PRACTICE Greenhealth®

Pandemic perspective:

Insights on health care sustainability in 2020

PracticeGreenhealth.org

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Practice Greenhealth has been measuring and benchmarking health care sustainability performance for more than a decade. In 2020, the health care sector saw a year unlike any other with the challenges resulting from the onset of the COVID-19 pandemic. Hospitals scrambled to stay abreast of the changing demands of a global crisis that included an undefined infection prevention protocol and a supply chain crash.

Sustainability leaders at hospitals across the country found themselves repurposed, reassigned, furloughed, or working in a virtual environment for the first time. Despite the upheaval, many hospitals and health systems remained committed to the annual sustainability assessment and data collection exercise that comprises the Practice Greenhealth awards application and recognition cycle, many aspects of which have become a core process for partner organizations. Two hundred sixty-nine hospitals submitted award applications in the 2021 Environmental Excellence Awards cycle – only a 19% decrease in participation despite herculean obstacles to data collection and project tracking.

This analysis seeks to highlight how the emerging pandemic impacted hospital operations – and sustainability work in particular – in 2020. There are several caveats:

- Most hospitals in the United States were conducting business as usual through mid-March of 2020, almost one quarter into the year. Thus, the annual "total outputs" for water, waste, or energy, for example, may be affected by the fact that nearly a quarter of the annual data for 2020 will not reflect the pandemic's impact.
- Practice Greenhealth collects only annual data for its benchmarking. An analysis of more granular data – such as monthly or quarterly data – may show more marked differences in outputs.

Practice Greenhealth looked at two key questions in its efforts to characterize the effect of the COVID-19 pandemic on health care facilities and their sustainability programming:

a. Were there unusual changes in quantitative (metric or utilization) data?
b. How did the COVID-19 pandemic affect hospital operations, and what new activities did hospitals take on relative to the pandemic that may have impacted their sustainability programming or performance?

Regarding the quantitative data, each year Practice Greenhealth sees incremental changes in facilities' patient volume, energy use, water use, and waste generation. Our analysis looked to see if any of the changes between 2019 and 2020 were atypical compared to the incremental changes normally seen. While we saw unusual changes in demographics (patient volume), we generally did not see unusual changes in energy use, water use, or waste generation. According to our analysis, no significant changes appeared to be related to the percentage of patients with known or suspected COVID-19. There were a range of operational practices, however, that shifted significantly as a result of the pandemic.

Changes in patient volume

Larger changes in patient days, outpatient visits, and OR procedures

Normally, most hospitals fluctuate a small amount every year in the number of patient days, staffed beds, licensed beds, operating room (OR) procedures, number of staff, and outpatient visits. In 2020, however, some changes in patient days, outpatient visits, and OR procedures were more significant than normal, likely due to the pandemic. Changes in staffed beds, full-time equivalents (FTEs), and licensed beds were not significantly different than in other years.

In 2020, more facilities decreased their patient days, outpatient visits, and OR procedures from the previous year. For outpatient visits and OR procedures, the median increase (for those that increased) was larger than normal. For OR procedures, the median change in both directions was larger than normal, indicating a significant disturbance in operations.

Usually, 40% to 60% of the hospitals in the data set decrease their count of patient days, outpatient visits, and OR procedures, with most of the remaining hospitals increasing these utilization metrics. In 2020, 71% of facilities decreased their patient days, with a median decrease of 7% as opposed to the usual 3% to 5%. Seventy-five percent of reporting facilities decreased their outpatient visits, and 87% of facilities decreased the number of OR procedures. In terms of OR procedures, this is likely due to facilities cancelling elective procedures during the initial shutdown and subsequent surges. Seventy-five percent of hospitals reported cancelling or postponing elective surgeries in 2020. Twenty-four percent shut down for 4-6 weeks, and 69% shut down for longer than a six-week period.

The median percent of emergency room (ER) visits related to COVID-19 was 3%. However, the facilities reporting show a very wide range, from zero to 44%. Ninety percent of respondents had less than 12% of their ER visits related to COVID-19. Five percent reported no COVID-19-related ER visits.

