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Commissioner of Food and Drugs

/S/

FROM: Stuart Wright
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SUBJECT: Memorandum Report: *High-Risk Compounded Sterile Preparations and Outsourcing by Hospitals That Use Them*, OEI-01-13-00150

This memorandum report provides information about the extent to which acute-care hospitals used compounded sterile preparations (CSPs) and purchased them from outside sources in 2012. It also describes the steps that hospitals take to ensure the quality of CSPs.

SUMMARY

We surveyed a nationally representative sample of acute-care hospitals that participated in Medicare in 2012. This survey focused on hospital use of compounded sterile preparations (CSPs). CSPs are sterile compounded drugs that are generally administered to patients via injection or infusion. We found that in 2012, 92 percent of hospitals used CSPs. Of those hospitals that used CSPs, 92 percent used sterile-to-sterile products and only 25 percent used higher risk nonsterile-to-sterile products. Nonsterile-to-sterile products composed less than 1 percent of CSPs used in 2012. Of the hospitals that used nonsterile-to-sterile CSPs, 85 percent outsourced at least some of these products (i.e., purchased them from outside pharmacies).

Ensuring an adequate supply of CSPs was very important to hospitals when determining whether to outsource CSPs. Many hospitals cited shortages of commercial products (68 percent), the availability of CSPs with extended shelf lives (62 percent), and CSP stability (69 percent) as very important factors when deciding whether to outsource CSPs. Also, hospitals took limited steps to ensure the quality of outsourced CSPs but had few problems with the quality of products from outside pharmacies. Few hospitals (11 of 236 hospitals in our sample) reported problems with product contamination; however, as shown by the meningitis outbreak in the fall of 2012, any instance of product contamination has the potential for serious consequences. Finally, we found that 56 percent of hospitals made changes or planned to make changes to CSP sourcing practices in response to that meningitis outbreak.

BACKGROUND

A recent nationwide meningitis outbreak caused by contaminated injections, which were compounded by the New England Compounding Center (NECC), raised major concerns about the use of compounded drugs supplied by outside pharmacies.[1] The meningitis outbreak and its aftermath revealed a gap in information about hospitals' use of drugs supplied by such pharmacies. Hospitals may have outsourcing arrangements with multiple outside pharmacies and may also compound drugs within their own pharmacies.

Pharmaceutical compounding is the creation of a prescription drug tailored to meet the needs of an individual patient. For example, a compounding pharmacist may produce a version of a drug without an ingredient to which a patient may be allergic, or the pharmacist might create a liquid form of a drug for a patient who is unable to swallow a pill. Traditionally, pharmacies compounded a drug upon receipt of a prescription for an individual patient. However, recent trends in drug compounding have included the large-scale production of certain drugs to help ease shortages of drugs approved by the Food and Drug Administration (FDA) and to meet the sourcing needs of some hospitals.[2]

Compounded Drugs

There are two broad categories of compounded drugs: nonsterile preparations and sterile preparations. (In this report, we refer to the latter as compounded sterile preparations, or CSPs.) Nonsterile preparations, such as ointments applied to the skin or capsules or pills that a patient takes orally, are lower risk products. Their production is subject to less stringent standards than those for sterile preparations.

CSPs are higher risk products that are generally administered to patients via injection or infusion. Preparation of CSPs requires more expertise and more extensive safety measures. Risks associated with CSP preparation include the use of the wrong medium or the wrong concentration for mixture, contamination with pathogens, and human error. CSPs may be divided into two types based on their components and the method of preparation:

- Sterile-to-sterile CSPs are prepared from sterile products, which a pharmacist constitutes. Sterile-to-sterile products are considered to carry a high risk of contamination in their preparation.
- Nonsterile-to-sterile CSPs carry the highest risk of contamination. These products are prepared from one or more nonsterile ingredients that must be mixed together and then sterilized. The products from NECC that led to the outbreak fell into this category. Nonsterile-to-sterile compounding requires extensive safety precautions, including specialized staff training, positive and negative flow sterile rooms, sterile laminar hoods, and daily cleaning and disinfection.

[1] In this report, the term "outside pharmacy" refers to any outside compounding pharmacy from which a hospital or medical center purchases compounded drugs.

[2] S. Tavernise, "FDA Chief Seeks Expanded Authority to Improve Safety of Drug Compounders," *The New York Times,* November 14, 2012.

Because of CSPs' greater risk, this study focuses on hospital use of both kinds of CSPs, rather than the lower risk nonsterile preparations, such as ointments and capsules.

