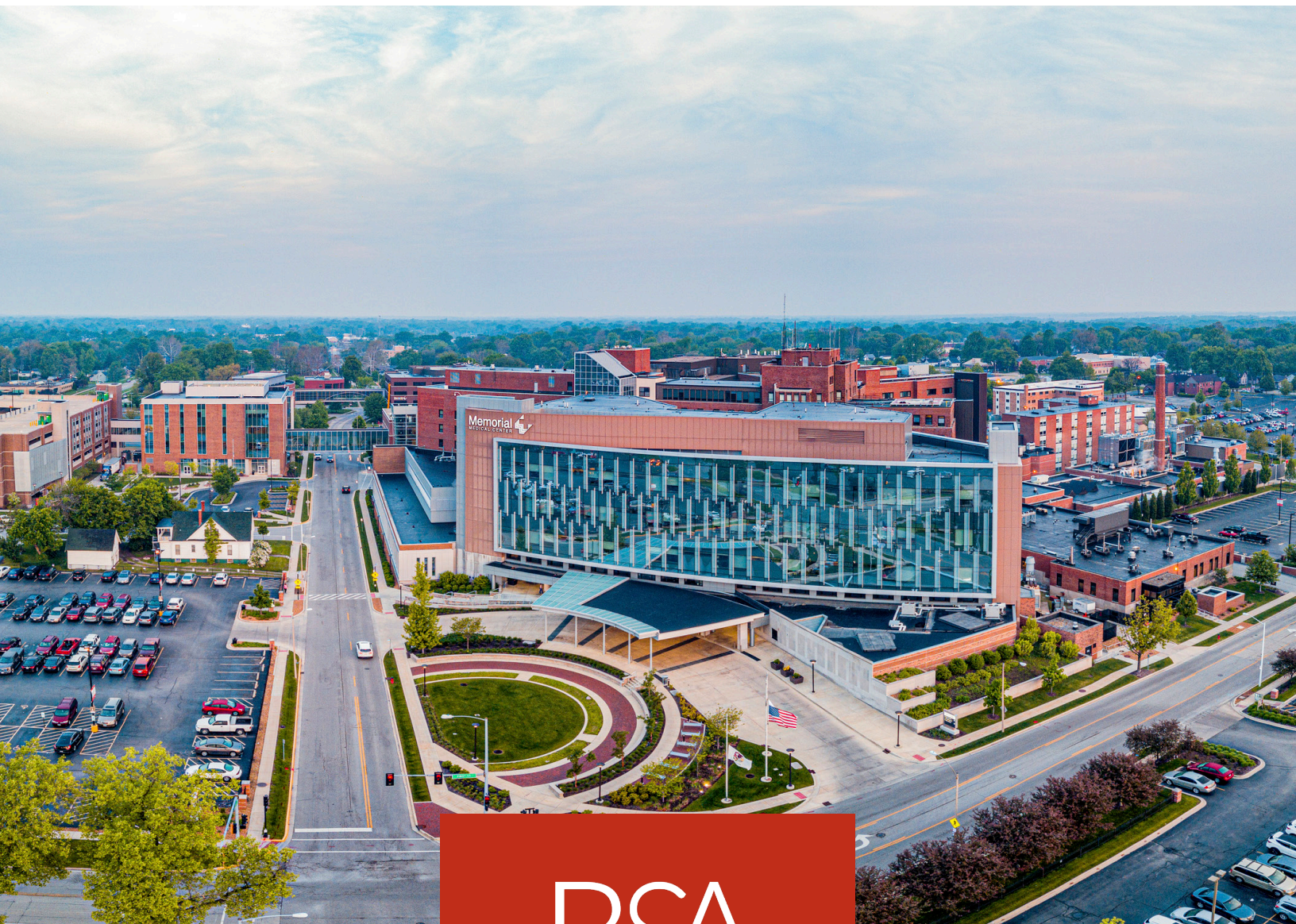


Advancing Care by Design

Main Campus Revitalization,
Memorial Health



BSA



Advancing Care by Design

Main Campus Revitalization, Memorial Health

Memorial Health, one of the leading health systems in Illinois, exists to improve the health of the people and communities it serves. The system serves an average of 40,000 in-patients, 667,000 outpatients, and 125,000 patients in emergency departments each year. Memorial Health incorporates its mission of advancing care through its design and operational goals.

Springfield Memorial Hospital, the flagship campus for Memorial Health in Springfield, Illinois, was slated to expand. The design and construction team were asked by Springfield Memorial Hospital to develop new structures providing cutting-edge health care while also creating a unified campus with a strong consistent architectural language. Specific project attributes were identified and included creating spaces with a simple, natural, sophisticated, modern, and earthy feel, influencing the overall design.

The design solution reflects a modern version of the architectural Prairie Style. Prairie Style is often identified with strong extended horizontals supported by heavy piers, creating deep shadows and texture. Because of the scale of Springfield Memorial Hospital, the prairie spirit is re-imagined as a larger scale use of brick, metal, and glass forming iconic forms with high contrast. Materials include a consistent and rich masonry blended with limestone trim, high performance glazing with frit for light control, solid and perforated metal panels.

Springfield Memorial Hospital wanted patients to feel comfortable and at home inside of the facility. BSA LifeStructures' modern Prairie Style design supports new health care technology and advancing practices while maintaining a comfortable, rural atmosphere to not overwhelm patients from surrounding agricultural communities. Main Campus Revitalization project re-imagines an existing low solid masonry block into a dynamic face of glass, serving a window to the city that is the new face of Springfield Memorial Hospital.



← TOP | The design solution reflects a modern version of the architectural Prairie Style, identified with strong extended horizontals supported by heavy piers, creating deep shadows and texture.

The hospital decided to design the new Patient Care Tower, Surgery Expansion Center, Memorial Learning Center, and Engineering Infrastructure projects, adding roughly 145,000 square feet to the campus.

Patient Care Tower and Surgery Expansion Center

COMPLETED DECEMBER 2015

The Patient Care Tower adds three new patient floors to the existing building. All three new floors include 100% private patient rooms. This vertical expansion interconnects the new floors with the existing building at six points. The new space provides a collaborative environment for physicians, nurses, and students who have the opportunity to learn with healthcare professionals.

The Surgery Expansion Center project increases the surgery capacity of the hospital while improving the patient process and experience. The project consists of a three-phase interior renovation. The design responds to important objectives for Springfield Memorial Hospital, including improving patient outcomes and designing an environment that improves patient safety. Patient and visitor satisfaction was addressed with dedicated family space in the holding bays. The larger suites accommodate orthopedics and neurology procedures.

Memorial Learning Center

COMPLETED FEBRUARY 2015

The Memorial Learning Center is a joint venture with Southern Illinois University that is a hub of activity for the medical campus and serve as a premier teaching facility in central Illinois. The building features a large

flexible conference center, surgical skills lab, and a variety of simulation labs.

