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2018 FGI *Guidelines* Benefit-Cost Analysis

Implications of changes to the 2018 Guidelines for Design and Construction for hospitals and outpatient facilities

by the 2018 FGI Benefit-Cost Committee

Changes incorporated into the 2018 FGI Hospital and Outpatient *Guidelines for Design and Construction* documents improve program flexibility, reduce risk, address trends, and offer greater consistency between documents. A number of these improvements can reduce costs and, although there are added capital costs for some facility types, overall the benefits outweigh any effects on construction cost. As well, the 2018 changes may lead to some operating cost reductions, such as reduced energy costs in facilities where patient flow allows the use of patient care stations for both prep and recovery. These conclusions are the result of a study of the benefits and costs of changes from the 2014 *Guidelines* to the 2018 edition conducted by the Facility Guidelines Institute (FGI) Benefit-Cost Committee (BCC) with assistance from other members of the FGI Health Guidelines Revision Committee (HGRC) and outside subject matter experts. This report summarizes findings from the study.

Process

The BCC's intent from the outset of its review was to extract real-world benefits and cost implications stemming from changes between the 2014 *Guidelines for Design and Construction of Hospitals and Outpatient Facilities* and the 2018 *Guidelines for Design and Construction of Hospitals* and the 2018 *Guidelines for Design and Construction of Outpatient Facilities*. To accurately measure the monetary value of these benefits and changes, the BCC considered facility programs from six health care project types—a secondary hospital, a critical access hospital, a freestanding emergency facility, a multi-specialty ambulatory care center, an ambulatory surgery center, and an endoscopy facility. Full programs were acquired for each project type based on current industry practices, and detailed cost estimates were developed based on current national averages for construction cost. The baseline programs and construction costs for each facility (using the 2014 *Guidelines* requirements and 2017 construction costs) were used to assess the cost impact of the changes published in the 2018 *Guidelines* edition. These assessed costs are for construction only and do not include other typical capital development costs, such as design fees, permits, medical equipment, furnishings, and information technology equipment.

During the BCC effort, two subcommittees, one for hospitals and one for outpatient facilities, combed through each document extensively. The committee members consulted independent architects, engineers, and contractors with health care expertise for assistance in preparing drawings and interpreting the benefits and costs of the new and revised requirements. Some benefits were determined by reviewing substantiation statements from recommendations

submitted during FGI’s open proposal and comment periods. For continuity, all changes considered to carry a significant cost impact were priced by the same construction estimator who created the baseline estimates.

An added benefit of the BCC process itself was the identification of several changes that had been implemented in both the Hospital and Outpatient documents that were not meant to impact outpatient facilities. These were corrected in the published documents.

Benefits and Cost Impacts Identified

The cost impacts revealed through the BCC’s efforts are summarized in the table below. The “basic cost impacts” represent the minimum cost increase or decrease for newly added requirements, while the “additional optional cost impacts” are for elements that did not appear in the programs used for this analysis but could account for additional costs if they are included in the functional program for a project. For example, in an outpatient facility where it is not a requirement to treat patients of size (formerly referred to as the bariatric population), newly adopted requirements for accommodating patients of size would add 1 percent to the construction cost if a health care organization chooses to treat this patient population.

Cost Impacts of Applying the 2018 *Guidelines*¹

	Basic Cost Impacts	Additional Optional Cost Impacts
To hospital and emergency facilities		
100-bed general hospital	.1%	.2%
Critical access hospital	.7%	.2%
Freestanding emergency facility	3.6%	.05%
To outpatient facilities		
Multi-specialty ambulatory care facility	.4%	1.3% ²
Ambulatory surgery center	–3.3%	3%
Endoscopy facility	–5%	3%

¹The numbers shown are percentages of construction cost of the facility programs reviewed.

²This figure does not include the cost impact of adding a USP 797 and/or USP 800 pharmacy to the program. Refer to the outpatient overview for more information.

Some changes to the 2018 *Guidelines* offer benefits to the document users without necessarily affecting the costs of newly constructed or renovated facilities. For example, dividing the outpatient facility requirements from the hospital requirements and publishing each as a separate book allowed the HGRC to support more flexible, forward-thinking design for outpatient facilities. This change will not only yield cost savings for some outpatient facility types; its new structure also better responds to the reality of the health care trend in which more patient care is moving out of the hospital into other facility types. A primary example of this flexibility is the inclusion of two different approaches to applying the outpatient requirements—one for specific facility types included in the Outpatient *Guidelines* and the other for facilities that include services defined in multiple chapters in the document. Some authorities having jurisdiction (AHJs) have assumed this intent when applying the 2014 *Guidelines*, but now this type of

compliance is formally defined as an alternative approach to using the document. Other changes in the 2018 *Guidelines* support design flexibility or clarify requirements in the 2014 edition. In addition, some new requirements are predicated on the results of a safety risk assessment, which the health care organization is required to perform during project planning.