United States Pharmacopoeia

The United States Pharmacopoeia (USP) is an official compendium of drug standards in the United States.[3] The USP chapter 797 (USP 797) provides product safety and quality standards for preparing CSPs.[4] Pharmacies have widely adopted USP 797 standards.[5] FDA has limited authority to inspect pharmacies and enforce compliance with current standards for good manufacturing practices; therefore, it largely defers to the States for regulating and inspecting pharmacies.[6]

METHODOLOGY

We identified 4,867 acute-care hospitals operating in 2012 that participated in Medicare.[7] From this population we selected a simple random sample of 300 hospitals. After we eliminated 2 ineligible hospitals, the sample consisted of 298 acute-care hospitals. We developed and used an online questionnaire to determine the extent and nature of hospital use of CSPs and outsourcing, including the extent to which hospitals outsource versus prepare onsite, and challenges in outsourcing and preparing CSPs. In January 2013, we mailed a letter to the director of pharmacy services for each sampled hospital requesting that he/she complete the online questionnaire.[8] We followed up with each nonrespondent with a reminder letter and telephone calls. We received responses from 236 hospitals, an overall response rate of 79 percent.

In addition, we interviewed stakeholders, including four practicing hospital pharmacists and officials of the trade association that represents hospital pharmacists.

Appendix A contains the sample sizes, point estimates, and 95-percent confidence intervals for all statistics in this report, as well as other data gathered in the survey.

Limitations

All data in this report are self-reported, and we did not independently verify them.

[3] The Federal Food, Drug, and Cosmetic Act §§ 201(j) and (g)(1)(A) (21 U.S.C. §§ 321(j) and (g)(1)(A)) (defining the terms "official compendium" and "drug").

[4] The United States Pharmacopeial Convention. "USP-NF General Chapter 797 Pharmaceutical Compounding—Sterile Preparations." *The United States Pharmacopoeia and the National Formulary*, ch. 797 (copyright 2011).

[5] American Society of Health-System Pharmacists (ASHP), *The ASHP Discussion Guide on USP Chapter 797 for Compounding Sterile Preparations.* Accessed at www.ashp.org on December 13, 2012.

[6] FDA, *Compliance Policy Guidance for FDA Staff and Industry, Section 460.200 Pharmacy Compounding* (reissued May 29, 2002). Accessed at www.fda.gov on December 13, 2012.

[7] Pursuant to Section 1861 of the Social Security Act, to participate in Medicare, hospitals must demonstrate that they meet the Medicare Conditions of Participation during onsite inspections conducted by State survey and certification agencies and hospital accreditors with Medicare deeming authority.

[8] Because of a law enforcement request, we did not contact six acute-care hospitals.

Standards

This study was conducted in accordance with the *Quality Standards for Inspection and Evaluation* issued by the Council of the Inspectors General on Integrity and Efficiency.

RESULTS

In 2012, only one-quarter of hospitals used higher risk nonsterile-to-sterile CSPs, whereas almost all hospitals used sterile-to-sterile products

Overall, 92 percent of hospitals used CSPs in 2012. Hospitals of all sizes used CSPs and some used them extensively (Table 1). For example, we interviewed a pharmacy director of a large teaching hospital who reported that his hospital uses around 2,500 doses of CSPs per day. Ninety-two percent of hospitals used sterile-to-sterile CSPs. Twenty-five percent of hospitals used higher risk nonsterile-to-sterile CSPs.

Table 1: Use of Compounded Sterile Preparations by Hospital Size, 2012

Hospital Size	Number of Doses of CSPs Administered in Hospitals Mean (95% Confidence Interval (CI))	Number of Doses of Nonsterile-to-Sterile CSPs Administered in Hospitals Mean (95% CI)	Number of Doses of Sterile-to-Sterile CSPs Administered in Hospitals Mean (95% CI)
Fewer Than 50 Beds (n=81)	3,065 (1,878–4,252)	67 (10–124)	2,947 (1,766–4,127)
50–99 Beds (n=40)	18,008 (6,930–29,086)	*	18,001 (6,925–29,077)
100–299 Beds (n=69)	45,378 (33,803–56,952)	158 (43–273)	45,222 (33,658–56,785)
300 Beds and Above (n=43)	206,086 (111,647–300,526)	666 (310–1,021)	205,421 (111,080–299,761)

Source: Office of Inspector General survey of acute-care hospitals participating in Medicare, 2013.
*We were unable to project an estimate for this data field because we did not have a valid 95-percent confidence interval.