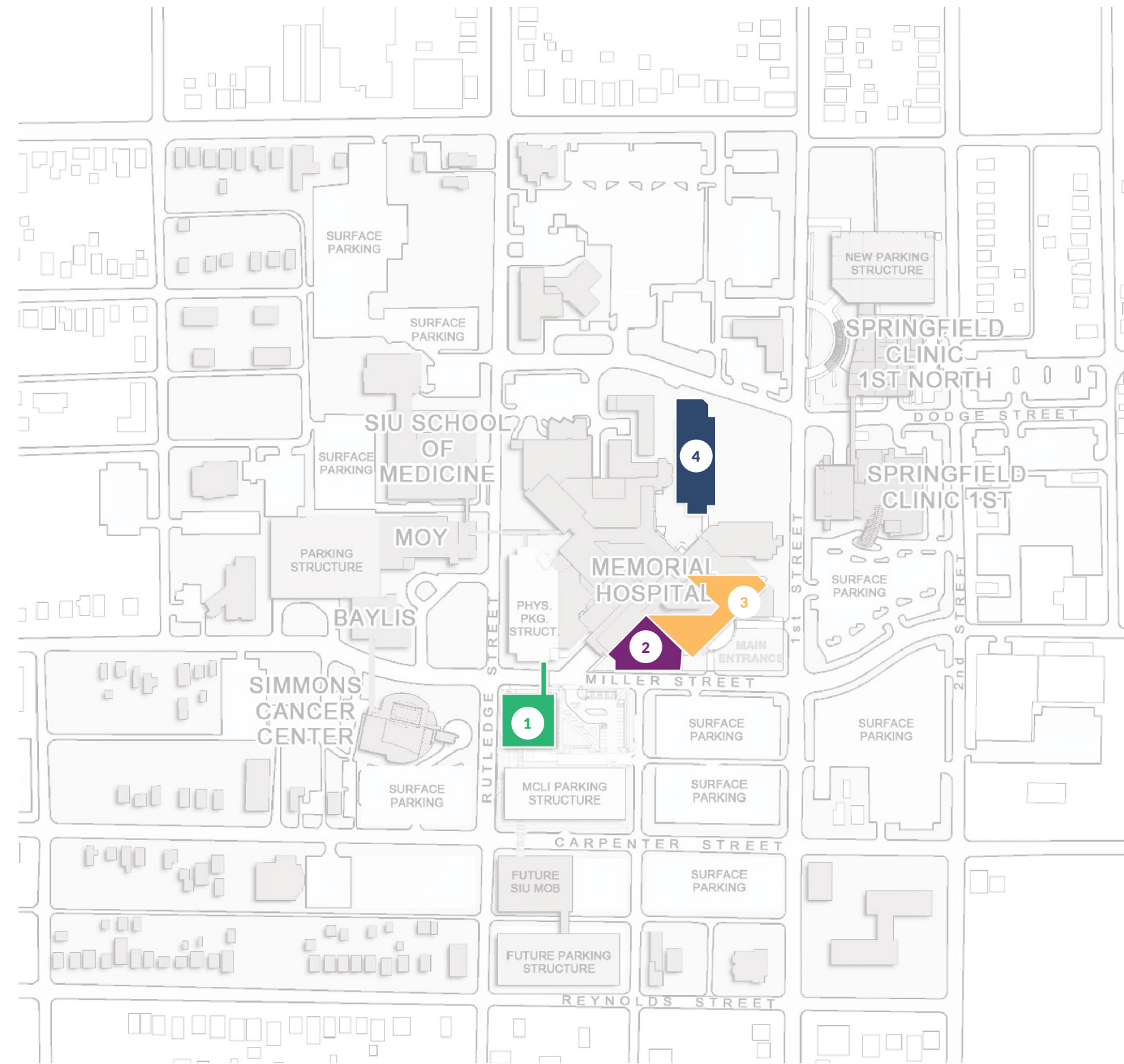
The Memorial Learning Center focuses on equipping students with the skills they need to treat patients in an environment that mimics an actual healthcare facility.

The simulation labs include a standard patient care room model, intensive care labs, exam rooms and an emergency department that prepares healthcare students for the evolving healthcare industry. The center also has formal and informal lecture halls for instruction and a 350-seat conference center with state-of-the-art communication tools.

Engineering Infrastructure

COMPLETED OCTOBER 2015

The Engineering Infrastructure project was developed to support the newly added square footage. But an additional goal was established: add the entire 145,000 square feet while simultaneously reducing annual energy consumption by 20%. The Engineering Infrastructure project included a two-story addition to the existing central plant, high-efficiency heating hot water boilers, heat recovery chillers, a variable frequency drive chiller, variable primary pumping, and variable drive cooling tower fans, a cooling tower storage sump, and other strategies for meeting the needs of the campus and the goals for energy efficiency. The project also included new emergency generators and long runs of chilled and hot water piping and conduit from the central plant throughout much of the existing hospital.



1 Memorial Learning Center

3 Patient Care Tower

2 Surgery Expansion Center

4 Central Plant

Team Approach

A hospital campus is among the most complex of environments. When Springfield Memorial Hospital embarked on its goal of campus transformation, true partnerships were needed. This project entailed building a new patient tower atop an operational facility, maintaining the front lobby and entrance during construction, adding a new surgery center adjacent to existing operational rooms, adding a state-of-the-art facility designed to provide high-tech medical training environments and community educational space, and lastly an addition to the existing central plant.

The concept of “Committed Team Delivery” was born, giving rise to deep, trusted relationships among designer, builder, and owner.

The success of this committed partnership did not occur overnight. During the past 30 years, Springfield Memorial Hospital, BSA LifeStructures (BSA) and O’Shea Builders cultivated strong and trusting relationships. However, just as the economic downturn and the Patient Protection and Affordable Care Act impacted healthcare funding, the design and construction industries also experienced financial pressures. Financial issues related to healthcare funding, access, and reimbursement models necessitated a paradigm shift. Having a team put together that was committed to each other’s successes led to a unique level of detailed project integration focused on the many goals, one being the speed to market required by the project scope.

Committed Team Delivery

This approach provides an enhanced collaborative process in which the focus shifts from internal and individual success to the external project outcome. The ultimate barometer of success is measured through long-term value for all team members.

The initial vision for this approach involved both design professionals as well as construction experts with the owner. In the very first conceptual project conversations, designers and contractors guided feasibility and cost issues to better inform decision-making by the hospital. The Springfield Memorial Hospital executive team believed this level of transparency was fundamental to delivering the next generation of healthcare services for the community. All team members were expected to actively participate in scope development, feasibility analysis, and information sharing in order to develop the best decisions.



The Memorial Learning Center included an 86-foot-long, single-span pedestrian bridge that connects the learning center with a parking garage.



Patient Care Tower and Surgery Expansion Center

The Patient Care Tower adds beds to the existing hospital and redefines the exterior aesthetics of the Midwestern facility. The new space provides a collaborative environment for physicians, nurses, and students who can learn with healthcare professionals.

Patient comfort and satisfaction are critical components to the design of the new tower. Patient rooms are enlarged to give more space to family and visitors, while also providing ample room for the caregiver to treat the patient. There are additional spaces included for classrooms, physicians and student collaboration.

The Tower sits atop the existing structure, presenting structural issues that the design team solved through locating alternative routes for plumbing and mechanical services serving the additional levels.

The Surgery Expansion Center at Springfield Memorial Hospital increases the surgery capacity of the hospital, while improving the patient process and experience. The design team led Springfield Memorial Hospital through a series of visioning sessions that identified goals and metrics to measure the design's success and value.

The expanded surgery center design responds to important objectives for Springfield Memorial Hospital, including improving patient outcomes and designing an environment that improves patient safety. Patient and visitor satisfaction was addressed with dedicated family space in the holding bays. The larger suites accommodate orthopedics and neurology procedures.



KEY FEATURES

- 114 private patient rooms, 6 operating rooms, 23 PACU rooms, 30 pre- and post-holding bays
- Metrics driven design
- Dedicated space for families and visitors
- New outpatient waiting area
- Standardized headwalls
- Flexible spaces to accommodate multiple medical procedures
- Expanded surgical support spaces

PROJECT DETAILS

SIZE	126,000 SF (Patient Care Tower); 50,700 SF (Surgery Expansion Center)
COST	\$61.0 M (Patient Care Tower); \$24.6 M (Surgery Expansion Center)
DATE	January 2018 (Patient Care Tower) ; July 2016 (Surgery Expansion)

◀ BOTTOM LEFT | A standardized headwall allows for caregivers to conveniently utilize specialty-care devices from either side of the bed. For nurses, it's a safety precaution that means no more stretching over patients and a reduction of possible injuries from overextending.

