Those surveyed were asked to assign the relative portion out of 100 across the 8 criteria factors. A Weight Multiplier was derived and used as a calculation reference for each of the criteria scores.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Avg</th>
<th>Weight Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk</td>
<td>20.7</td>
<td>0.207</td>
</tr>
<tr>
<td>Condition</td>
<td>18.9</td>
<td>0.189</td>
</tr>
<tr>
<td>Age</td>
<td>13.6</td>
<td>0.136</td>
</tr>
<tr>
<td>Support</td>
<td>16.1</td>
<td>0.161</td>
</tr>
<tr>
<td>Freq of Use</td>
<td>15.4</td>
<td>0.154</td>
</tr>
<tr>
<td>Price</td>
<td>5.4</td>
<td>0.054</td>
</tr>
<tr>
<td>Ltd Parts</td>
<td>5.4</td>
<td>0.054</td>
</tr>
<tr>
<td>Ltd Hours</td>
<td>4.6</td>
<td>0.046</td>
</tr>
<tr>
<td>Total %</td>
<td>100</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Table 1. Weighting Table

Condition, Support, and Age (CSA) Factor Average

There are certain factors that are not time-dependent. They are price, labor, parts, risk, and utilization. By eliminating these, a strictly practical method of prioritization can be realized. This might be suitable for those individuals who are more skeptical of the numerical approach. The remaining time-dependant factors such as condition, support, and age; are used exclusively. It is useful in determining what needs to be replaced regard-
less of its value, work performed, risk level, and usage. It places all devices in order based on the practical wear and tear factors (CSA).

The CSA Factor Average is calculated as follows:

\[
 CSA \ Avg = \frac{C + S + A}{3}
\]

Where:  
- C = Condition Factor  
- S = Support Factor  
- A = Age Factor

Sorting Buttons

The buttons shown in Figure 1 are used to easily sort the spreadsheet. By clicking on the appropriate button, the spreadsheet will sort according to the heading of the associated column. Although the index ranges and decimals are different, this is irrelevant. The indexes are relevant only within their own sorted column.

Accrual Column

An Accrual column appears just right of the price column on the ‘Over $15K Periop - All’ spreadsheet (see Figure 2). This addresses the scenario where a funding amount might be known and you want to find out what devices populate the range between the highest priority index to the accumulated funding threshold point (cut-line). This is a useful tool for areas that are allocated a certain funding amount for capital equipment replacement. The column accrues from top to bottom regardless of which sort button is clicked. Arbitrarily selecting a Priority Index number as a cut-off point can also be undertaken. However, as the list is relative and not absolute, it may be difficult to decide where to place it. Accrual cut-line would be the more legitimate cut-off option.

Accuracy

Initially, the list was used to affirm current notions regarding equipment needing replacement. This provided a method to test its accuracy. In other words, how close to the top would devices that we initially thought needed replacement appear? We selected those items and did the analysis. They included an image guidance system, two lasers, and two electrosurgical units. The exact items appeared in relative positions based on PI index as listed in Table 2. The sequential ranking number (line number on spreadsheet) divided by the total number of devices provides a ratio indicating how close to the top (highest priority) relative to the range between top and bottom. The accuracy indicator is derived by subtracting the average % ratio (2.6 %) from 100%. The result is 97.4 %. This provided the evidence required to trust the criteria and begin analysis.

Correlation of Factors

The criteria studied here are assumed to be independent of each other. For example, if a device was assigned a rating of poor condition, this may exist regardless of risk, age, utilization, support, etc. An old device (high-age factor) may indeed be in good condition. The device’s condition is a subjective judgment. Therefore,
we must apply other criteria to help assign a replacement rating (Priority Index). Additionally, if a device sees much support cost in parts and hours, this again can occur completely independent of any of the other factors. This can occur in something that is old but not exclusively. In other words, if a device’s condition is poor, and other factors are positive, we have to realize that there are likely other devices that may be in poor condition especially in a list of great numbers. If there are other devices that exhibit poor condition but with other factors scoring higher (negative effect), then their Priority Indexes will be higher in relation to those that have the same condition. This explains the relative nature of the process in that we are assessing devices in relation to each other.

There are three factors that might be considered interdependent: condition, support, and age (CSA). They all happen to be time-dependent. If you choose to place emphasis on this distinction, you can prioritize the list in this manner by using the CSA function on the spreadsheet. Again, this is a guide or starting point and therefore may require additional user interpretation and input.

**Data Analysis**

The distribution of data generated by each of the criteria can reveal the current state of the equipment and identify possible trends. By capturing the number of devices within each range and for each criterion, histograms can be derived (see Figure 3). These charts provide a snapshot of the equipment aggregate.

Items of note include the following: Almost 80% of items are valued at $10,000 or under and only 1% (19 devices) are valued at over $100,000. Only 6% are considered to be in poor to very poor condition. However, this represents 108 devices which is not insignificant. Thirty percent are either near or completely out of support from the original equipment manufacturers (OEM); a startling figure considering that it represents 460 devices. Sixty-five percent of all items are five or more years old (over 1,000 items) and 3% are over 20 years old (57 items). Only 8% of items have seen more than 4 hours of repair service per year while 68% have seen none. Only 4% of items have seen greater than 4% of the capital value spent on parts while 71% have seen 0%. Forty-six percent of items are in the category of Risk Factor 2 out of a range of 5 while 13% are seen as Risk Factor 5 (high risk). Eighty percent of items are used very frequently. Overall, the snapshot captures the need for improved and more proactive purchasing in order to catch up with the age and support issues revealed in the analysis.

![Figure 3. Distribution of Scores by Criterion](image)
Summary
It is suggested that clinical engineers take the lead in formulating evaluation processes to recommend equipment replacement. Their skill, knowledge, and experience, combined with access to equipment databases, make them a logical choice.\(^2\)\(^3\)

Based on ideas from Fennigkoh’s scheme, elements such as age, vendor support, accumulated maintenance cost, and function/risk were used.\(^6\) Other more subjective criteria such as cost benefits and efficacy of newer technology were not used. The element of downtime was also omitted due to the data element not being available.

The resulting Periop Master Equipment List and its rationale was presented to the Perioperative Services Program Council. They deemed the criteria to be robust and provided overwhelming acceptance of the list. It was quickly put to use to estimate required capital funding, justify items already thought to need replacement, and identify high-priority ranked items for replacement.

Incorporating prioritization criteria into an existing equipment database would be ideal. Some commercially available systems do have the basic elements of this. Maintaining replacement data can be labor-intensive regardless of the method used. There is usually little time to perform the tasks necessary for prioritizing equipment. However, where appropriate, a clinical engineering department might be able to conduct such an exercise as shown in the following case study.

Acknowledgements
I would like to thank the biomedical technology staff in the operating rooms (Walter Fong, Joe Morgan, Janice Wheeler, Terry Moffatt, Greg Mitton, and Tim Campbell) for their help on the equipment inventory and assessment. Their diligence and attention to detail enhanced the value of the information obtained. Thanks to Leslie Gauthier, director of Perioperative Services for offering up the challenge, her assistance in reviewing the article, and for providing added insight into the process. The clinical managers of the Perioperative Program also were helpful in obtaining information on device utilization and criteria weighting.

References