Nonsterile-to-sterile preparations composed less than 1 percent of CSPs used in hospitals in 2012. Only 16 percent of hospitals with fewer than 50 beds used these products. Nonsterile-to-sterile CSPs have a higher risk of contamination than other CSPs because pharmacists prepare them from nonsterile components that must be sterilized prior to administration. When we asked hospitals which kinds of nonsterile-to-sterile CSPs they commonly used, they named both product types and modes of administration. Hospitals in our sample commonly used nonsterile-to-sterile opioids, steroids, electrolytes, and diuretics. Hospitals in our sample also reported using nonsterile-to-sterile CSPs for intrathecal pain pumps and epidurals.

Sterile-to-sterile preparations composed over 99 percent of CSPs used by hospitals in 2012. When asked about commonly used sterile-to-sterile CSPs, hospitals in our sample reported using antibiotics, opioids, epidurals, oxytocics, total parenteral nutrition, and cardioplegic solutions.

Of the hospitals that used higher risk CSPs in 2012, 85 percent purchased at least some of these products from outside sources

Of the hospitals that used nonsterile-to-sterile CSPs in 2012, only 36 percent prepared any of these products onsite (Table 2). USP 797 standards for preparing nonsterile-to-sterile CSPs are more stringent than those for sterile-to-sterile CSPs, and a few hospitals in our sample (5 out of 236) reported that they cannot make these products onsite because their facilities do not meet USP 797 standards. Overall, most hospitals (75 percent) that used any CSPs used a combination of outsourcing and onsite preparation to obtain these products.

Table 2: Hospital Sourcing of Compounded Sterile Preparations, 2012

Product Type	Percentage of Hospitals That Outsourced	Percentage of Hospitals That Prepared Onsite	Percentage of Hospitals That Both Outsourced And Prepared Onsite
All CSPs (n=218 Hospitals That Used CSPs)	79.4% (74.1%−84.6%)	95.0% (92.1%−97.8%)	74.7% (69.2%−80.4%)
Nonsterile-to-Sterile CSPs (n=59 Hospitals That Used Nonsterile-to-Sterile CSPs)	84.7% (75.8%−93.7%)	35.6% (23.7%−47.5%)	20.3% (10.3%−30.3%)
Sterile-to-Sterile CSPs (n=216 Hospitals That Used Sterile-to-Sterile CSPs)	76.9% (71.4%−82.3%)	95.4% (92.6%−98.1%)	72.2% (66.4%−78.0%)

Source: Office of Inspector General (OIG) survey of acute-care hospitals participating in Medicare, 2013.

Of the hospitals that purchased nonsterile-to-sterile CSPs from outside pharmacies, 63 percent contracted with one pharmacy, 20 percent contracted with two, and 16 percent with three (see Table A4 in Appendix A).[9] Most hospitals (67 percent) that purchased nonsterile-to-sterile CSPs from outside pharmacies used at least one pharmacy located in another State.[10]

For those hospitals that used sterile-to-sterile CSPs, 77 percent purchased sterile-to-sterile products from at least one outside pharmacy. Of these hospitals that purchased sterile-to-sterile CSPs from outside pharmacies, 41 percent contracted with one outside pharmacy, 50 percent contracted with two or three pharmacies, and 9 percent contracted with four or five pharmacies (see Table A5 in Appendix A). As with nonsterile-to-sterile products, most of these hospitals purchased sterile-to-sterile CSPs from at least one out-of-State pharmacy: 45 percent used one out-of-State pharmacy, 41 percent used two or three out-of-State pharmacies, and 3 percent used four or five out-of-State pharmacies.

[9] The 95-percent confidence intervals for these three percentage estimates are 50.1 to 76.4 percent, 9.4 to 31.4 percent, and 6.2 to 26.4 percent, respectively.
[10] The 95-percent confidence interval for the 67-percent estimate is 54.6 to 80.1 percent.

Hospitals consider factors related to ensuring an adequate supply of CSPs as very important when determining whether to outsource CSPs

Hospitals cited shortages of commercial products as a very important factor when deciding whether to outsource CSPs (see Table A6 in Appendix A). Outsourcing CSPs may be necessary to ensure the ready availability of products during such shortages. A few hospitals in our sample (15 of 236) indicated that they outsource CSPs only when commercial products are unavailable because of a shortage and the cost of producing the CSP onsite would be prohibitive. One pharmacy director stated that his hospital had outsourced more CSPs in 2012 than in previous years because of growing shortages of commercially available products.