Project Definition

The project definition phase included BSA and O'Shea Builders with the Springfield Memorial Hospital Leadership team as project needs and goals were defined for the Patient Care Tower and Surgery Addition projects. Feedback and opinions from design and construction team members were invaluable as decisions surrounding scope unfolded.

During this first phase, the team identified three major project goals – private patient rooms, intermediate care capacity and additional surgical capacity. Springfield Memorial Hospital heard from community focus groups that having 100% private patient rooms was of critical importance. The owner, architect, and contractor left the project definition stage “committed” to this ultimate outcome. These commitments were conveyed to all project team members, opening many non-traditional lines of communication during the design approach and project delivery phases.

Design Approach

The design approach phase continued to build on the “committed” team approach. BSA provided cutting-edge design concepts, providing O'Shea with access to real time electronic drawings in order to eliminate potential clashes. Design ideas were coordinated and shared in weekly meetings in an on-site office mobilized by BSA and O'Shea Builders. These weekly meetings with the project leadership team eliminated many setbacks throughout the project.

A main goal of the Patient Care Tower project was to provide a flexible design that was also sustainable enough to improve walking distance and efficiency of movement for nurses and staff. The tower has shown to decrease travel time by 7.7%.

To better accommodate patients, families, and the guests of those in the facility, patient rooms have been modified. For guests, a bench and a separate sofa which folds out for sleeping are installed in all patient rooms. Other features were added to make the patient's stay more enjoyable and comfortable, such as a universal control unit for patient control of the light filtering shade, TV, and temperature of the room.



Additional modifications include open space to provide more natural light and beautiful courtyard views, an open lobby to allow for better traffic flow, a new easily accessed lobby café, a new driveway canopy, a more open drive lane and front entry drive to alleviate traffic congestion.

As a team member committed to project success, BSA went the extra mile in patient room design. In meetings with medical staff, designers projected a life-size image of the patient room headwall on an 8-foot rear projection screen. An actual patient bed was rolled up to the screen so that Springfield Memorial Hospital medical staff could effectively visualize the location of gases, outlets and other important medical equipment. The design team moved elements of the headwall virtually in real time during the meetings as medical staff and the BSA Operational Planners discussed how to make the layout more efficient.

But the team did not stop with virtual design. BSA and O'Shea built a complete physical mock-up of the patient room, allowing the Springfield Memorial Hospital medical staff to completely understand and experience the new design. These extra steps provided by team

members allowed for a comprehensive understanding of the design to limit changes during construction and minimize negative impacts on both the schedule and budget.

An additional component of the project is the Surgery Expansion Center. This two-story addition, with penthouse and partial renovation of existing surgery department, defines a street edge and serves as a horizontal base and a counterpoint to adjacent forms. The design increases the size of the operating rooms (OR) by 35% to better accommodate Orthopedics, Neurology and Robotics. Six of the twenty-three ORs were newly constructed as a part of this project. The rooms are centralized as much as possible to reduce time and walking distance to supplies and equipment and to increase the quality of patient care.

The surgery center was structured to better fit the needs of surgery patients as well as their families. Outpatient families have direct access to patients in the Pre/Post Operation rooms from the family lounge. Six new private Pre/Post rooms with full height partitions and doors were added to provide increased privacy and comfort.

Three private consultation rooms directly off the family lounge are located in the facility for families and doctors to discuss patients' needs in privacy.

The goals of enhanced patient throughput, flow and length of visits have been achieved by reducing the number of stops from arrival to discharge. Patients are preregistered and registration is completed bedside. The Pre/Post unit on Level 1 is directly above the ORs with a dedicated elevator to eliminate the need for a separate holding area of anesthesia.

The Patient Care Tower and Surgery Expansion Center project serve as design beacons of the Advancing Care by Design campaign, transforming the aesthetic look of the Springfield Memorial Hospital campus. The project provides a foundation for Springfield Memorial Hospital as a highly preferred medical facility for the surrounding community.

⬆️ *The new glass facade of The Patient Care Tower rises above the new main entrance. The additional three floors of the tower were built above the two existing floors.*



Project Delivery

The true value of the “Committed Team Delivery” process was fully realized when the project team was confronted with a number of technically challenging issues. With a spirit of collaboration and unity, the team worked together to address effectively three major project challenges:

1. Undersized Floor Plate
2. Floor to Floor Heights
3. Engineering Systems Coordination

Utilizing the Committed Team Delivery process to resolve these challenges resulted in an improved project experience and positive impacts on the schedule and budget.

The first major project challenge encountered by the team was an undersized floor plate. In setting project goals, Springfield Memorial Hospital established the importance of maintaining all adjacencies between the new nursing units in the Patient Care Tower and existing hospital support departments. The team collaboratively studied the hospital campus, determining the optimal location for the new three-story tower to be on top of an existing three-story structure. The existing hospital structure consisted of a surgery unit (Lower Level), oncology center (Level One) and oncology inpatient unit (Level Two).

The team began to solve this complex issue with an analysis of the existing structure’s ability to support the new addition. Although the original structure, built in 1990, was designed to expand vertically for an additional five levels, today’s more restrictive seismic code requirements limited vertical expansion to three levels. Newer building codes imposed weight restrictions on the new structure which had to be lighter than the existing flat plate concrete system.

As a result of this analysis, the team proposed the incorporation of a lighter-weight structural steel system as well as use of lighter exterior materials. The team proceeded with a composite structural steel system and exterior materials limited to aluminum and glass curtain wall and composite metal panel systems.

After analyzing the structural limitations of the expansion, the team then tackled the issue of an undersized footprint. The ultimate solution proposed cantilevering the new triangular floor plate over the existing floor plate, up to six feet in some areas. This creative solution provided several key programmatic benefits:

Increased square footage to support new program goals, such as larger private patient rooms
Reduced impact of the 24-foot structural grid
Larger support spaces and 9-foot wide corridors, a significant benefit in a teaching hospital

Once the decision was reached to place the new Patient Care tower on top of the existing structure, a second project challenge arose. Related to new patient care spaces, Springfield Memorial Hospital placed a high priority on maintaining close proximity to existing support areas such as additional inpatient rooms, critical care, imaging and other ancillary spaces. However, the existing hospital structure featured floor-to-floor heights of 11’-6”. Current standards in hospital design along with the vertical space required by newer MEP systems recommended a floor-to-floor height in the 15’-0” range. Therefore, it would not be possible to connect at every floor.

The collaborative team was put to the test. Two key areas were identified as priorities for connection. The third level of the new Patient Care Tower would connect to the third level of the existing hospital, improving staff efficiency and providing adjacency between the new Intermediate Care Unit and the existing Medical/Surgical Unit. On the sixth level, the new Cardiology In-Patient Unit would connect to the existing Cardiology Unit.

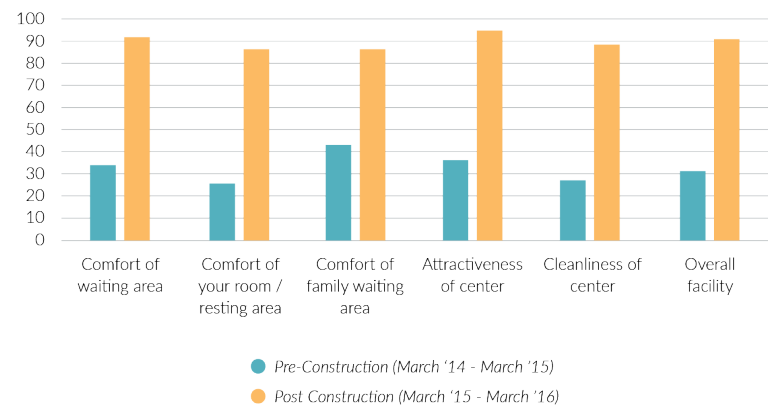
Operationally, this strategy worked well, yet it created additional challenges for the team. Aligning the third level necessitated building the new tower on top of the existing roof, which was directly above an operational

oncology inpatient unit. It was critical to the success of the project that this unit remained operational with minimal disruption. The team collaboratively evaluated a number of core drilling methods and selected those that minimized noise and vibration to the greatest extent. Sample cores were drilled so patients and staff could be made aware of the impact. The team also developed a core drilling schedule and coordinated the times closely with Springfield Memorial Hospital medical staff so that disruptions were concentrated on only certain times of the day.