Almost all facilities (94%) saw a decrease in ER visits overall. The proportion of facilities seeing a decrease was 97%. The median percent decrease in ER visits between 2020 and 2019 was 16% for all visits (and 18% for non-COVID-19-related visits). Because this is the first year we are collecting this data, we are unable to compare the size of this decrease to what happens during a typical year.

Change in emergency room (ER) visits	All	Small	Large	Academic	Non-academic
Percent seeing a decrease in total ER visits (of those reporting)	94.30%	98.40%	90.00%	89.90%	100.00%
Median percent decrease in total ER visits (for those with a decrease)	15.90%	16.00%	15.90%	16.10%	15.80%
Percent seeing a decrease in non-COVID-related ER visits (of those reporting)	96.80%	100.00%	93.30%	94.20%	100.00%
Median percent decrease in non-COVID-related ER visits (for those with a decrease)	18.30%	18.70%	17.80%	18.60%	17.80%

Many hospitals and health systems scrambled to find ways to deliver care while keeping people out of the hospital and safe in their own homes where feasible. Telemedicine was projected to account for approximately 20% of all medical visits in 2020, with associated revenue of nearly $29.3 billion. Additionally, there was a 38% increase in the number of physicians citing “telemedicine” as a skill between 2019 and 2020. Seventy-two percent of hospitals in the data set reported they provide telehealth services, and an additional 44% cited that the hospital (or an outside authority having jurisdiction) required eligible outpatient visits be delivered via telehealth for a period of time in 2020 due to the pandemic. Sixty-four percent said this period was six weeks or longer – with primary care and mental health reported most frequently as the types of visits moved to telehealth.

Telehealth	All	Small	Large	Academic	Non-academic
Does the facility provide telehealth services?	72%	71%	75%	82%	64%
Did the facility (or outside authority) require eligible outpatient visits be delivered via telehealth for any period of time in the past year due to the COVID-19 pandemic?	44%	40%	48%	58%	31%
Facilities or outside authorities required eligible outpatient visits be delivered via telehealth for the following lengths of time:					
0-2 weeks	5%	6%	5%	1%	12%
2-4 weeks	3%	4%	3%	5%	0%
4-6 weeks	8%	2%	13%	11%	2%
Longer than 6 weeks total	64%	72%	57%	64%	64%
Other	3%	2%	3%	1%	5%
The following types of outpatient visits have been transitioned to telehealth:					
Primary care	45%	41%	49%	61%	31%
Mental health	44%	38%	51%	60%	31%
Specialty care	37%	33%	43%	50%	26%
Wellness	35%	33%	39%	46%	26%
Physical therapy	28%	24%	33%	41%	18%
Occupational therapy	27%	22%	32%	38%	18%
Rehabilitation	26%	23%	30%	33%	20%
Urgent care (screening, triage)	21%	17%	26%	29%	14%
Pre-surgery testing	20%	19%	22%	26%	15%
Home health care	17%	16%	19%	23%	12%
Other	11%	7%	15%	16%	7%
Does the facility calculate the environmental benefits, particulate matter or greenhouse gas emissions reduction associated with its telehealth visits?	14%	15%	14%	14%	15%

The shift to virtual health care also had some significant benefits for the environment, lowering carbon emissions from patient and physician travel and saving patients travel costs. For example, CommonSpirit Health calculated that 1.5 million virtual visits conducted through its clinic settings between March 8, 2020 and April 2, 2021 had prevented 1,678,956 gallons of fossil fuels from being burned and 15,092 metric tons of carbon dioxide from being released while saving patients close to $11 million from no longer having to drive to these appointments. Fourteen percent of reporting hospitals indicated they were calculating the environmental benefits, reduced particulate matter or greenhouse gas emissions associated with telehealth visits – and that percentage will likely increase once other hospitals understand the methodology to tackle these calculations.

Staffing changes

The pandemic impacted the ability of most hospitals to focus on sustainability as consistently as before, with 63% of hospitals reporting reduced capacity for/focus on sustainability.