When asked how an abrupt shortage of CSPs from outside pharmacies would affect delivery of care and risk to patients, 48 percent of hospitals stated that a shortage of outsourced CSPs would have a non-life-threatening but great impact on delivery of care in their hospitals (see Table A8 in Appendix A). An additional 11 percent responded that such a shortage would cause life-threatening, major disruptions.

Hospitals also regarded CSP stability[11] and the need for CSPs with extended shelf lives as very important factors when deciding whether to outsource CSPs. A pharmacy's ability to provide products with extended shelf lives was also important to hospitals when selecting a particular outside pharmacy (see Table A7 in Appendix A). This suggests that hospitals rely on outsourcing to provide commonly used products for which the exact demand may be unpredictable. According to pharmacists with whom we spoke, CSPs prepared onsite often have limited shelf lives or must be refrigerated. In many cases, outside pharmacies can provide products that have undergone stability testing and have extended shelf lives. Outsourcing these CSPs enables hospitals to have product on hand when needed with less waste. A few hospitals in our sample (6 out of 236) noted that the option of outsourcing CSPs with extended shelf lives is particularly important because they do not have pharmacies that operate 24 hours a day.

In deciding to outsource, hospitals considered other factors as important in ensuring a supply of CSPs. Hospitals cited the ability to prepare CSPs onsite, such as lack of necessary equipment, shortage of trained staff, and lack of physical facilities to prepare CSPs as important when deciding whether to outsource CSPs (see Table A6 in Appendix A). In fact, only 56 percent of hospitals had a USP 797-compliant clean room for preparing CSPs. When deciding whether to outsource, hospitals also considered whether CSPs were high risk or required nonsterile-to-sterile preparation.

Hospitals took limited steps to ensure the quality of outsourced CSPs, but they also rarely had problems with CSP quality

Most hospitals that outsourced CSPs required that outside pharmacies comply with USP 797 (83 percent) and reviewed quality reports provided by outside pharmacies (71 percent, Table 3). Of the hospitals that outsourced CSPs, few conducted their own site visits at outside pharmacies (22 percent) or reviewed independent quality

[11] The term "CSP stability" refers to the extent to which the preparation retains the same properties and characteristics that it possessed at the time of its preparation throughout its period of storage and use.

assessments of the outside pharmacies used (27 percent). Some hospitals in our sample (14 out of 236) also reported that they lacked the resources, access, or expertise to assess the quality of outside pharmacies and therefore must rely on State Boards of Pharmacy to assess them.

Table 3: Steps That Hospitals That Outsourced Compounded Sterile Preparations Took To Ensure Quality in 2012

Quality Step	Percentage of Hospitals That Reported Taking Quality Step for Some or All Outside Pharmacies They Contracted With
Required Compliance With USP 797	83%
Reviewed Quality Reports Provided by the Outside Pharmacy	71%
Reviewed Quality Reports Provided by a Third Party	27%
Conducted Onsite Visits at the Outside Pharmacy	22%
Tested CSPs Provided by Outside Pharmacy	9%

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Although hospitals took limited steps to ensure the quality of outsourced CSPs, 42 percent of hospitals were very confident that the steps taken were adequate. An additional 47 percent were only somewhat confident that these steps were adequate. However, 12 percent of hospitals were not at all confident in the quality of products from outside pharmacies.[12] Most hospitals (64 percent) that outsourced CSPs had no problems or concerns with outside pharmacies in 2012, and of those that had problems, many were related to product availability (73 percent).[13] Few hospitals (11 of 236 hospitals) in our sample reported problems with product contamination; however, as shown by the meningitis outbreak in fall 2012, any instance of product contamination has the potential for serious consequences.

Half of all hospitals made changes or planned to make changes to CSP sourcing practices in response to the fall 2012 meningitis outbreak

Overall, 56 percent of hospitals made changes to CSP sourcing practices in 2012 or plan to make changes in 2013. This includes hospitals that use only sterile-to-sterile products and hospitals that use higher risk nonsterile-to-sterile products. Some changes were related to the way in which hospitals outsource CSPs (see Table A14 in Appendix A). Outsourcing changes that hospitals made or plan to make included decreasing CSP outsourcing, requesting more information on product quality from outside pharmacies, and contracting with different outside pharmacies.