Hospital Overview

The following overview—organized by the content of the 2018 Hospital document—outlines significant changes made in the 2018 edition, some of which increase costs and some of which reduce costs. Also mentioned are the benefits of changes, which may not necessarily affect costs.

Planning, Design, Construction, and Commissioning

Commissioning. As part of the commissioning requirements, more extensive documentation is required for heated potable water distribution systems. As well, commissioning of these systems was added as a minimum requirement. These changes are intended to help hospitals combat *Legionella* and support the common practice of testing and treating hot water systems.

Acoustics. The 2018 edition features revised exterior noise classifications and adjusted requirements for vibration control and isolation. Table 1.2-6 (Design Criteria for Minimum Sound Isolation Performance Between Enclosed Rooms)

now includes sound isolation requirements for walls between operating rooms, increasing partition costs but reducing sound transmission between ORs.

Sustainable design. Many of the changes made to the sustainable design section are advisory, but hold the potential for life-cycle savings, if not savings in first costs. New appendix materials provide guidance on developing a waste management plan, sourcing mercury-reduced and

Hospital Facility Programs Used in the Study

- **100-bed general hospital:** A 214,031 building gross square footage (BGSF) facility including 72 single-patient medical/surgical rooms (including four for patients of size), 16 critical care beds, six LDRP beds, and a well-baby nursery; eight operating rooms and two endoscopy procedure rooms; two cardiac catheterization rooms and two vascular lab rooms; an emergency department with 26 patient care stations (including one for patients of size); diagnostic imaging facilities for MRI and CT; R/F and mammography rooms; two nuclear medicine rooms; two ultrasound rooms; and central sterile processing, a pharmacy; and a laboratory.
- **Critical access hospital:** A 70,393-BGSF facility including 20 medical/surgical patient rooms (including four for patients of size), two LDRP rooms, two behavioral health beds, one isolation room, and one rehabilitation bed; four operating rooms and two procedure rooms; nine emergency department patient care stations (including one for patients of size); diagnostic imaging facilities for CT, R/F, and mammography; an optical clinic and an infusion clinic; rehab facilities; a pharmacy; and a laboratory.
- **Freestanding emergency care facility:** A 10,397-BGSF facility with one triage room, seven exam rooms (including one designated for patients of size), one trauma room, one observation bed, laboratory facilities, a radiography/fluoroscopy (R/F) room, and CT scanner facilities. (This chapter also appears in the 2018 Outpatient *Guidelines*.)

mercury-free products, and implementing a measurement and verification plan to address long-term continuous use of potable water and to track energy consumption by source.

Emergency preparedness. New recommendations in the appendix provide information to assist with creating an emergency preparedness assessment, projecting space needs in the event of an emergency, and planning for resiliency. These considerations create the potential to reduce costs should a natural or manmade emergency event occur.

Common Elements for Hospitals

Accommodations for patients of size. In the 2018 *Guidelines*, an effort was made to update the requirements for spaces where patients of size will be treated. “Bariatric” patients are those designated for bariatric surgery, whereas patients of size (i.e., those who are very tall, muscular, or obese and may require expanded clearances or expanded-capacity wheelchairs or lift equipment) may be treated in a variety of spaces throughout a facility. In the 2014 edition, these spaces were prescribed only in a dedicated bariatric unit. For 2018, a topic group of HGRC members and outside subject matter experts developed new requirements for spaces throughout a health care facility that can support safe care for patients of size.

These new requirements were created to provide health care facilities the means to respond to the prediction that, if current increases in obesity rates continue, half of all Americans will be considered obese by 2030 (National Health and Nutrition Examination Survey, CDC). By incorporating specific design criteria for patients of size, the 2018 *Guidelines* provides design professionals the tools needed to overcome a concerning lack of preparedness for patients of size on the part of many health care organizations.