Sustainability	All	Small	Large	Academic	Non-academic
How the facility's sustainability work has been impacted by the COVID-19 pandemic:					
Increased focus on sustainability	9%	8%	10%	10%	9%
Reduced capacity for/focus on sustainability	63%	67%	61%	56%	70%
Sustainability work on hold for at least 3 months	4%	3%	5%	8%	1%
Sustainability work on hold for at least 6 months	4%	4%	5%	3%	6%
Sustainability work on hold until further notice	2%	3%	1%	2%	2%
Sustainability program eliminated	0%	1%	0%	1%	0%
Other	9%	9%	10%	14%	5%
Sustainability staff changes as a result of the COVID-19 pandemic:					
Furloughed	10%	8%	12%	11%	9%
Eliminated	2%	1%	3%	2%	3%
No change	68%	70%	66%	77%	58%

During the initial phase of the pandemic when personal protective equipment (PPE) was limited, many companies pivoted to virtual telework for employees who could effectively do their jobs from home. Health care was no exception, with 48% of facilities reporting they directed non-clinical, administrative, or ancillary staff to telework. This was a 253% increase from 2019. Of those that directed employees to telework, 85% did so for longer than six weeks.

Telework	All	Small	Large	Academic	Non-academic
Did the facility direct any non-clinical, administrative, or ancillary staff to telework for any period of time during the COVID-19 pandemic?	48%	43%	54%	55%	42%
Facilities that directed staff to telework did so for the following lengths of time:					
0-2 weeks	2%	2%	1%	1%	2%
2-4 weeks	1%	2%	0%	0%	2%
4-6 weeks	2%	0%	3%	1%	2%
Longer than 6 weeks total	85%	86%	83%	86%	82%
Other	5%	2%	9%	5%	5%
Median percent of FTEs who teleworked in baseline year (2019)	2.60%	2.00%	3.00%	3.00%	2.00%
Median percent of FTEs who teleworked in current year (2020)	9.80%	9.00%	10.00%	15.00%	5.00%
Median percent increase in telework: 2019 to 2020	253%	137%	261%	346%	101%
Does the facility calculate the environmental benefits, particulate matter or greenhouse gas emissions reduction associated with employees who telework?	10%	9%	11%	15%	6%

Waste, energy use, and water use did not shift significantly

Surprisingly, Practice Greenhealth did not see significant changes in energy use intensity (energy use per square foot), water use intensity, or waste generation rates in 2020. Normalized energy use, water use, and waste generation appeared substantially similar to that of previous years.

Waste

Despite expecting to see that the massive amounts of PPE (such as disposable masks, gowns, gloves, PAPRs, etc.) disposed of due to the COVID-19 pandemic would affect the proportion of either solid waste or regulated medical waste (depending on the decision to dispose of as "infectious" or not), an analysis of the different types of waste (as a percentage of total waste) looks almost identical to 2019.

Median tons of waste by type as a percentage of total waste	All 2020	All 2019
Solid waste	66%	65%
Recycling	26%	27%
Regulated medical waste	6.30%	6.30%
Hazardous waste	0.30%	0.40%

Practice Greenhealth also compared the volume of waste generated in each category (solid waste, regulated medical waste, recycling, and hazardous waste) over the past five years for each hospital (where available) to look for significant site-specific variations in volume and was not able to identify any significant trend in the differences year-to-year, including last year.

There are a variety of factors at play that may have influenced the waste data, including:

- Three months of "business as usual" data for January to March for most sites,
- Likely several months of significantly reduced patient volume in regions where the surges weren't felt initially and where elective procedures had been cancelled and patient volume minimized to prepare for potential surges,
- Possibly several months of significant COVID-19 patient volume from surges in the local area, and
- Many facilities were disinfecting and reusing certain PPE, including gowns, masks, PAPRs, and face shields, due to supply chain shortages, which could have slowed the volume of disposable waste at some sites.

Energy

Hospitals made significant changes in how they utilized energy within their facilities – increasing the percentage of outside air, transitioning to negative pressure rooms on certain units, increasing use of x-ray and diagnostic equipment, running additional ventilators, and more. Despite these operational changes, energy use in 2020 looked only slightly higher but not significantly different than in previous years. Because of the ebb and flow of patient activity in 2020, it may make sense for facilities to look at more granular impact periods, such as comparing July 2020 energy use to July 2019. Because Practice Greenhealth tracks only annual energy use values and not monthly values, this comparison is not possible.