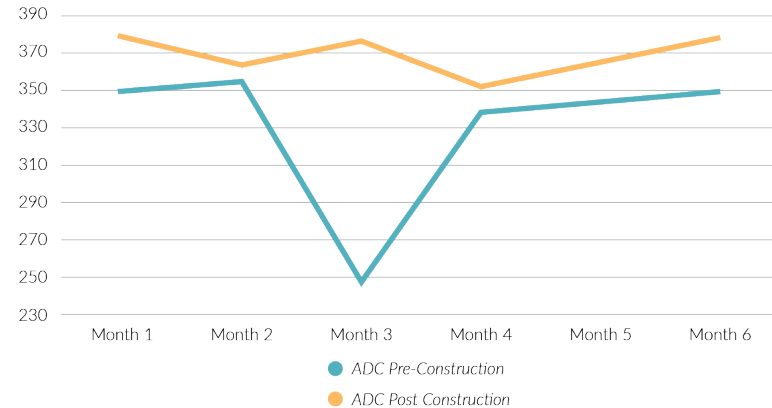
The nature of flat plate concrete construction includes a significant amount of reinforcing steel in the slab, mostly concentrated around structural columns. Early in the design process, the team developed floor penetration plans that responded to the structural and operational needs of the existing facility.

⬆️ TOP MIDDLE | *Sound-absorbing floors help cut down the sound of traffic and provide a calmer, more peaceful environment for patients.*

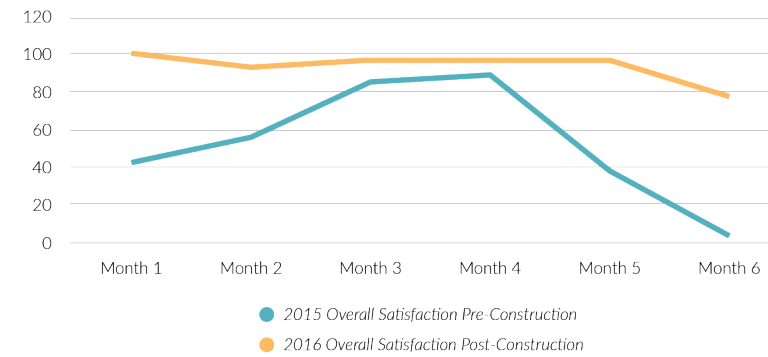
MMC Surgery Patient Satisfaction Ratings



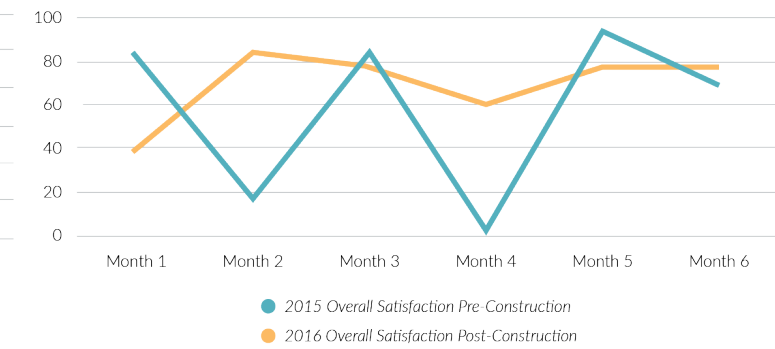
MMC Average Daily Census



MMC Ortho Unit Patient Satisfaction Results



MMC Cardiac Unit Patient Satisfaction Results



Connecting the third and sixth levels left a new, non-aligned floor for Orthopedics. Providing this non-aligned level between existing floors required close coordination among the design and construction team and the elevator manufacturer. Existing elevators were reprogrammed with the requisite intermediate stops. In the event that elevators were inoperable, new stairs were installed to connect back to the existing hospital to maintain required life safety egress.

Finally, planning new patient floors with a cantilever design provided an additional challenge. The team determined that the best location for patient restrooms was along the outside wall of the new patient tower. The space under the restroom floor was exposed to the outside, presenting potential maintenance issues and freezing problems for shower drain piping. The team worked together to design a heated and insulated space beneath the patient restrooms with an accessible horizontal chase. Collaboration among maintenance personnel and the design and construction resulted in an effective solution for both the initial construction as well as long-term building operation.

In the final phase of project delivery, team members undertook measures to address potential problems. During such a significant project with major construction impacting the main hospital, complex logistical problems were a concern. Springfield Memorial Hospital developed a project website – Advancing Care by Design – to communicate directly and proactively

with patients and visitors during the 36 months of major campus construction. The website informed the community of major project developments, highlighted new hospital features, and updated patient and visitors about additional parking and wayfinding directions.

Springfield Memorial Hospital provided a dedicated employee to study the increased volume times and patterns of deliveries, suppliers and visitors during construction. O’Shea used this data to create a logistics plan to minimize disruptions of daily hospital operations. O’Shea also created a construction visualization video, depicting current state to future state of construction activities. The video highlighted fences, cranes and road closures, informing and guiding design decisions and operational communication. Additionally, O’Shea provided Springfield Memorial Hospital with drone images to illustrate the progress of the construction compared to the schedule. These videos and drone images provided the local community with important updates about upcoming construction phases and suggestions for navigating construction obstacles.

This complex project incorporated the latest technological tools as well as virtual communication devices in addition to passionate project team members. The Springfield Memorial Hospital campus was not only renovated and expanded successfully; the delivery process resulted in a transformed project team through its guiding focus on “Committed Team Delivery.”

Improved Metrics Through Design

Over the years, Springfield Memorial Hospital has remained committed to being on the forefront of innovative healthcare design and advanced technology. Initiated in September 2012, the Advancing Care by Design expansion project aimed to transform the way that Springfield Memorial Hospital provides care to the community through enhanced patient safety, patient and family comfort, and patient/family and staff satisfaction. The construction of the Patient Care Tower has been a significant piece of the expansion project. Inter-professional discussions between facilities and clinical operations on evidence-based design topics, such as nursing workstation configuration and healing environments, allowed those responsible for care to influence design decisions on an ongoing basis. Clinical leaders across the organization were engaged early in the project planning phase, determining the overall unit layout and the unique design of the patient rooms and support spaces.

In the current design for traditional inpatient hospital units, there is an emphasis on care processes that force the nurse to perform work within a large, centralized nursing station. Evidenced-based design research has shown that a decentralized nursing station layout has the potential to positively impact health and performance outcomes, as well as increase patient

satisfaction and decrease nurse nonproductive time. The decentralized nursing station places caregivers closer to patient rooms, enabling staff to provide close monitoring of high-risk patient activities and vital sign parameters through a viewing window into the room. Additional safety features include widened doorways into the room and the bathroom, allowing caregivers to effectively navigate through these passages with medical equipment and assistive devices. Inside the room, storage areas for both the patient and visitors maintains a clutter-free work area, free of trip hazards. Lighting enhancements on the floor of the room enable night-shift staff to safely navigate through the room without disrupting sleeping patients and visitors. Careful considerations were made in the patient bathroom to enhance safety, including grab bar assistance around the perimeter of the room, integrated patient call technology, a fold down shower seat and non-slip zero-entry shower floor. As a result of these design features, comparing six months of data prior to and following the December Patient Care Tower opening, the rate of falls with injury decreased by 24 percent, demonstrating the effectiveness of evidence-based design on patient safety.