Hospitals also made or planned changes to the way they prepare CSPs in-house. Many hospitals increased or plan to increase quality control mechanisms in the hospital pharmacies and hospital capacity to prepare CSPs in-house. Making such changes while complying with USP 797 may be resource intensive for hospitals. About half of hospitals ranked cost (47 percent) and space limitations (49 percent) as major challenges to

[12] Percentages for hospital confidence in the quality of CSPs purchased from outside sources add up to 101 percent because of rounding. See Table A10 in Appendix A for exact percentages.
[13] The 95-percent confidence interval for the 73-percent estimate is 61.8 to 83.4 percent.

USP 797 compliance. A few hospitals in our sample (6 out of 236) reported that becoming fully compliant with USP 797 would require a building redesign or new construction.

CONCLUSION

Our review shows that the use of compounded sterile products is widespread in hospitals, although the use of the highest risk products—those involving preparation of sterile products from nonsterile components—is limited to about one-quarter of hospitals, most commonly larger facilities.

Although most hospital pharmacies prepared sterile-to-sterile products onsite, hospitals outsource most nonsterile-to-sterile CSPs. Hospitals tend to rely upon a limited number of external pharmacies for these CSPs, especially for nonsterile-to-sterile products. Often these pharmacies are located in other States.

Many factors go into a hospital pharmacy's decision to outsource CSPs. Among these are the need to ensure a ready supply of products in the event of shortages and the need for products with extended shelf lives, which require sophisticated equipment and testing that may not be readily available on the hospital premises.

The meningitis outbreak in the fall of 2012 has spurred hospital pharmacies to make some changes, such as seeking additional information from outside pharmacies about quality practices, or even expanding their own internal compounding capacity. For the most part, hospitals remain confident about the quality of outsourced CSPs. Nevertheless, the meningitis outbreak raises questions about whether this confidence is well placed and emphasizes the need to stay vigilant about procedures for compounding and outsourcing CSPs.

OIG will pursue additional work to further examine the safety and quality of pharmaceutical compounding in hospitals, including work examining Federal oversight mechanisms.

This report is being issued directly in final form because it contains no recommendations. If you have comments or questions about this report, please provide them within 60 days. Please refer to report number OEI-01-13-00150 in all correspondence.

APPENDIX A

Complete Results From Office of Inspector General Survey of Acute-Care Hospitals That Participated in Medicare in 2012

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Table A1: Hospital Demographic Information, 2012

	Sample Size	Percentage of Hospitals (95% Confidence Interval (CI))
Hospital Size	233	
Fewer Than 50 Beds		34.8% (28.8%−40.7%)
50–99 Beds		17.2% (12.5%−21.9%)
100–299 Beds		29.6% (23.9%−35.3%)
300 Beds and Above		18.5% (13.6%−23.3%)
Operating Room in Hospital	235	91.5% (88.0%−95.0%)
Intensive Care Unit in Hospital	234	72.6% (67.1%−78.2%)
Dialysis Performed at Hospital	235	47.7% (41.4%−53.9%)

Source: Office of Inspector General (OIG) survey of acute-care hospitals participating in Medicare, 2013.

Table A2: Use of Compounded Sterile Preparations by Hospital Size, 2012

	Sample Size	Hospitals That Used Compounded Sterile Preparations (CSPs) Percentage (95% CI)	Hospitals That Used Nonsterile-to-Sterile CSPs Percentage (95% CI)	Hospitals That Used Sterile-to-Sterile CSPs Percentage (95% CI)
All Hospitals	236	92.4% (89.1%−95.7%)	25.1%* (19.7%−30.5%)	91.5% (88.1%−95.0%)
Hospitals by Size				
Fewer Than 50 Beds	81	81.5% (73.2%−89.7%)	16.0% (8.8%−25.9%)	79.0% (68.5%−87.3%)
50−99 Beds	40	95.0% (88.4%−100.0%)	5.0% (0.6%−16.9%)	95.0% (83.1%−99.4%)
100−299 Beds	69	98.6% (95.8%−100.0%)	25.0% (15.3%−37.0%)	98.6% (92.2%−100.0%)
300 Beds and Above	43	100.0% (91.8%−100.0%)	60.5% (46.2%−74.7%)	100.0% (91.8%−100.0%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.
*The sample size for this estimate is 235.