Median energy metrics	All 2020	All 2019
Energy use intensity (EUI) in kBtus per square foot	225	217
ENERGY STAR Portfolio Manager EUI	232	226
Weather-normalized EUI (from ENERGY STAR Portfolio Manager)	233	230
ENERGY STAR score	64	58
Percent reduction in energy use intensity from baseline year (of those that reduced)	10%	9%
Percent reduction in energy use intensity from previous year (of those that reduced)	4%	4%

The data set below highlights other key operational changes hospitals made in energy use and management through engineering controls designed to minimize the spread of COVID-19.

Energy	All	Small	Large	Academic	Non-academic
Did the facility make changes to its air handling protocols to adapt to the COVID-19 pandemic?	65%	65%	67%	70%	61%
The 128 facilities that made changes to their air handling protocols to adapt to the COVID-19 pandemic used the following measures:					
Increase in outside air	66%	63%	71%	64%	69%
Increased number of air changes	57%	57%	57%	59%	55%
Discontinued use of HVAC setback	16%	16%	15%	11%	21%
Negative pressure rooms	76%	70%	83%	77%	75%
Negative pressure isolation rooms	70%	64%	77%	72%	69%
Other	14%	9%	18%	17%	10%
The 117 facilities that increased outside air utilized it in the following areas:					
100% outside air for entire facility	13%	9%	16%	10%	16%
By department or unit	79%	82%	76%	80%	78%
Other	4%	2%	6%	7%	2%

Several of the factors listed in the waste section above may also have contributed to why energy use looks similar. Fluctuating patient load is the most likely cause. ORs are significant users of energy with high air change requirements. When elective procedures were shut down for weeks at a time, this may have decreased energy use for ventilation in these spaces, perhaps offsetting some of the increased energy use needed for negative pressure rooms or bringing in 100% outside air. Many administrative areas were also shuttered at key times during 2020 due to the pandemic, as unprecedented numbers of staff pivoted to telework, reducing thermal load requirements in administrative areas.

Water

Similar to waste and energy, Practice Greenhealth's analysis of water use in hospitals did not indicate any significant changes for 2020. As the table below demonstrates, water usage in 2020 was almost identical to the previous year.

Normalized water consumption	All 2020	All 2019
Gallons per cleanable square foot	50.5	50.8
Gallons per gross square foot	39.4	42
Gallons per total onsite FTEs	14,708	14,469
Million gallons per operating room (OR)	2.2	2.8
Gallons per adjusted patient day (APD)	277	270
Gallons per patient day	618	640
Gallons per staffed bed	140,785	153,346
Gallons per OR procedure	3,984	3,842

It is reasonable to assume that water use from domestic flush and flow processes decreased to some degree due to the absence of large numbers of non-clinical staff who were teleworking for portions of the year, perhaps evident in the decrease from a median of 42 to 39.4 gallons per gross square foot. Regardless, the decrease is minimal and does not appear to have substantially harmed or benefited hospital sustainability efforts.

Other changes in facility operations

Chemicals

One of the distinct challenges of the pandemic was an undefined infection prevention protocol for COVID-19. Hospitals did not initially know how contagious the virus was, how it was transmitted, or how long it could survive on surfaces. Cleaning and disinfection processes had to be re-evaluated, and in some cases strengthened, against an unknown threat.

Disinfectants	All	Small	Large	Academic	Non-academic
Has the facility expanded its use of disinfectants/one-step disinfectant cleaners for environmental cleaning as a result of the COVID-19 pandemic?	67%	66%	69%	74%	60%
The 180 facilities that expanded use of disinfectants did it in these areas:					
All patient care areas	41%	42%	40%	39%	44%
Some patient care areas	20%	21%	19%	15%	26%
Food services	27%	29%	24%	23%	30%
Administrative areas	28%	32%	23%	27%	29%
Everywhere	73%	77%	69%	70%	76%
Other	10%	9%	11%	10%	10%

Hospitals reported several consistent themes in terms of changes to their cleaning and disinfection processes, including:

- Increased wiping frequencies of public areas and high-touch surfaces,
- Changing out cubicle curtains after each patient on COVID wards,
- Nursing assistance with cleaning (instead of just EVS), and
- Allowing a 30-minute downtime after discharge before cleaning to allow airborne particles to settle.