Enhancement of nursing workflow for accessing patient care supplies through evidence-based facility design

4B / 4E - Press Ganey (Percentile)		
Category	4B	4E
Overall	57th	96th
Room	20th	99th
Noise Level	9th	99th
Nurses	27th	36th
Visitors	3rd	99th
Personal Issues	44th	76th
Privacy	15th	88th
Likely to Recommend	50th	85th
Data by discharge date: 8/2015 - 10/2015 N=97		
Data by discharge date: 12/2015 - 7/31/2015 N=394		

Note - 4B represents scores from one of Springfield Memorial Hospital existing in-patient units. 4E represents scores from the new Patient Care Tower in-patient unit.

4B / 4E - HCAHPS				
Category	Pre-PCT		Post-PCT	
	4B	CMS Threshold	4E	CMS Threshold
Rate Hospital 9-10	67%	70%	77%	70%
• Definitely Recommend	74.5%		81.8%	
Overall Hospital Environment	53%	65%	75.2%	65.6%
• Cleanliness	68%		82.0%	
• Quietness	37%		68.4%	
Communication w/Nurses	80%	78%	75.8%	78.5%
Responsiveness of Hospital Staff	63%	65%	58.9%	65%
Data by discharge date: 8/2015 - 10/2015 N=97 % Always or Definitely Yes Responses				
Data by discharge date: 12/2015 - 7/31/2015 N=394 % Always or Definitely Yes Responses				

Note - 4B represents scores from one of Springfield Memorial Hospital existing in-patient units. 4E represents scores from the new Patient Care Tower in-patient unit.

provides additional opportunities for improved patient outcomes. The patient server, a supply storage cabinet that provides access to frequently used supplies and medications from both the hallway and inside the patient room, allows caregivers to only take into the patient space the supplies that are truly required for care. With demarcations in the color of the flooring, staff clearly delineate between the “clean” and “dirty” areas of the room. This additional visual support for infection prevention principles has maintained the patient servers as a clean space and reduced risk for harmful transmissions of infectious diseases. In a comparison of the six months before and after the Patient Care Tower opening, the units moving into this new space experienced a 71 percent reduction in the rate of hospital-acquired C difficile infections, validating the impact that workspace design has on patient outcomes.

In addition to enhanced patient safety and outcomes, design elements embedded within the space provide patients and visitors enhanced satisfaction with care experiences. Understanding the impact that natural light has on patient healing, each patient room has large expansive windows with remote-controlled sunshades for both partial and full coverage. Natural light also pervades the bathroom, providing continuity of the healing environment throughout the patient space. While traditional receiving lounges with large windows provide private space for visitors to take care of any personal needs, visitors are welcomed into the patient room and afforded a separate space, complete with seating for four, sleeping for one, a side table, and television. In addition to the in-room design features, the move towards a decentralized nursing station allows for more interaction between caregivers and patients and families, supporting the goals of patient and family-centered care, ultimately increasing patient, family, and staff satisfaction.

As a result of these innovations in design, patient satisfaction with the overall care experience one the orthopedic unit rose from the 57th percentile, as measured by Press Ganey surveys, to the 96th percentile in the eight months following the Patient Care Tower opening. Scores specific to the room, noise level, and visitor experience, rose to the 99th percentile during this same period, demonstrating the tremendous impact that evidence-based and patient-centered design has on the patient experience. Patients on the cardiac unit experienced similar results following the move,

moving Press Ganey scores for the room from the 7th to the 99th percentile, also noting a dramatic increase in satisfaction with noise level and visitor experience, and currently performing at the 96th percentile.

In addition to the success of the Patient Care Tower post-occupancy increases, the Surgery Expansion Center part of the project also significantly increased their scores. Layout, aesthetics, and attention to detail attributed to the Patient Satisfaction Ratings. When a patient enters the facility, the perfectly placed greeters in the renovated lobby assist in directing the patients towards the surgery registration and waiting area. The wood tones, natural patterns, and soothing artwork continue from the lobby into the surgery center. The brightly glowing pendant lighting fixtures and wood-toned desk guide patients to the check-in. The waiting area incorporates organically etched glass and placement of furniture that create multiple pods, a variety of seating options and furniture layouts allow patients and families to choose what is most comfortable for them, and the large windows flood the space with natural light. As a result, the Surgery Expansion Center significantly improved the patient satisfaction ratings from the 30th percentile to 90th percentile following the Surgery Expansion Center project. The pre-post bays are private for each patient and allow room for one to two family members to comfortably sit with their loved one. These bays are also exposed to natural light – when the patient desires this – and have light-blocking window shades when the patient prefers dimmer lighting. Designing around patient control impacted patient comfort scores from 20th percentile before construction to 85th percentile after the surgery project.

In contrast to the previous environment, the new facility is modern and updated, which contributes to the attractiveness of the center rating increase from 35 percentile to 92nd percentile. The durability and cleanability of all surfaces promote easy and better quality maintenance of the space. The aesthetics of the space may also contribute to the look of cleanliness. These factors aided the cleanliness of the center ratings to increase from 25th percentile to 89th percentile. When the patient is discharged, they are left with an overall satisfaction of the facility, as described by the overall facility rating increase from 31st percentile to 90th percentile.

Memorial Learning Center

The Memorial Learning Center building creates an east gateway with its bridge connector and has a street corner entry with cafe and first floor public spaces. The building encloses an urban node to the east and adds life to the public exterior zone with cafe seating. Flexibility was a key driver for most of the Memorial Learning Center design decisions.

The Memorial Learning Center is located in the heart of Springfield Memorial Hospital's campus and serves as a centralized hub for learning. It is supported by a new parking structure with a capacity of 600 vehicles. The Memorial Learning Center is vertically organized, featuring a main conference room as an anchor on the first floor, classrooms on the second floor, complete simulation center on the third floor, and collaboration and partnership between SIU School of Medicine and Springfield Memorial Hospital on the fourth floor. The Memorial Learning Center also features a pedestrian walkway connecting directly to the hospital and Southern Illinois University's School of Medicine. This adjacency facilitates learning by allowing staff from Memorial Health and Southern Illinois University School of Medicine to enter the Memorial Learning Center on the second floor and immediately funnel into the classrooms.

The main conference room on the first floor is designed to host all day seminars as well as community meetings and needs. As a result, the conference room has access to natural daylight that can be controlled by motorized blackout shades. The room is also supported by a new Café capable of providing meals for all day seminars as well as breakfast and lunch to anyone on the Springfield Memorial Hospital's campus.

An open stair connects the classrooms on the second floor with the simulation center on the third floor. This connection allows Memorial Health to avoid having redundant spaces for students on multiple floors and results in an increased number of high-fidelity simulation spaces. For example, after a simulation on the third floor, students could utilize an open classroom on the second floor for debriefing. Another effort to provide flexibility was to expand the AV and technology services beyond the classrooms. Every conference room and classroom has the same technology (i.e., access to captured simulation, live simulation streaming, web conferencing).

KEY FEATURES

- Central campus location and a hub for medical teaching
- Surgical skills lab
- 350-seat conference center
- Flexible learning environments for instruction

PROJECT DETAILS

SIZE 66,000 SF
COST \$20.6 M
DATE February 2015

Educational center with a healthcare simulation labs, including an operating room, intensive care area, exam rooms, nursing station, and a high-tech ambulance simulator designed to provide realistic and practical learning opportunities in an interactive learning environment.