Table A3: Total Doses of Compounded Sterile Preparations Used in 2012

	Percentage of Total CSPs (95% CI)
Total Doses of CSPs (n=236)	
Nonsterile-to-Sterile CSPs (n=235)	0.34% (0.2%−0.5%)
Sterile-to-Sterile CSPs (n=236)	99.6% (99.5%−99.8%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A4: Use of Outside Pharmacies by Hospitals Outsourcing Nonsterile-to-Sterile Compounded Sterile Preparations in 2012

Number of Outside Pharmacies Used	Sample Size	Hospitals That Outsourced Nonsterile-to-Sterile CSPs Percentage (95% CI)
All Outside Pharmacies	49	
1		63.3% (50.1%−76.4%)
2		20.4% (9.4%−31.4%)
3		16.3% (6.2%−26.4%)
Out-of-State Pharmacies	49	
0		32.7% (19.9%−45.4%)
1		51.0% (37.4%−64.7%)
2		14.3% (5.9%−27.2%)
3		2.0% (0.1%−10.9%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A5: Use of Outside Pharmacies by Hospitals Outsourcing Sterile-to-Sterile Compounded Sterile Preparations in 2012

Number of Outside Pharmacies Used	Sample Size	Hospitals That Outsourced Sterile-to-Sterile CSPs Percentage (95% CI)
All Outside Pharmacies	165	
1		40.6% (33.3%−47.9%)
2		36.4% (29.2%−43.5%)
3		13.9% (8.8%−19.1%)
4		6.7% (3.0%−10.4%)
5		2.4% (0.1%−4.7%)
Out-of-State Pharmacies	163	
0		11.0% (6.4%−15.7%)
1		44.8% (37.3%−52.2%)
2		33.1% (26.1%−40.2%)
3		8.0% (3.9%−12.0%)
4		1.8% (0.4%−5.3%)
5		1.2% (0.1%−4.4%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A6: Factors Important to Hospitals When Deciding Whether To Outsource Compounded Sterile Preparations

Factor	Sample Size	Very Important Percentage (95% CI)	Somewhat Important Percentage (95% CI)	Not Important Percentage (95% CI)
Stability of CSP	226	68.6% (62.7%−74.5%)	19.9% (14.8%−25.0%)	11.5% (7.5%−15.6%)
Shortages of Commercial Products	229	68.1% (62.2%−74.0%)	22.7% (17.4%−28.0%)	9.2% (5.5%−12.8%)
Need for Ready-to-Administer Form of CSP	227	67.0% (61.0%−72.9%)	20.7% (15.6%−25.8%)	12.3% (8.2%−16.5%)
Need for Product With Extended Shelf Life	226	61.9% (55.8%−68.1%)	23.5% (18.1%−28.8%)	14.6% (10.1%−19.1%)
Product-Testing Requirements	228	61.4% (55.2%−67.6%)	23.2% (17.9%−28.6%)	15.4% (10.8%−19.9%)
Product Is High Risk or Problem Prone To Prepare	229	53.7% (47.4%−60.0%)	27.5% (21.9%−33.1%)	18.8% (13.8%−23.7%)
Inability of Hospital Pharmacy To Produce CSPs in Quantity Needed	228	46.9% (40.6%−53.2%)	27.2% (21.6%−32.8%)	25.9% (20.3%−31.4%)
CSP Requires Nonsterile-to-Sterile Preparation	227	47.1% (40.8%−53.5%)	18.1% (13.2%−22.9%)	34.8% (28.8%−40.8%)
Need for Specialized Products	228	45.6% (39.3%−51.9%)	30.7% (24.9%−36.5%)	23.7% (18.3%−29.1%)
Lack of Necessary Equipment To Prepare CSP in-House	229	38.9% (32.7%−45.0%)	23.6% (18.2%−28.9%)	37.6% (31.4%−43.7%)
Amount of Time Needed To Produce CSP in-House	229	39.3% (33.1%−45.5%)	36.7% (30.6%−42.8%)	24.0% (18.6%−29.4%)
Predictability of Demand for CSP	229	35.4% (29.3%−41.4%)	45.0% (38.7%−51.3%)	19.7% (14.6%−24.7%)
Lack of Physical Facilities To Prepare CSP in-House	227	34.8% (28.8%−40.8%)	26.9% (21.3%−32.5%)	38.3% (32.2%−44.5%)
Workflow Management	229	33.6% (27.7%−39.6%)	38.4% (32.3%−44.6%)	27.9% (22.3%−33.6%)
Prior Problems With Outsourced CSPs	223	27.8% (22.1%−33.5%)	22.0% (16.7%−27.3%)	50.2% (43.8%−56.6%)
Cost of Producing Product in-House	229	27.5% (21.9%−33.1%)	49.8% (43.5%−56.1%)	22.7% (17.4%−28.0%)
Shortage of Staff Trained to Prepare CSP	228	26.8% (21.2%−32.4%)	33.8% (27.8%−39.8%)	39.5% (33.3%−45.7%)
Prior Problems Preparing CSP in-House	225	20.0% (14.9%−25.1%)	21.8% (16.5%−27.0%)	58.2% (51.9%−64.5%