Food

Almost half of facilities (48%) shut down at least one food service area due to the COVID-19 pandemic, and 83% of these shutdowns were for more than six weeks.

Food services	All	Small	Large	Academic	Non-academic
Percentage of hospitals that shut down any food service areas for any period of time due to the COVID-19 pandemic.	48%	47%	49%	56%	39%
The 128 facilities that shut down food service areas did it for these lengths of time:					
0-2 weeks	4%	3%	5%	1%	7%
2-4 weeks	2%	2%	2%	1%	2%
4-6 weeks	10%	14%	6%	11%	9%
Longer than 6 weeks total	83%	80%	86%	85%	80%
Did the facility change any of its food and nutrition services protocols as a result of the COVID-19 pandemic?	74%	74%	76%	80%	68%

Of the 74% that reported changes to food and nutrition protocols, a number of common themes emerged, some of which had negative repercussions on the sustainability front:

- Many hospitals indicated that in-person dining for cafeteria and retail outlets was eliminated or had significant capacity limits that allowed social distancing.

- A large number of sites shut down all self-serve areas and reported a move to disposable dishware and cutlery in both retail and patient food operations, replacing reusables in many instances. This created additional waste and increased use of plastics, many of which were not recycled.
- Beverage and soda stations were shut down at most sites, transitioning to the sale of single-serve beverages along with limited served options such as coffee and tea. Undoubtedly, this drove the creation of more plastic, glass, and aluminum waste, though not necessarily to a measurable degree.

Food service inside of hospitals shifted dramatically. "It has been a full year of daily change, evolution, and progression. It has affected every granular detail of our food service operations," said Jenna Agins, energy and sustainability manager at NYU Langone Health.

Procurement

2020 was the theoretical "canary in the coal mine" for the health care supply chain, which grappled with incredible upheaval as global suppliers shut down at the onset of the pandemic. The extraordinary and sudden demand for PPE combined with the overdependence on imported PPE left the U.S. health care sector competing with itself, fighting internally for limited stockpiles of PPE and international supply. The American Hospital Association estimated that the added costs of buying PPE for hospitals was $2.4 billion over just four months, from March through June 2020, or about $600 million per month.

Many hospitals were forced to ration PPE, causing protests from nurses and physicians on the front lines. Days of inventory on hand measures the period of time it takes for an organization to use the inventory it has in stock. Close to one in 10 hospitals in the 2020 data set reported having less than four days on hand of N95 respirators, the high-protection masks that clinicians utilize when treating infectious patients. Nearly 16% ran short on exam gloves. Practice Greenhealth looked at a range of different critical PPE supplies and days on hand during 2020.

Supply chain	All	Small	Large	Academic	Non-academic
Percent of facilities that reached less than four days on hand for these categories of PPE:					
Ventilator supplies	4%	5%	4%	2%	7%
N95 respirators	9%	8%	9%	9%	8%
Surgical and procedure masks	6%	7%	5%	3%	9%
Other respirators such as powered air purifying respirators (PAPRs) or elastomerics	2%	1%	3%	2%	1%
Eye protection (including face shields and goggles)	3%	1%	4%	2%	3%
Single-use gowns	6%	5%	6%	6%	5%
Exam gloves	16%	20%	13%	9%	23%

An embedded sustainability focus was a strategic advantage for the 72% of facilities that pivoted during the crisis and created procedures to reuse or extend the use of PPE in response to the pandemic. Researchers and infection preventionists scrambled to evaluate mechanisms to disinfect and reuse masks such as N95s, with 92% of facilities reporting they created procedures for reuse. Another snapshot is isolation gowns, with 59% reusing compared to 2019 when just 10% of facilities reported using reusable isolation gowns a majority of the time. A range of solutions emerged as hospitals were forced to innovate.