Among the new requirements are clear floor areas for rooms with lifts (either portable or fixed) in the percentage of patient rooms the health care organization has determined, by conducting a PHAMA, will adequately serve their population; patient toilet rooms with sufficient space to allow staff to assist persons of size and to accommodate expanded-capacity wheelchairs; and grab bars installed to sustain a concentrated load of 800 lbs. Such accommodations create a more welcoming environment for patients and are intended to reduce injury risks for both patients and caregivers. The many benefits of providing a safe environment of care for patients of size spill over into benefits for health care organizations through cost savings from reductions in staff injuries, increased caregiver morale, and improved patient satisfaction. Based on limited research, the BCC hospital subcommittee assumed, for the purposes of this study, that 5 percent of the patient population would meet the criteria for patients of size. For the 100-bed hospital, this equated to requiring lifts in four medical/surgical patient rooms and one ED treatment room.

Hand-washing stations. The requirement for a hand-washing station in an administrative center or nurse station has been reduced to a required hand sanitation dispenser. The infection preventionists on the HGRC have indicated that a hand-washing station is not necessary in this location and that removing the requirement reduces opportunities for aerosolized water spray to settle on surfaces in the nurse station, at the same time protecting paper and electronics from water damage.

Pre- and post-procedure patient care areas. Revised requirements for pre- and post-procedure patient care areas allow for flexible design of these areas. Health care facilities may choose to

provide separate pre-procedure and recovery patient care areas or combine them (including pre-procedure and Phase I [PACU] and Phase II recovery areas) into one space as long as the most restrictive design requirements are followed. If a health care organization's patient flow permits combining spaces, this flexibility can result in significant savings. As well, the number of PACU stations required per operating room has been reduced to one per OR rather than 1.5 patient care stations per OR as was required in the 2014 edition.

Sterile processing. The 2018 edition increased the minimum requirements for a sterile processing facility from one room to two rooms (a decontamination room and a clean workroom), except when small countertop sterilizers are used for a limited workflow. Requirements for a three-basin sink and additional stainless-steel counter increased the cost of the decontamination room in the two-room sterile processing facility. However, the change to a two-room minimum did not increase overall costs for this facility in the BCC study because the hospital program used already included a two-room facility, which infection preventionists generally view as the most effective design for supporting the essential dirty-to-clean workflow. See the sidebar for a discussion of changes in *Guidelines* sterile processing facility requirements from the 2010 edition to the 2018 edition.

Electrical receptacles. A significant change appears in Table 2.1-1 (Electrical Receptacles for Patient Care Areas in Hospitals). To align with requirements in NFPA 99: *Health Care Facilities*

Guidelines Sterile Processing Changes, 2010 – 2018

The 2010 and earlier versions of the FGI *Guidelines* required one substerile room between every two ORs for flash sterilization. Since then, it has been established that open-pan flash sterilization has a high risk for contamination of sterile instruments, so the practice is no longer accepted. For this reason, in the 2014 *Guidelines*, the substerile room requirement was replaced with a satellite sterile processing room located in the semi-restricted area of the surgical suite. The intent was to create a space where instruments could undergo “immediate use steam sterilization” (IUSS), a quick-turnaround sterilization method performed in a validated closed container that ensures instruments remain sterile during transport. Instruments still required washing and decontamination prior to IUSS, but it was thought at the time that a workflow operationally designed to go from soiled to clean would allow safe sterile processing in a one-room facility. Time and observation of practice, however, have proved this is not possible. There is no way to ensure contaminated aerosols from the decontamination side of the room would not drift to the clean side as the HVAC system could not be designed to ensure containment of aerosols on the dirty side.

For the 2018 edition, the infection preventionists on the HGRC and other subject matter experts took a second look at the *Guidelines* sterile processing facility requirements. Their goal was to support development of facilities that encourage clinical personnel to comply with professional practice guidelines for cleaning, decontaminating, and sterilizing surgical instruments. Considering the importance of maintaining a dirty-to-clean workflow in sterile processing areas, it was determined the minimum requirement for these spaces is a two-room configuration, consisting of a decontamination room and a clean workroom. This allows for a one-way traffic flow and eliminates the possibility of cross-contamination from dirty instruments to clean instruments.

Ensuring the sterility of surgical instruments requires diligence throughout the sterilization process and the layout of the sterile processing facility can significantly improve the likelihood that reprocessing is performed in the safest manner possible.

Code, 12 outlets have been added to the requirements for an operating room and four outlets for a procedure room. Health care projects are generally designed to the most stringent requirements of the *Guidelines* or NFPA 99 due to the expectations of most AHJs. Syncing the requirements of these two documents adds clarity to expectations and reduces confusion in the industry regarding minimum requirements as well as the frequency and cost of delays due to AHJ rejection of plan reviews and field inspections.