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A7: Factors Important to Hospitals When Selecting a Particular Outside Pharmacy

Factor	Sample Size	Very Important Percentage (95% CI)	Somewhat Important Percentage (95% CI)	Not Important Percentage (95% CI)
Quality of Product	228	88.6% (84.6%–92.6%)	3.1% (0.9%–5.3%)	8.3% (4.8%–11.8)
Pharmacy Expertise in Preparing Product	228	87.3% (83.1%–91.5%)	5.3% (2.4%–8.1%)	7.5% (4.1%–10.8%)
Pharmacy Reputation	229	83.8 % (79.2%–88.5%)	9.6% (5.9%–13.3%)	6.6% (3.4%–9.7%)
Pharmacy Accreditation	229	79.0% (73.9%–84.2%)	13.5% (9.2%–17.9%)	7.4% (4.1%–10.7%)
Inspection History With State Board of Pharmacy	227	77.5% (72.2%–82.8%)	13.2% (8.9%–17.5%)	9.3% (5.6%–12.9%)
Product Availability	229	75.5% (70.1%–81.0%)	17.0% (12.3%–21.8%)	7.4% (4.1%–10.7%)
Pharmacy's Ability To Provide Products With Extended Shelf Life	228	71.1% (65.3%–76.8%)	18.9% (13.9%–23.8%)	10.1% (6.3%–13.9%)
Pharmacy Responsiveness	228	66.7% (60.7%–72.6%)	25.0% (19.5%–30.5%)	8.3% (4.8%–11.8%)
Pharmacy's Delivery Schedule	229	50.7% (44.3%–57.0%)	37.6% (31.4%–43.7%)	11.8% (7.7%–15.9%)
Product Cost	227	37.4% (31.3%–43.6%)	48.5% (42.1%–54.8%)	14.1% (9.7%–18.5%)
Hospital's Own Site Inspection of Pharmacy	226	23.5% (18.1%–28.8%)	39.8% (33.6%–46.0%)	36.7% (30.6%–42.8%)
Medical Staff Preference	228	3.5% (1.2%–5.8%)	31.1% (25.3%–37.0%)	65.4% (59.3%–71.4%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A8: Hospital Beliefs About the Effect of an Abrupt Shortage or Loss of Supply of Compounded Sterile Preparations From Outside Pharmacies on Risk to Patients and Delivery of Care in the Hospital (n=235)

Perceived Level of Risk to Patients and Disruption of Care	Percentage of Hospitals (95% CI)
Life-Threatening, Major Disruptions	11.5% (7.5%–15.5%)
Not Life-Threatening, But Still Great Impact	48.1% (41.9%–54.3%)
Little Impact, an Inconvenience	16.6% (12.0%–21.2%)
No Impact at All	23.8% (18.5%–29.1%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A9: Steps That Hospitals Outsourcing Compounded Sterile Preparations To Ensure Quality in 2012

Quality Step	Sample Size	Performed Quality Step for All Outside Pharmacies Percentage (95% CI)	Performed Quality Step for Some Outside Pharmacies Percentage (95% CI)	Did Not Perform Quality Step Percentage (95% CI)	Not Applicable Percentage (95% CI)
Required Compliance With USP 797	172	76.7% (70.6%−82.9%)	6.4% (2.8%−10.0%)	14.0% (8.9%−19.0%)	2.9% (0.5%−5.4%)
Reviewed Quality Reports Provided by Outside Pharmacy	171	48.5% (41.2%−-55.8%)	22.8% (16.7%−28.9%)	26.3% (19.9%−32.7%)	2.3% (0.1%−4.5%)
Reviewed Quality Reports Provided by Third Party	170	16.5% (11.0%−21.9%)	10.0% (5.6%−14.4%)	67.6% (60.8%−74.5%)	5.9% (2.4%−9.3%)
Conducted Onsite Visits at Outside Pharmacy	172	7.0% (3.3%−10.7%)	15.1% (9.9%−20.3%)	72.7% (66.2%−79.2%)	5.2% (2.0%−8.5%)
Tested CSPs Provided by Outside Pharmacy	171	5.8% (2.4%−-9.3%)	3.5% (0.8%−6.2%)	86.0% (80.9%−91.0%)	4.7% (1.6%-7.8%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A10: Hospital Confidence in Steps Taken To Ensure Quality of Compounded Sterile Preparations Purchased From Outside Pharmacies in 2012 (n=221)