Project Definition

During the project definition phase, the team was challenged with an evolving program. The expansion of the hospital's surgery department required relocating the main conference room on the campus. The concept of a new facility was born, allowing the project team to investigate possibilities to consolidate and centralize multiple teaching programs spread across the campus. This sudden shift in direction could have led to a disastrous outcome, but with the committed relationship among Memorial Health, BSA LifeStructures and O'Shea, the conference room relocation project was transformed into a successful, state of the art educational and simulation facility.

Once Memorial Health leadership committed to expand the project to a stand-alone building, the team quickly redefined the project. During the project definition phase, the team toured a variety of facilities to evaluate leading industry trends and best practices. Important to the owner was the ability to host national speakers and conferences. The leadership team toured large conference centers to understand the technology, flexibility and critical adjacencies in similar spaces. The team also researched industry trends in clinical simulations and classrooms, student and faculty collaboration, facility branding and state of the art technology. Participation from all team members – Memorial Health, BSA LifeStructures and O'Shea – allowed for facility design to be flexible to changing and growing programmatic needs.

Another facility goal was to provide effective and efficient uses of energy. In order to achieve that goal, BSA LifeStructures designed a series of systems. The Ice Storage System was created by adding ice storage to the traditional air-cooled chiller system, to effectively produce a cooling "battery." That battery can be charged at night when it's more efficient to cool and later discharged as "stored cooling" during peak hours of the day.



Through ventilation, the dedicated outside air system and ventilation systems limit the amount of outside air needed for the building. Building sensors detect occupancy and measure carbon dioxide levels. These measurements allow staff to regulate the amount of outside air brought into the building based on the number of people inside. As a result, energy is not wasted on conditioning excess ventilation air. Fan efficiency is also used in the facility. The coil and filters in air-handling units are sized to reduce pressure drops, which improves efficiency and decreases fan energy. Smaller fan systems use special motors to adjust airflow and energy output.

Waste reduction is significant within hospital and healthcare facilities. In order to manage issues of waste, the facility features all drinking fountains with water bottle filling stations. Guests and occupants are encouraged to refill and reuse drinking containers. Each station counts the number of bottles kept out of landfills by this waste-reduction initiative.

The Memorial Learning Center exists in order to improve patient and family needs. The Patient Care Simulation Room is an exact replica of the new rooms associated with the new Patient Care Tower. Memorial uses this room to train doctors, nurses, housekeeping and building maintenance staff. The Patient Home on the third floor allows instructors to train staff on best practices when providing "at home" care. It includes a mock-kitchen, bathroom and shower, family room and bedroom. In addition, classrooms facilitate group patient education for associated clinics.

Design Approach

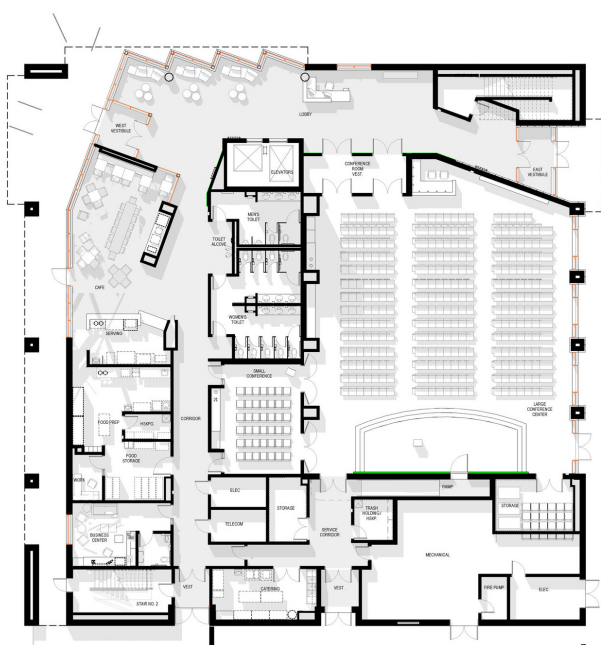
During the project approach phase, BSA LifeStructures utilized technology to help communicate the design to both Memorial Health and O'Shea. A virtual mockup was provided of critical spaces during meetings with medical staff, projecting a life-size image of facility spaces on an 8-foot rear projection screen. The design of these spaces was carefully coordinated with the design of the new Patient Care tower. It was critical to have simulation



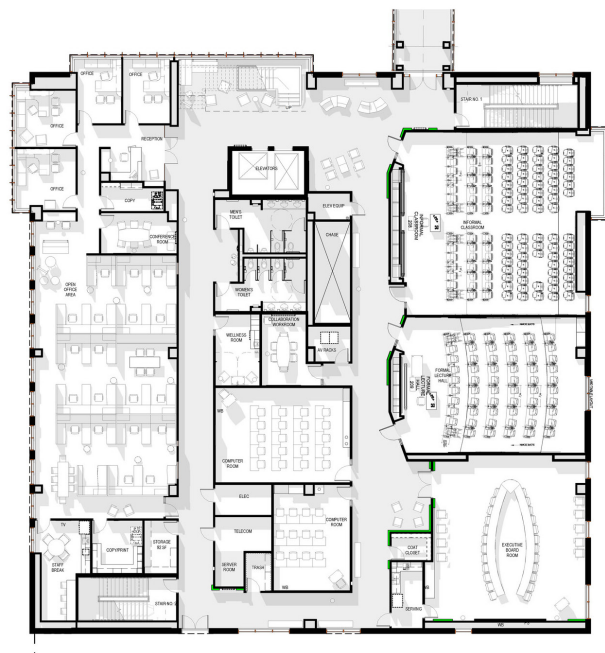
spaces identical to new patient care spaces being built across the street in the hospital. Clinical staff needed to learn in the exact same environments they would be treating patients.

The project approach phase continued to build on the "committed" team approach. BSA LifeStructures provided cutting-edge design concepts, providing O'Shea with access to real time electronic drawings in order to eliminate potential clashes. Design ideas were coordinated and shared in weekly meetings in an on-site office mobilized by BSA LifeStructures and O'Shea Builders. These weekly meetings with the project leadership team eliminated many setbacks throughout the project. In order to ensure consistency among all team members, a website was created through which project leaders uploaded drawings, meeting notes, pictures and renderings to share. The website allowed for all team members to work collaboratively and to effectively communicate design ideas and progress.

Open connector stair at the Memorial Learning Center with custom sculpture.



1st FLOOR PLAN



2nd FLOOR PLAN



3rd FLOOR PLAN



4th FLOOR PLAN

Project Delivery

Fortifying a strategic partnership between Memorial Health and Southern Illinois University School of Medicine (SIU SOM) was a primary driver for the design and construction of The Center for Learning and Innovation. The true value of the “Committed Team Delivery” approach was fully realized when the project team was confronted with several challenges, most significantly the addition of a floor to this project while under construction.

The Center for Learning and Innovation began as a three-story building to be used by both Memorial Health and SIU SOM, featuring a large conference center and classrooms, a modern clinical simulation center, and surgical skills laboratory. The project team worked with both Memorial Health and SIU SOM to identify organizational requirements for learning, teaching, and collaborating. Common spaces that could be shared strategically between the two organizations were identified.

For example, both Memorial Health and SIU SOM were interested in developing open collaboration spaces, classrooms for lecturing and state of the art learning environments. An easier design approach would have been to separate the two organizations and allocate each to distinct floors. However, a segregated approach

did not support the overall vision for The Center for Learning and Innovation – to create a facility that would strengthen their partnership. In order to avoid redundant spaces for both Memorial Health and SIU SOM, the design team introduced an open stair to physically connect the shared classrooms with clinical simulation and open collaboration environments.

The project team worked with Memorial Health and SIU SOM to standardize the technology used throughout the entire building, allowing all spaces to be shared by both organizations. For example, SIU SOM could capture video from the fourth floor surgical skills lab and broadcast it to 350 people in the first floor Conference Center. Memorial Health could record video from a simulation space and broadcast it to a shared classroom on the second floor. Standardizing the technology throughout the building was critical to the success of the collaborative vision.