Specific Requirements for General Hospitals

In addition to the items in the chapter on common elements for hospitals, a few other changes in the general hospital chapter have significant cost effects.

Resuscitation area in MRI suite. A patient treatment/resuscitation area was added to requirements for the MRI suite to respond to the known risks of anaphylactic/anaphylactoid reactions to gadolinium-based contrast agents used in some procedures. The added area also supports the growing use of magnetic resonance imaging for higher-acuity patients and as a platform for intervention, all of which increase the likelihood of code responses for MR patients. This area must be located outside the MRI scanner room because the MRI environment makes a significant projectile risk of virtually every tool and device a code team might bring to a patient in need of resuscitation, endangering the safety of the patient, the MR department staff, and the responding code team.

Endoscopy procedure rooms. Reducing the minimum square footage for endoscopy procedure rooms from 200 square feet to 180 square feet can result in cost savings.

Imaging facilities. Savings—as well as design flexibility—may also be realized for new imaging rooms as these spaces are sized according to clearances needed around the imaging equipment selected for a project. Conversely, a requirement for two pre/post-procedure patient care stations for certain imaging facilities adds overall cost. In the model program, this added two patient care stations for the CT facilities.

Critical care rooms. In new hospitals, all critical care rooms (except in the neonatal intensive care unit) are now required to be single-patient. This change was made to help reduce infection rates, improve options for family support, reduce transfers, improve privacy, improve communication between care providers and patients, and improve patient experience.

Telemedicine spaces. Minimal requirements were added for facilities that choose to provide clinical telemedicine spaces. Although the requirements are few, significant advisory information has been provided on lighting, acoustics, equipment, and privacy. These recommendations can help assure that spaces intended for telemedicine use support accurate transfer of visual information between patient and care provider. The provision of care through telemedicine may offer operational cost savings through reduced ED visits, fewer hospital readmissions, reduced need for physical buildings, and increased convenience and timely care for patients.

The 100-bed general hospital program used by the BCC to price changes in the *Guidelines* included the facilities described above but no specialty services areas; thus, changes in cost for specialty services facilities were not considered in this analysis. The services not considered included a NICU, bone marrow transplant unit, specialized oncology treatment units, dedicated

observation units, hybrid ORs, radiation therapy facilities, hemodialysis treatment facilities, and dedicated adolescent/pediatric units.

Specific Requirements for Critical Access Hospitals

The cost impacts discussed above for general hospitals would only apply to critical access hospitals if those services are provided in the hospital (e.g., critical access hospitals commonly do not offer MRI services). The BCC assessed added costs for including support spaces for off-site sterile processing services in a critical access hospital; however, if these spaces take the place of a two-room on-site sterile processing facility (rather than being built in addition to this facility), a savings would result.

Freestanding Emergency Facility Overview

The chapter on freestanding emergency facilities appears in both the 2018 *Hospital Guidelines* and the 2018 *Outpatient Guidelines*. The content is identical, although it is presented differently as the chapter in the Hospital document refers back to the emergency department requirements in the general hospital chapter, which the chapter in the Outpatient document cannot. Many of the cost changes that affect the freestanding emergency facility are included under the Common Elements for Hospitals heading above. The requirement for central monitoring at the nurse station and each patient care station in the facility is the primary additional cost.

Outpatient Overview

In assessing the cost impacts of changes in the *Guidelines* for these programs, the BCC considered the design elements included in each facility. Where scope is added by the 2018 *Guidelines* but the item would be provided in a typical design to meet other codes and standards or where it is considered standard practice (e.g., an added outlet at equipment storage), the BCC did not consider it added cost. But where scope was added for what is normal practice in larger

Outpatient Facility Programs Used in the Study

- **Multi-specialty ambulatory care center:** A 19,680-BGSF facility that includes an urgent care center, primary care clinic, imaging center, laboratory facilities, and a community room.
- **Ambulatory surgery center:** A 12,411-BGSF facility that includes five operating rooms and one endoscopy procedure room, supported by six preoperative patient stations and 15 post-anesthesia care unit (PACU) patient care stations.
- **Endoscopy facility:** A 7,653-BGSF facility that includes three endoscopy procedure rooms, three pre-procedure patient care stations, and eight post-procedure (recovery) stations.

facilities but now will impact smaller facilities, the BCC added it to the cost equation. Where possible, the BCC identified revised scope that might affect operating expenses (positively or negatively). Flexibility in ambulatory spaces like primary care and urgent care were not found to have direct cost savings for the models studied, but they do have operational value and could provide savings in other facilities.