Level of Confidence	Percentage of Hospitals (95% CI)
Very Confident	41.6% (35.3%−48.0%)
Somewhat Confident	46.6% (40.2%−53.0%)
Not at All Confident	11.8% (7.6%−15.9%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A11: Hospitals That Outsourced Compounded Sterile Preparations and Had Problems or Concerns With Outside Pharmacies in 2012

Problems or Concerns	Sample Size	Had Problem or Concern Percentage (95% CI)	Did Not Have Problem or Concern Percentage (95% CI)
Any Problem or Concern With Outside Compounding Pharmacies	171	35.7% (28.7%−42.7%)	64.3% (57.3%−71.3%)
Lack of Product Availability	62	72.6% (61.8%−83.4%)	27.4% (16.6%−38.2%)
Problems With Product Delivery	61	42.6% (30.5%−54.7%)	57.4% (45.3%−69.5%)
Product Contamination	61	18.0% (8.6%−27.4%)	82.0% (72.6%−91.4%)
Problems With Product Potency	61	8.2% (1.5%−14.9%)	91.8% (85.1%−98.5%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A12: Hospital Ability to Prepare Compounded Sterile Preparations Onsite, 2012

	Sample Size	Percentage of Hospitals (95% CI)
Hospitals With a USP 797-Compliant Clean Room	235	56.2% (50.0%−62.4%)
Hospitals With a Barrier Isolator for Preparing CSPs	236	54.2% (48.0%−60.4%)
Hospital Compliance With USP 797 Requirements for Risk Level of CSPs Prepared Onsite	228	
Fully Compliant		59.6% (53.4% −65.9%)
Mostly Compliant		29.8% (24.0% −35.6%)
Somewhat Compliant		6.1% (3.1%−9.2%)
Not at All Compliant		4.4% (1.8% −7.0%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A13: Hospital-Identified Challenges To Meeting Compliance With USP 797 Standards

	Sample Size	Major Challenge Percentage (95% CI)	Minor Challenge Percentage (95% CI)	Not a Challenge Percentage (95% CI)
Space Limitations	226	49.1% (42.8%−55.5%)	27.0% (21.4%−32.6%)	23.9% (18.5%−29.3%)
Cost	228	47.4% (41.1%−53.7%)	30.3% (24.5%−36.1%)	22.4% (17.1%−27.6%)
Access to Needed Equipment	228	25.4% (19.9%−30.9%)	35.5% (29.5%−41.6%)	39.0% (32.9%−45.2%)
Number of Staff	228	22.4% (17.1%−27.6%)	43.4% (37.2%−49.7%)	34.2% (28.2%−40.2%)
Staff Skill Set	228	11.0% (7.0%−14.9%)	45.6% (39.3%−51.9%)	43.4% (37.2%−49.7%)

Source: OIG survey of acute-care hospitals participating in Medicare, 2013.

Table A14: Hospitals That Have Made or Plan To Make Changes to Sourcing Practices for Compounded Sterile Preparations in Response to the Fall 2012 Meningitis Outbreak

	Sample Size	Percentage of Hospitals (95% CI)
Hospitals That Either Changed or Plan To Change CSP Sourcing Practices	232	56.0% (49.8%−62.3%)
Hospitals That Changed CSP Sourcing Practices in 2012	233	45.9% (39.7%−52.2%)
Changes Made		
Decreased Outsourcing of CSPs	106	78.3% (70.7% −85.9%)
Requested More Information From Outside Compounding Pharmacies on Product Quality	105	61.9% (52.9%−71.0%)
Increased Quality Control Mechanisms in Hospital Pharmacy	104	54.8% (45.5% −64.1%)
Increased Hospital Capacity To Prepare CSPs Onsite	106	51.9% (42.6%−61.2%)
Contracted With Different Outside Pharmacy	105	50.5% (41.2%−59.8%)
Hospitals That Plan To Change CSP Sourcing Practices in 2013	234	38.5% (32.4%−44.5%)
Planned Changes		
Request More Information From Outside Compounding Pharmacies on Product Quality	88	84.1% (76.6%−91.5%)
Increase Quality Control Mechanisms in Hospital Pharmacy	87	74.7% (65.8%−83.6%)
Decrease Outsourcing of CSPs	88	56.8% (46.7%−66.9%)
Increase Hospital Capacity To Prepare CSPs Onsite	88	54.5% (44.4%−64.7%)
Contract With Different Outside Pharmacy	89	51.7% (41.6%−61.8%)