As the project progressed, the team realized that needs for programmatic space had grown beyond the initial building design. Aimee Allbritton, Memorial’s Senior Vice President and Chief Learning Officer, explained: “As we looked more closely at how we wanted to use the building, we became concerned that the building after it

opened might not meet all of our needs. After all of this time, effort and investment, we did not want there to be a gap.”

With space at a premium on the Memorial campus, the obvious answer for expansion was to add another floor. However, adding a floor to the building would not be simple, especially since the foundation had already been completed and the steel was about to be erected. The committed team was up for the challenge.

Prior to deciding to add another floor, construction submittals including doors and casework had been partially reviewed and approved. Doors designed for the second and third floor that were approved for fabrication were now to be moved to the fourth floor. Close collaboration between BSA LifeStructures and O’Shea along with command of the Revit model allowed the team to coordinate all changes efficiently. The addition of the fourth floor and the adoption of new technology resulted in significant changes to the casework. The design team established weekly casework meetings to reduce the review time needed in a traditional submittal review process.

An additional project challenge involved the design of new clinical simulation spaces on the fourth floor. The design of these spaces needed to be carefully coordinated with the new Patient Care Tower rooms, which were being designed and constructed at the same time across the street. Any modification to the patient care room was simultaneously incorporated into The Center for Learning and Innovation’s simulation room. Design and construction changes to spaces in the new Patient Care Tower project were closely monitored by BSA LifeStructures and O’Shea team members. Weekly meetings were conducted to communicate project changes.

It was imperative to the Memorial Health client to incorporate hi-fidelity simulation spaces throughout the building. The design team collaborated with Memorial Health to identify specific rooms for simulation purposes and incorporate these spaces into the established footprint of the facility. The design featured a shared

As the project progressed, the team realized that needs for programmatic space had grown beyond the initial building design. With space at a premium on the Memorial campus, the obvious answer for expansion was to add another floor.



At the Memorial Learning Center, employees, residents, and physicians are able to advance their skills and learn the latest medical techniques to deliver the best possible care to patients.

simulation control room in order to maximize floor space available for clinical simulation.

Memorial Health challenged the team to capture and utilize multiple simulation spaces simultaneously in order to improve the teaching and learning process. Specifically, the video and audio experience was to be seamless when transitioning from one space to another. For example, paramedics in training could attend to a patient who had fallen in the shower in the residential simulation room. They could transport the patient across the hall to the ambulance simulation area and subsequently down the hall to the emergency trauma simulation area. This training exercise can be captured on one continuous video with one audio track. BSA LifeStructures collaborated with the technology consultant on camera and video programs and also O’Shea to ensure the cameras were installed in appropriate ceiling locations.

The challenges of adding a fourth floor during construction, working with multiple clients and incorporating state-of-the-art technology may have posed significant budget and schedule issues. However, with the collaboration of Memorial Health, BSA LifeStructures and O’Shea, the committed team was

able to transform challenges into successful solutions. The result is an innovative and collaborative Center for Learning and Innovation facility, recognized as an integral centerpiece of the Memorial Health campus.

In this final phase, committed team members undertook measures to address potential problems. O’Shea created a construction visualization video, depicting current state to future state of construction activities. The video highlighted fences, cranes and road closures, informing and guiding design decisions and operational communication. Additionally, O’Shea provided drone images to illustrate the progress of the construction compared to the schedule. These videos and drone images provided the local community with important updates about upcoming construction phases and suggestions for navigating construction obstacles. This complex project combined the latest technological tools with virtual communication devices in addition to passionate project team members. The Center for Learning and Innovation project was designed and built successfully. The delivery process resulted in a transformed project team through a focus on “Committed Team Delivery,” incorporating the latest technology to provide spaces improving the care of patients.

Improved Metrics Through Design

The investment in a facility dedicated to learning and development of the healthcare workforce is a true testament to Memorial’s commitment to education. When it comes to inventive details, the Memorial Learning Center has covered them all.

The Memorial Learning Center is a technologically advanced learning environment where Memorial Health employees, community-health partners, and the SIU School of Medicine’s medical students, residents, and physicians can develop and strengthen their skills and knowledge. Since opening in May of 2015, the Memorial Learning Center has attracted national and international attention for its innovative approach to preparing current and future generations of caregivers to obtain the highest skill level. The facility, located on the Springfield Memorial Hospital campus, features state-of-the-art technology and ample training space. In the first 15 months since opening, the Memorial Learning Center has hosted over 7,300 conferences, classes and events, all focused on educating the healthcare workforce to improve the health of the people and communities we serve.

The Memorial Learning Center showcases Memorial’s commitment to education, collaboration, innovation and continuous improvement as well as our commitment to strengthening relationships with our healthcare partners. For Memorial Health, the facility’s emphasis on education is an investment not only in its employees but in the community at large, providing learning opportunities to area healthcare professionals throughout the state of Illinois. “The addition of the Memorial Learning Center really speaks to Memorial’s dedication to lifelong learning, particularly the space for simulation,” said Chris McDowell, MD, Memorial Learning Center Medical Director. “This type of education is more interactive for learners and allows for multiple professions to work through a realistic situation”.

A major focus in the first 12 months for Memorial Health’s Organization Development Division was to continue Operational Excellence that was established day one of the completion of the Memorial Learning Center. The Memorial Learning Center is a significant example of the support and value placed on learning at Memorial Health. The commitment and support that has

been entrusted to us requires dedication by the learning and development function of Memorial to commit to and succeed in ensuring our learning strategies are executed within a framework of operational excellence. Memorial has dedicated resources and staff to a new department within the Organization Development Division – Memorial Learning Center Operations. This department was tasked with ensuring “moment one readiness” in the Memorial Learning Center. The goal of moment one readiness requires that awareness of the Memorial Learning Center is promoted to both internal and external audiences. We have been designing and developing innovative methods to reach current and potential customers of the learning functions of the Memorial Learning Center with the information they will need to use the Center to its highest potential. Another function of moment one readiness is the acquisition of certifications by accrediting bodies which will reinforce Memorial’s commitment to operational excellence. Within the next year, Organization Development will apply for The Society for Simulation in Healthcare accreditation and The International Association for Continuing Education and Training certification. These two prestigious acknowledgments, when achieved, will place the Center apart as a center for excellence internationally.

Finally, to achieve operational excellence in this new facility, Organization Development must lay the groundwork for achieving a dominant position in our market by building trust, increasing collaboration and strengthening our internal and external strategic partnerships. To ensure these strategic partnerships are successful, we have begun and will continue to investigate opportunities for joint endeavors. Our long history of collaboration with the SIU School of Medicine provides a great track record for what is possible when strong organizations work together towards a common aim. “The Memorial Learning Center is much more than a building – it is an educational philosophy, a way of thinking and learning. In the context of collaborative space and communication, the Memorial Learning Center unites professional development, quality improvement, patient safety, educational simulations, virtual medicine, and skills development for our students, residents, fellows, faculty members, graduates and partners. The Memorial Learning Center is more than state-of-the-art. The Memorial Learning Center defines the art for innovation in healthcare learning in the United States.” – Jerry Kruse, MD, Dean and Provost SIU School of Medicine, CEO SIU HealthCare



Engineering Infrastructure

The Engineering Infrastructure project was developed with the purpose of supporting the new added square footage. But an additional goal was established, add the entire 145,000 square feet while simultaneously reducing annual energy consumption by 20%. For this significant project, Springfield Memorial Hospital trusted their successful relationships with BSA LifeStructures and O'Shea Builders.