Common Elements for Outpatient Facilities

Procedure and Class 2 imaging rooms. These rooms must meet semi-restricted requirements, whether they are in a doctor's office, clinic, or outpatient surgery facility. While this results in minimal added construction costs, it reduces infection and other risks.

Pre- and post-procedure patient care areas. The flexibility now permitted in the design of pre- and post-procedure patient care areas can reduce the number of bays required depending on the health care organization's patient flow. This may reduce both construction and operational costs in facilities such as outpatient surgery and endoscopy.

Sterile processing. The change from a one-room to a two-room sterile processing facility mentioned above under the hospital common elements head applies as a minimum requirement to outpatient surgery facilities. However, many other smaller outpatient facility types where on-site sterile processing is performed may be able to use the one-room sterile processing facility, which is permitted when the quantity of instruments to be processed is small enough to be handled by a tabletop sterilizer.

For the two-room sterile processing facility, some added requirements will increase costs. The decontamination room now requires a third sink basin, a flushing-rim sink, a documentation area, piped or cylinders of instrument air (including a pump if piped), and added cooling. The clean workroom requires a documentation area, sterile cart cooling area, and instrument air.

Building systems. Although a few outpatient facility types are still required to meet the requirements of ANSI/ASHRAE/ASHE 170: *Ventilation of Health Care Facilities* in at least some spaces, the 2018 edition for most outpatient facility types now refers to local codes for HVAC and plumbing requirements, which could result in savings. This change was made to simplify requirements for small facilities and align with local and state requirements.

Increased electrical costs include a panelboard required in tenant spaces to facilitate access for routine maintenance and in an emergency. Smaller facilities may have a significant added cost for a required fire alarm, although this change was made to align with requirements in other codes.

Other changes. Other examples of changes in common elements that could reduce costs are flexibility to use control alcoves in lieu of control rooms in some imaging rooms and reduction in door sizes in some locations. An example of possible increased cost would be the increased size needed to include an anesthesia work zone in a procedure room in which use of an anesthesia cart will be required.

Specific Requirements for Urgent Care Centers

The requirements for examination rooms in an urgent care center have been loosened, changing from all single-patient rooms to permission to use bays or cubicles in a multiple-patient room. This may allow some facilities to achieve a savings.

Specific Requirements for Endoscopy Facilities

Inclusion of an exam room in an endoscopy facility has been made optional and requirements for patient changing spaces and lockers have been reduced, both reducing costs. An increased cost comes from the new requirement for a soiled holding room or a soiled workroom to support

infection prevention practices; previously, a soiled workroom was optional in an endoscopy facility.

Optional Elements

Certain changes in the 2018 text of the Outpatient *Guidelines* affect optional programming decisions, so they would not apply to all facilities. Not mandated in every outpatient facility, these elements would become required if they were added as a program component in the functional program for a project. However, because the Outpatient *Guidelines* requires only the facilities needed for the pharmacy services provided, the cost impact is incremental. Another example of optional cost impacts is the requirement for a canopy over a service entrance, which would only be needed where a service entrance is provided. The impact of adding such elements is reflected in the optional cost impacts shown in the table at the beginning of this document.

The most significant difference in optional elements between the Hospital and Outpatient documents is in the requirements for accommodations for care of patients of size. A PHAMA must be prepared for all facility types, hospital and outpatient, to determine the percentage of the patient population to be served that will need accommodations for persons of size. However, hospitals are required to have some spaces meet these requirements, but the operator of an outpatient facility may determine that patients of size will not be served and thus they can choose not to provide accommodations for persons of size.

Conclusion

During every *Guidelines* revision cycle, the HGRC, volunteer subject matter experts, and FGI staff put in thousands of hours to update the content of the *Guidelines*. This effort is diligently monitored by the Benefit-Cost Committee throughout the cycle as they assess benefit and cost implications of initial proposals, the draft document and subsequent comments, and finally as they weigh the impact of each new requirement in the published *Guidelines* documents. The decision to accept a proposal or comment may be influenced when the BCC identifies its cost as high and benefit as low; for this reason, it is imperative that all HGRC members and those who submit proposals and comments strive to create *Guidelines* requirements that balance a fundamental level of patient, staff, and visitor safety and an overall usability of health care spaces with concerns about the continually increasing costs facing the U.S. health care system and the patients it serves. The final results in the 2018 FGI Hospital and Outpatient *Guidelines for Design and Construction* documents, as demonstrated in this report, offer a comprehensive and current standard that will support good clinical outcomes and cost-effective care.



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