The Effectiveness of a Program to Reduce the Rate of Flash Sterilization

Julia D. Smart, BA, Stephen M. Belkoff, PhD, MPH, and Simon C. Mears, MD, PhD

Abstract: Flash sterilization of surgical instruments has been a common practice, but patient safety and quality assurance health care groups have recently recommended minimizing its use. Our goals were to describe the implementation and effectiveness of our institution's program for reducing the flash sterilization rate of instruments used for total hip and knee arthroplasties. We reviewed flash sterilization logs of all hip and knee arthroplasties from the program's implementation in July 2009 through August 2010 (N = 555) and calculated the monthly percentage of cases using flash sterilization. From the first to the last month, the amount of flash sterilization decreased significantly ($P < .05$): 6 of 34 to 0 of 41, respectively. Our results show that the rate of flash sterilization can be reduced with this strategic program. Keywords: sterilization, infection control, hip arthroplasty, knee arthroplasty.

Orthopedic surgical site infections are devastating complications, resulting in prolonged initial hospital stays, increased risk of rehospitalization, additional surgical procedures, and increased mortality [1,2]. Furthermore, the cost associated with treating patients who acquire surgical site infections is approximately 4 times that of noninfected patients [2]. An effort to decrease surgical site infections requires controlling many preoperative, intraoperative, and postoperative factors [3]. Flash sterilization may be 1 such factor.

Flash sterilization is a technique that was originally designed as a means of sterilizing items that were needed immediately in surgery but that had not been expected to be used or had become contaminated [4]. However, concerns have been raised that flash sterilization is being overused to compensate for insufficient inventory, to save time, or for the sake of convenience [5]. Although the use of flash sterilization in hospitals has not been routinely monitored, organizations such as the Association for the Advancement of Medical Instrumentation [6], Association of periOperative Registered Nurses [7], and the Center for Disease Control [8] have recently recommended monitoring and reducing the use of flash sterilization, presumably as an effort to remove a potential factor in postoperative infection [9].

In response, our institution developed and implemented a program designed to accomplish this recommendation. The goals of our study were to describe the implementation and effectiveness of this program in reducing the flash sterilization rate of instruments used for total hip and knee arthroplasties at an academic medical center.

Materials and Methods

Program Development

In January 2009, a group of orthopedic surgeons, members from the orthopedic infection control committee, perioperative administrators, operating room coordinators, and individuals from central sterile processing (CSP) formed a committee to address the goal of reducing the use of flash sterilization for instruments used in total hip and knee arthroplasties at our academic medical center. Over the course of several months, the committee identified 5 factors as major contributors to flash sterilization use and delineated specific interventions to address each factor (Table 1). These strategies were implemented on July 1, 2009, and results were evaluated on a monthly basis and conveyed to staff and other groups (eg, orthopedic infection control and quality control).

Program Implementation

On July 1, 2009, we implemented the flash sterilization use reduction program using the 5 general...
strategies developed by our team (Table 1). The first factor, lack of knowledge, was addressed with 3 strategies: collecting data, informing staff, and sharing information. A system for documenting all instances of flash sterilization was introduced. The name of the person sterilizing, the instrument, and the reason for flashing were recorded. The goal to reduce flash sterilization was communicated to the entire team of orthopedic nurses and technicians, and everyone was encouraged to question if flash sterilization of a particular item was absolutely necessary or if an alternative solution existed (ie, using a different instrument). Flash rates were included as part of the orthopedic dashboard and discussed at monthly quality improvement meetings.

The second factor, insufficient inventory, was addressed with 2 strategies: improving communication between the operating room and CSP and prioritizing sterilization. Interventions aimed at the burden of instrument demand involved purchasing more instrument sets/trays and increased use of loaner sets/trays. In general, communication between operating room managers and CSP is absolutely necessary to ensure adequate availability of equipment for the day’s cases. In addition, a method was put in place to enable CSP to prioritize sterilization of equipment that was needed in a timely manner. By anticipating the daily needs of the 4 autoclaves (2 of which are used exclusively for sterilization of camera and scope equipment), CSP was able to increase the overall efficiency of their instrument sterilization process. In addition, if a set/tray needed to be reprocessed for another case that day, it was sent to CSP with a red tag containing information about the case for which it was needed (including room number, surgeon’s name, and surgery start time). However, although prioritization will ensure that the item is not waiting to begin the sterilization process, at least 3 hours must still be allowed for terminal sterilization to be completed for that item. Another intervention was improvement in surgical scheduling, with attention to limitations of instrument inventory. This strategy was achieved by improved communication among operating room managers, CSP, surgeons, and personnel who handle surgical booking. In addition, an electronic “conflict” indicator was created within the scheduling program to notify personnel when more procedures were scheduled than inventory could handle. There was also a comment area in which personnel could specify particular equipment requested by the surgeon (ie, specific vendor trays of a given instrument set) for the procedure to avoid scheduling conflicts for specialized and limited equipment.

The third factor, improper handling of trays resulting in punctures of internal filters or outer packaging, was addressed by 2 main strategies. We examined all of the total joint trays to remove excess and unused instruments to lessen the weight of the trays. Lighter trays produce fewer punctures of the paper wrappers. We also began to replace the wrapped trays with filterless trays so that paper was eliminated.

The fourth factor was the use of flashing for instruments contaminated during surgery. The goal of reducing this use was achieved by sterilizing instruments that are commonly contaminated in individual “peel packs.” This strategy not only provided presterilized backups of commonly contaminated instruments, but it also eliminated the need to open an entire tray/set to replace 1 instrument. Personnel were educated on which items were available in individual peel packs and how they could be readily obtained.