Supply chain	All	Small	Large	Academic	Non-academic
Has the facility created procedures to reuse or extend the use of PPE in response to COVID-19?	72%	70%	76%	78%	66%
The 128 facilities that reused or extended the use of PPE did so with these products:					
Reusable/launderable isolation gowns	59%	59%	59%	51%	67%
PAPRs or elastomerics	60%	63%	57%	50%	71%
N95 masks	92%	91%	93%	92%	91%
Other	30%	31%	29%	21%	40%
Did the facility leverage its supply chain relationships to address the critical shortage of supplies and PPE over the past year?	71%	71%	73%	74%	69%
Has the facility (or parent health system) made (or is planning to make) any changes to its long-term buying/supply chain strategy based on the COVID-19 pandemic?	60%	58%	64%	61%	59%

Sixty percent of hospitals in the data set indicated they have made or are planning to make changes to their long-term buying/supply chain strategy based on the COVID-19 pandemic.

Hospitals repeatedly stressed the importance of building resilience into their operations, placing more reliance on local and multiple suppliers, having more PPE stockpiled, and an increased focus on reusables where feasible.

"Providence has more visibility and better control over current inventory at local facilities to allow for internal transfers where inventory is short. We have also implemented a supplier resiliency program, strategic stockpile process, and due diligence on manufacture capabilities."

— Providence Health (Renton, Washington)

"In California, we must have a 90 day supply of PPE on hand. We will continue to use the reusable gowns and to increase reusables and reprocessed items as much as possible. CommonSpirit has created a national inventory tracking system and new policies for PPE management. We now have multi source vs. sole source agreements."

— CommonSpirit Health-California Hospital Medical Center (Los Angeles, California)

"We have identified a large list of items that can be converted from a disposable product to a reusable one to help mitigate the effect of future supply issues. This list is being reviewed on a per item basis."

— Rochester Regional Health (Rochester, New York)

"For our disaster planning, we are now considering worldwide supply chain disruptions in helping to determine supplies and quantities to store. We've also invested in reusable gowns, sterilization wrap, masks, and shoe/head coverings to continue surgical operations for supply chain disruptions."

— St. John's Health (Jackson Hole, Wyoming)

"The importance of supply chain resiliency was a key takeaway from the Covid-19 pandemic for UCLA Health. Given the success of our washable isolation gowns program, we are now evaluating other opportunities to transition disposable items to reusables. We have local and sustainable procurement goals, and moving forward we will continue evaluate our global manufacturers with resiliency in mind when comparing them with regional suppliers. We hope this effort will help protect our health system against future impacts to critical product categories such as personal protective equipment (PPE)."

— UCLA Health (Los Angeles, California)

Surgical services

One of the major shifts that occurred in health care during 2020 was the pause on elective surgeries as hospitals prioritized the treatment of patients with COVID-19. Seventy-five percent of reporting hospitals indicated they had either cancelled or postponed elective surgeries for some period of time during 2020, with 69% paused for more than six weeks. The national revenue loss due to the cessation of elective surgery in just a three month span (March-May 2020) was projected to be $22.3 billion.[1] The pauses have been iterative, as hospitals are repeatedly forced to delay elective surgeries due to local surges.

Operating rooms	All	Small	Large	Academic	Non-academic
Did the facility cancel or postpone elective surgeries for any period of time (either by organizational decision or mandate) during the past year due to COVID-19?	75%	76%	77%	82%	69%
The 203 facilities that cancelled or postponed elective surgeries did so for these lengths of time:					
0-2 weeks	1%	1%	1%	2%	0%
2-4 weeks	2%	3%	2%	3%	2%
4-6 weeks	24%	25%	22%	23%	24%
Longer than 6 weeks total	69%	69%	70%	68%	72%
Were there any changes made to operating room protocol as a result of the COVID-19 pandemic?	71%	76%	68%	77%	66%

More than 70% of facilities indicated changes to their OR protocol resulting from the pandemic. There were a number of common themes in terms of changes to OR protocol, and the following changes were most commonly cited:

- COVID-19 testing procedures for all surgical patients (once testing became available),
- Increased PPE (respirators required),
- Personnel limited during intubation/extubation procedures,
- 15 to 30-minute wait (time varied) after aerosol-generating procedures (AGPs) to allow increased air exchanges before other clinicians enter room or room was cleaned,
- Creation of anterooms that were negative pressure so ORs could remain positive pressure,
- Dedicated OR rooms for COVID-positive patients,
- Limited entry/exit during procedure with a dedicated runner to the core for supplies,
- Pulled unnecessary equipment out of ORs where possible during COVID-positive surgeries,
- Increased air exchanges during surgery as well as between surgeries, and
- Increased wiping of high touch surfaces, increased use of UV disinfection in ORs, increased frequency of terminal clean with some moved to overnight shift.