The new engineering infrastructure project included a two-story 4,500 square foot addition to the existing central plant, high efficiency heating hot water boilers and heat recovery chillers, a variable frequency drive chiller, variable primary pumping, and variable drive cooling tower fans, a cooling tower storage sump, and other strategies for meeting the needs of the campus and the goals for energy efficiency. The project also included new emergency generators, and long runs of chilled and hot water piping and conduit from the central plant throughout much of the existing hospital.

KEY FEATURES

- Two-story addition to existing central plant
- New emergency generators
- 15% increase in campus size with 20% reduction in energy consumption
- Hospital campus remained fully operational

PROJECT DETAILS

SIZE	4,500 SF
COST	\$9.8 M
DATE	October 2015



- ◀ TOP | Normal service entrance switchgear. BOTTOM LEFT | A hospital essential electrical systems upgrade, which includes paralleling and distribution switchgear. BOTTOM LEFT | New emergency generators were added to meet the desired capacity of the emergency power system.

Project Definition

In 2011, the hospital consumed a combined energy consumption total of approximately 348,000 BTU/SF/YR. Natural gas comprised over three fourths of the total energy consumption, but electricity comprised over three fourths of the energy cost.

To achieve 20% energy consumption reduction while expanding the facility would take multiple integrated strategies and concepts. First, the performance of the existing hospital needed to be optimized. Most areas of the hospital have never gone through a formal, systematic commissioning or quality assurance process, and were performing below their potential. The team worked together to identify and implement over 100 energy efficiency measures in the existing facilities. Most measures were related to scheduling and controls adjustments throughout the facility, but lighting retrofits, steam trap repairs, air handler control modifications, and the like were also implemented. The simple payback on each of these changes was always under three years.

Second, the sheer capacity of the existing emergency power, heating system, and chilled water systems needed to be upgraded in order to handle the additional square footage. New piping and conduit needed to carry the heating and cooling systems and power distribution throughout the facility and to the new additions. All of this work had to be done in a phased approach so that all areas of the hospital could remain functional throughout the building process with minimal down-time. The team worked together over numerous months to develop strategies for

the best locations and sizes of equipment, and distribution routes. The O'Shea team, knowing the facility intimately, worked with the design team and the owner to determine very complex routing of large piping and conduit throughout the facility. The team walked together after hours, or during the day when it was possible to find space above ceilings, in tunnels, in utility rooms, and on roofs and then record those spaces so they could be utilized in the design. Certain areas were laser scanned to more easily and accurately depict all of the existing piping, conduit, and ductwork.

And finally, the systems as a whole needed to be evaluated and altered in order to gain the efficiencies needed to meet the lofty goals. The steam heating system was replaced with high efficiency hot water boilers. A chiller was replaced with a variable frequency drive chiller and a heat recovery chiller was added to provide hot water re-heat during times of low need for cooling. New emergency generators were added to meet the desired capacity of the emergency power system. New pumping schemes and controls sequences were developed to fine-tune the efficient use of the systems. New spaces included additional energy saving features such as LED lighting, unoccupied controls schemes, and heat recovery in the air handlers. And all of this was done in together with the three primary team members of Springfield Memorial Hospital, BSA, and O'Shea Builders.

In order to gain the efficiencies needed to meet the lofty goals, the steam heating system was replaced with high efficiency hot water boilers.





While the project was under construction, the design team remained engaged. As questions arose, once again the owner, builder, and design team worked closely together to determine the best solutions moving forward.

Project Delivery

The true value of the “Committed Team Delivery” process was fully realized when the project team was confronted with a number of technically challenging issues. With a spirit of collaboration and unity, the team worked together to address effectively two major project challenges:

1. Space constraints around the central utility plant
2. Pipe and conduit routing impediments while maintaining full operations

Utilizing the Committed Team Delivery process to resolve these challenges resulted in an improved project experience and positive impacts on the schedule and budget.

The first major project challenge encountered by the team was the fact that the existing central utility plant required an addition, but was hemmed in all sides. On the west side, an existing buried fuel tank and the oxygen farm resided underneath and bordered an access road to the back of the hospital. On the north side, the main electrical service to the hospital entered underground. An alley and tunnels completed the challenges on the east and south sides. The team worked closely together to analyze the site in detail and determine possible solutions. The final solution was the relocation of the bulk oxygen site to a new location further west. The team also determined that the new emergency generators could go on a new second story, further reducing the footprint of the addition. Those two

decisions as well as some creative locating of equipment allowed enough building footprint to handle the additional equipment with room for future generators, boilers and chillers.

The second challenge involved finding a route through the hospital for new hot and chilled water piping, as well as emergency power to not only get to the new additions on the opposite side of the hospital, but to feed existing equipment with the new systems. Supply and return hot and chilled water piping as large as 8” each in some areas required creative teamwork to find paths to wind the pipes through areas of the hospital that were already full of existing systems. And this work, along with equipment replacement had to be done while maintaining hospital operations to the fullest extent possible and with limited down times allowed for certain areas. To solve these challenges, the team “got dirty” together and walked and crawled through the existing

At the end of the project, many nurses and others working in various departments commented on how well the team communicated and worked with them to minimize their “pain” during the process.

facility to find the best possible routing. Working closely with department heads, detailed schedules were developed, communicated, and followed in order to meet the operational consistency goals of the hospital.

Improved Metrics

An overall electricity savings of 10% has been realized even while 145,000 square feet was added to the facility. This savings also minimizes the hospital's carbon footprint by 2,753 metric tons of Carbon Dioxide per year.

Electricity Use Baseline Summary (Baseline Year: 2011)		
Annual Average Electricity Consumption	38,441,184 kWh	
Daily Average Electricity Consumption	105,318 kWh	
Electricity Use / Savings Summary (Current Year: 2015)		
Annual Average Electricity Consumption	34,449,080 kWh	3,992,104 kWh/yr saved
Daily Average Electricity Consumption	94,381 kWh	10,937 kWh/day saved

An overall savings of 26% of natural gas has been realized even while 145,000 square feet was added to the facility. This savings is not only conserving the Hospital's supply of natural gas but has reduced its carbon footprint by 2,509 metric tons of Carbon Dioxide per year.

Combining the savings between gas and electric, the hospital is meeting the goal of a reduction in annual energy consumption of 20%. The team continues to work together to further develop energy reduction strategies and expects the energy use to continue to drop as controls are monitored and dialed into their most efficient positions.

Natural Gas Use Baseline Summary (Baseline Year: 2011)		
Annual Average Natural Gas Consumption	1,850,010 therms/year	
Daily Average Natural Gas Consumption	5,069 therms/day	
Natural Gas Use / Savings Summary (Current Year: 2015)		
Annual Average Natural Gas Consumption	1,375,870 therms/yr	473,140 therms/yr saved
Daily Average Natural Gas Consumption	473,140 therms/day	1,296 therms/day saved

The additions are operating today at full capacity, and utilizing the new mechanical, electrical, and plumbing systems developed and implemented by the team. The work was done with minimal disruption to hospital operations, and has positioned the hospital for the ability to add additional space in the future, and connect to the new systems as various buildings on the campus are renovated.

The team worked exceptionally well together during this very complex process and will continue working in a Committed Team Delivery methodology on projects at the campus for the foreseeable future.





Memorial
MEDICAL CENTER

FRONT COVER | *Springfield Memorial Hospital's new structures providing cutting-edge health care while also creating a unified campus with a strong consistent architectural language.*

BSA

BSA LifeStructures is an integrated design firm creating inspired solutions that improve lives through architecture, engineering, interior design, and planning services. With national expertise and regional leadership, BSA designs LifeStructures – innovative and inviting spaces that not only house the activities of healing, learning, and discovery but actually contribute to them – in order to make a difference for our clients and communities. As such, a LifeStructure is purposeful, a LifeStructure inspires, a LifeStructure delights and a LifeStructure improves lives.

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