The fifth factor, loaner items received late, was addressed with 2 strategies: surgeon/vendor education and enforcement of the 24-hour rule. Institutional policy states that all loaner items must be received 24 hours before the case to allow sufficient time for CSP. The 24-hour expectation was discussed with vendors and surgeons, and this rule was enforced with both groups to allow for adequate sterilization of all loaner sets. Instruments that did not arrive on time were not used.
Data Collection and Analysis

In compliance with patient safety and quality assurance guidelines, the following information was collected for all flash-sterilized items and entered into a log: autoclave number, date, time, operating room number, load number, patient name, autoclave operator, equipment flashed (including whether it was an implant), reason for the flash sterilization, and results of the biologic and chemical indicators. This log was reviewed by the perioperative administrative staff, on a monthly basis, to obtain the number of cases in which flash sterilization occurred. They entered this information into a Microsoft Excel (Microsoft Co, Redmond, Wash) spreadsheet and removed all patient identifiers before sharing the information with the study team.

With the approval of our institution’s review board, we also reviewed our patient database to determine the overall number of total hip and knee arthroplasties performed during the study period (N = 555). Total hip and knee arthroplasties were performed in a total of 3 rooms on Mondays, Tuesdays, Wednesdays, and Fridays during the study period. The number of flash sterilizations per total cases per month was analyzed as a function of time using a Poisson regression model (STATA10; StataCorp, College Station, Tex). Significance was set at \( P < .05 \). This information was used to evaluate the effectiveness of the program’s interventions from July 1, 2009, through August 30, 2010.

Results

In July 2009, the percentage of total hip and knee arthroplasties with flash-sterilized instruments was 17.6% (6/34). In June 2010, 1 year after initiation of the flash reduction program, the flash sterilization rate was 0 (0/42). During the next 2 months leading up to the study’s conclusion (July and August 2010), there was also a 0 flash sterilization rate (Table 2). This decrease represented a statistically significant change as a function of time over the period of the study.

Discussion

Review of the flash sterilization rates for instruments used in our total hip and knee arthroplasties showed a significant decline after the establishment of this strategic program. Furthermore, the last 3 months of the study maintained a rate of 0 flash sterilizations for the combined 125 arthroplasties.

Because our program instituted several changes to reduce the rate of flash sterilization, it is difficult to determine precisely the changes that made the biggest impact. However, we think that the following interventions were fundamental to the success of our program. First, the act of recording the flash sterilization data was essential for monitoring and allowed the nursing staff to actively participate in reducing the number of occurrences. Second, simply letting people know that flashing is not the preferred method of sterilization created awareness and facilitated the communication that was a large part of the program. For example, nurses began to seek out presterilized, individually packaged instruments rather than routinely flashing those that were dropped. A collaborative team effort with CSP and orthopedic vendors was also important to determine if extra instruments were needed and to secure necessary backup sets of instruments. Additional instrumentation has been previously described as 1 method of decreasing flash sterilization rates [10]. Third, communication among surgeons, operating room staff, and vendors is also important to make available adequate instrumentation for the day’s surgical schedule. To allow for routine sterilization procedures, clear guidelines need to be in place to ensure that equipment is brought to the hospital at least 24 hours before a case.

Our study had a few limitations. First, we had no data regarding flash sterilizations before the advent of the program. However, one might assume that the number of cases using flash sterilization was greater than or equal to those recorded in the first month. Without a control group, our analysis was limited to comparing flash sterilization over time after implementation of the program instead of comparing average rates before and after the program’s initiation. Second, the program was used in and data were collected from only 1 hospital. However, we believe that the principles outlined in our program are broadly applicable to other hospitals and will allow other centers to reduce flash sterilization rates and meet the guidelines of the Joint Commission on the Accreditation of Healthcare Organization.

In conclusion, we introduced a program to reduce flash sterilization of orthopedic instruments used for total hip and knee arthroplasties and found it to be effective, as evidenced by the reduction to a 0 usage rate over a 1-year period. The orthopedic infection control team continues to monitor flash sterilization rates, facilitate communication between the operating room

<table>
<thead>
<tr>
<th>Date</th>
<th>Total No. of Arthroplasties</th>
<th>No. of Arthroplasties Using Flash Sterilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2009</td>
<td>34</td>
<td>6</td>
</tr>
<tr>
<td>August 2009</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td>September 2009</td>
<td>43</td>
<td>9</td>
</tr>
<tr>
<td>October 2009</td>
<td>33</td>
<td>3</td>
</tr>
<tr>
<td>November 2009</td>
<td>37</td>
<td>6</td>
</tr>
<tr>
<td>December 2009</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>January 2010</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>February 2010</td>
<td>42</td>
<td>1</td>
</tr>
<tr>
<td>March 2010</td>
<td>49</td>
<td>3</td>
</tr>
<tr>
<td>April 2010</td>
<td>46</td>
<td>3</td>
</tr>
<tr>
<td>May 2010</td>
<td>39</td>
<td>1</td>
</tr>
<tr>
<td>June 2010</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>July 2010</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>August 2010</td>
<td>41</td>
<td>0</td>
</tr>
</tbody>
</table>
managers and the CSP department, and identify continued areas of improvement in its overall infection control efforts. We recommend broad implementation of this program to reduce the rate of flash sterilization of surgical instruments.

Acknowledgments
The authors thank the orthopedic nursing staff and the CSP staff at our institution for their attention to detail and commitment to patient safety in reducing the flash sterilization rates at our hospital. The authors are especially grateful to Deborah Coleman-Johnson for her generous assistance.

References