1 Bose, Sourav K., et al. The Cost of Quarantine: Projecting the Financial Impact of Canceled Elective Surgery on the Nation's Hospitals. Annals of Surgery: May 2021. Volume 273 - Issue 5. Pp 844-849. Accessed on 10/12/21.

Design, construction, and renovation

Hospital design, construction, and renovation was also impacted by the pandemic. According to the American Society of Healthcare Engineering's 2021 Hospital Construction Survey, 76% of hospital respondents reported one or more projects were delayed due to the pandemic, with 29% indicating one or more projects were cancelled. While many hospitals had invested in emergency preparedness measures in advance of the pandemic, surge capacity didn't always get the necessary attention it needed, and many hospitals were left scrambling to deal with overflowing emergency departments and ICUs. The American College of Emergency Physicians' 2017 policy statement "Health care system surge capacity recognition, preparedness, and response" states:

> "Health care facilities and system plans should maximize conventional capacity as well as plan for contingency capacity (adapting patient care spaces to provide functionally equivalent care) and crisis capacity (adapting the level of care provided to the resources available when usual care is impossible).[2]"

Forty-four percent of Practice Greenhealth hospitals reported they had predetermined flexible space they could utilize for surge capacity for the pandemic, with 27% reporting they did not have predetermined flexible space. Separately, 57% of hospitals in the data set adapted other usable space to accommodate surge capacity. Flexibility, adaptability, and resilience are all elements commonly discussed in the design process, but the pandemic has elevated these from optional to critical in future building design.

Building capacity	All	Small	Large	Academic	Non-academic
Did the facility have predetermined flexible space it could utilize for surge capacity for the COVID-19 pandemic?	44%	37%	52%	53%	35%
Did the facility adapt other usable space to accommodate surge capacity for COVID patients during the pandemic?	57%	47%	68%	69%	45%
Of those facilities answering both questions (did they have predetermined flexible space, and did they adapt other usable space):					
Used predetermined and had to adapt other space	52%	36%	67%	58%	44%
Adapted other space, did not have predetermined space	27%	31%	24%	27%	28%
Did not need either	11%	17%	5%	8%	15%
Used predetermined, did not need to adapt other space	10%	17%	3%	8%	13%

While the pandemic challenged health care design and will influence its evolution, climate change will also continue to force the issue of resilient design. In 2012, the recovery costs for the New York health care sector following Superstorm Sandy were estimated at $3.1 billion. Wildfires ravaged California in 2017, shutting down local hospitals while nearby residents were still struggling with smoke-related illness. And the heatwave in the Pacific Northwest in July of 2021 caused ERs to overflow, doubled 911 calls, and caused more than 118 deaths. Hospital design has to account for and prepare to address these potential extreme events.

2 American College of Emergency Physicians. Policy Statement: Health Care System Surge Capacity Recognition, Preparedness, and Response. October 2017. Available at: https://www.acep.org/globalassets/new-pdfs/policy-statements/health-care-system-surge-capacity-rec-preparedness-response.pdf. Accessed on October 12, 2021.

Climate

Many hospitals are already facing the impacts of climate change. According to NOAA's National Centers for Environmental Information, there were 22 separate billion-dollar weather and climate disasters across the United States in 2020, shattering the previous annual record of 16 events, which occurred in 2017 and 2011. The billion-dollar events of 2020 included a record seven disasters linked to tropical cyclones, 13 to severe storms, one to drought, and one to wildfires. The 22 events cost the nation a combined $95 billion in damages.

Seventeen percent of hospitals in the data set reported they were impacted by an extreme weather event in 2020. While not all of these can be tied specifically to climate change, climate change is increasing the frequency of some types of weather extremes, including more frequent high temperature extremes and heavy precipitation events. Nearly 60% of hospitals reported that their responses to these kinds of events were complicated by the pandemic.

Climate	All	Small	Large	Academic	Non-academic
Was the facility impacted in the past year by an extreme weather event?	17%	12%	23%	17%	18%
Was the response to the extreme weather event complicated by the COVID-19 pandemic?	59%	63%	57%	50%	67%

Community connectedness and resilience

Community connectedness	All	Small	Large	Academic	Non-academic
Has your facility partnered with the local community to address supply gaps brought on by the COVID-19 pandemic?	63%	59%	68%	63%	63%

Sixty-three percent of hospitals reported partnering with the local community to address supply gaps. These impressive examples of community resilience should remind us of the value of building stronger local relationships and the benefits of a deeply invested community.

- Stony Brook University Hospital, in partnership with the university and a local supplier, was able to retool and reconfigure their manufacturing processes to produce full face shields. Another firm produced gown blanks from large rolls of plastic film to supplement the hospital's gown needs. "We now have solid relationships going forward. We do not anticipate needing them in the short term," said Carol Gomes, chief executive officer at Stony Brook University Hospital.
- OSF HealthCare partnered with the Central Illinois Chapter of the American Sewing Guild to repair and put back into use more than 50,000 N95 masks and worked with another local company to begin to manufacture face shields to support their hospitals.
- Froedtert Health in the Milwaukee area partnered with new local companies stating that they partnered with, "Allen Edmunds Shoes to make us reusable masks, Olympus Group to make us masks and face shields, and the Dancing Goat Distillery to make us hand sanitizer."
- Michigan Medicine partnered with its engineering and medical schools and the local maker community to develop a prototype for face shields. It also partnered with a local manufacturer and built a myriad of local relationships in the process, stating, "We built these collaborative, trusted pathways and the mechanisms for sharing the designs and putting them out there. I think those are probably the most important outcomes of the work we've done so far."

Community needs	All	Small	Large	Academic	Non-academic
Has your facility partnered with the community to address community needs brought on and/or exacerbated by the COVID-19 pandemic?	62%	62%	62%	73%	51%
Did your facility work with the community to address increased food insecurity as a result of the pandemic?	34%	25%	44%	46%	22%

Seventy-three percent of academic medical centers and 62% of all hospitals in the data set reported partnering with their community to address key community needs that emerged during the pandemic. More than a third of hospitals reported working with their local communities to address food insecurity during the pandemic. Many of these efforts grew out of food insecurity screenings that had already been put into place relative to looking at social determinants of health. The depth of the need, however, forced hospitals to innovate in this space and find ways to provide meals and support for employees, patients, and the broader community. Common practices included:

- Increased funding and distribution of food to families in need,
- Expanded partnerships with local food pantries and volunteer organizations,
- Donation of food and supplies for patients and staff from large corporations and local businesses,
- Donation of meals for hospital staff during surges and partnerships with local restaurants to keep people employed, and
- On-site grocery "stores" for staff offering hard-to-get items.

Conclusion

While vaccines and a standardized set of care protocols have vastly improved COVID-19 outcomes, low vaccination rates in some states continue to drive the risk for new variants of COVID-19 to cause regional surges in the virus. Health care is also facing significant fatigue and burnout among its staff, with the nursing shortage continuing to cause severe stress on both the financial and clinical fronts. California reported a deficit of more than 44,000 nurses while Texas is short more than 23,000. It appears that health care will need to adjust to a new normal as the pandemic persists and find ways to address the root causes of some of the upheaval, including supply chain, staffing shortages, and surge capacity.

The silver lining may be that more hospitals have become aware of the urgent need for supply chain resilience and that a sustainability focus can aid and assist in this important priority. Sustainability, climate change, and community connectedness continue to emerge as important themes for health care leaders. Practice Greenhealth is committed to helping the sector stay abreast of how operational practices and sustainability indicators are shifting in relationship with the pandemic and how hospitals are innovating to meet these new challenges.

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