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Returning to a ‘New Normal’ in Regional Campus Research Laboratories During the COVID-19 Pandemic

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Abstract

In the spring of 2020, the worldwide biomedical sciences community anticipated a need to return to critical laboratory research prior to the end of the COVID-19 pandemic. Models for accomplishing recovery from a worldwide disaster are mostly found in the business realm. In the pandemic situation, literature focuses on how governments or clinical care settings can best respond. Very few guidelines exist for accomplishing the resumption of academic biomedical research, particularly for basic science laboratories and programs. A U.S. regional medical campus can be in a unique situation if it must follow the return-to-work dictates of the larger institution, and yet have different challenges and potential advantages from its parent institution. We present a model used by one such regional medical campus in order to navigate the resumption of laboratory research activities after COVID-19 driven operations shutdown. This model allowed us to accomplish our target of a rapid yet smooth return to the “new normal” way of executing laboratory research, although our success in mitigating SARS-CoV-2 transmission is an outcome that we cannot yet know. Templates for materials used in the resumption of laboratory activities are provided. The lessons learned in our experience of laboratory restart go beyond the current pandemic.

Introduction

Disasters that affect human populations lie on an event continuum. Most natural disasters such as earthquakes and hurricanes have somewhat distinct stages: a mitigation stage, a planning stage, and an action stage (such as shelter in place or move to safety), followed by a recovery stage.¹ While the SARS-CoV-2 pandemic has a different disaster time course than what we typically think of for natural disasters, the same principles can apply.² In this case, the ‘disaster’ will last for months to years, and the frontline workers are still working tirelessly to care for patients and make sure intensive care facilities are not overwhelmed, while other portions of the population are in a recovery phase. The recovery phase has begun, even when the disaster has not yet cleared. The United States finds itself in this situation during the summer of 2020.

From family units to corporations to economies and international organizations, the process of returning to normal has begun in the midst of the ongoing SARS-CoV-2 pandemic. Academic institutions are one of these units. Academic institutions have endless variety in terms of mission, physical plant, student population, community size, and community norms. Academic institutions can be highly networked, research-driven, teaching-focused, fiercely independent, private, public, or a combination of the above.

They are also answerable to a wide range of stakeholders; students, faculty, staff, and community. A unique situation is the medical school regional campus, itself anything but monolithic. Regional campuses have some structures in common with the parent campus but have varied independence in operation and mission. Often, they serve some specialized mission, for example, a focus on rural medicine. In some models, primarily the basic sciences are taught at the remote location, in others, clinical components of training are included and regionally managed.³ Many variations of these themes occur in practice.

The University of Minnesota Medical School has a 2-campus system with both campuses having teaching and research missions. Under one classification system, it would be considered a year 1 and 2 basic science model.³ Part of the research mission on each campus involves “bench” or “wet laboratory” studies. This laboratory research focuses on questions essential to our understanding of human health and disease but does not have major interaction with the public. When laboratories are shut down, delays in research jeopardize productivity in terms of publications, and generation of new data for garnering research funding. In addition, the lab risks loss of reagents, cell lines, and unique research animal resources. Laboratory research tasks cannot be completed from home, and thus technical staff and

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students engaged in research are left waiting to do their jobs. In addition, progress on extramurally funded projects is delayed and careers of graduate student and postdoctoral trainees jeopardized. For all of these reasons, laboratory bench work of most academic institutions, including those of regional campuses, has been deemed potentially safe yet important work for resumption during the current pandemic.

How to execute resumption of these operations is the challenge. There is a focus on pandemic management at a governmental level (e.g.⁴). Offerings are sparser for academic institutions, although resources such as pandemic planning exercises that include recovery for academic institutions can be found.⁵ For a regional campus, the challenge of phased resumption of bench research activities involves navigation of central university and medical school directives, as well as being attentive to local campus policies on returning to work. For a large organization with extensive electronic communication, it is key that regional campus employees have help navigating the directives from the main campus and interpreting their importance for operation on a coordinate campus. The path forward can be informed by features of the practice of business continuity management. Continuity management consists of steps taken so that the essential operations of an organization can be maintained/resumed upon or after disaster, and can be applied to research laboratories as well as businesses.⁶ A key feature of the recovery plan portion of continuity management is that it takes place quickly, prior to the resolution of the disaster itself.⁶ Thus, rapid resumption became one of our main priorities. Here, we report our methods for the planning and execution of resumption of research after COVID-19 hibernation of bench laboratory activities at a regional medical campus. We stress the key actions that helped us to have a smooth return to a 'new normal' in laboratory activities, as we were measuring success partly as a rapid and organized resumption of activities. We also describe what we might have done differently and the measures of success that we are yet unable to ascertain.

Background and Execution

Institutional Organizational Structure. One campus of the University of Minnesota Medical School is located in the Minneapolis-St. Paul metropolitan region (Twin Cities; TC) and is interconnected with the University of Minnesota (U of M) East Bank campuses and health care entities including M Health Fairview. The regional Duluth medical campus is located a couple of hours north of the Twin Cities area on the campus of the University of Minnesota Duluth (UMD), home to approximately 10 000 undergraduate students and a regional campus of the College of Pharmacy of the University of Minnesota. The University of Minnesota Medical School, Duluth Campus is responsible for basic and behavioral science

research and delivery of medical school Year 1 and Year 2 curriculum.

The Duluth campus has 2 departments plus the administrative structure for admissions and delivery of the medical school curriculum. The Department of Family Medicine and Biobehavioral Health houses clinical faculty as well as faculty engaged in community based participatory research. The Department of Biomedical Sciences (BMS) is a basic sciences department with 17 active research laboratories, most with small teams of 1-6 staff and trainees. The medium-sized BMS Department has a leadership structure that centers around a Department Head (DH). Fig. 1A outlines the organizational relationships of the University of Minnesota entities involved in the resumption of laboratory activities of the Medical School, Duluth Campus.

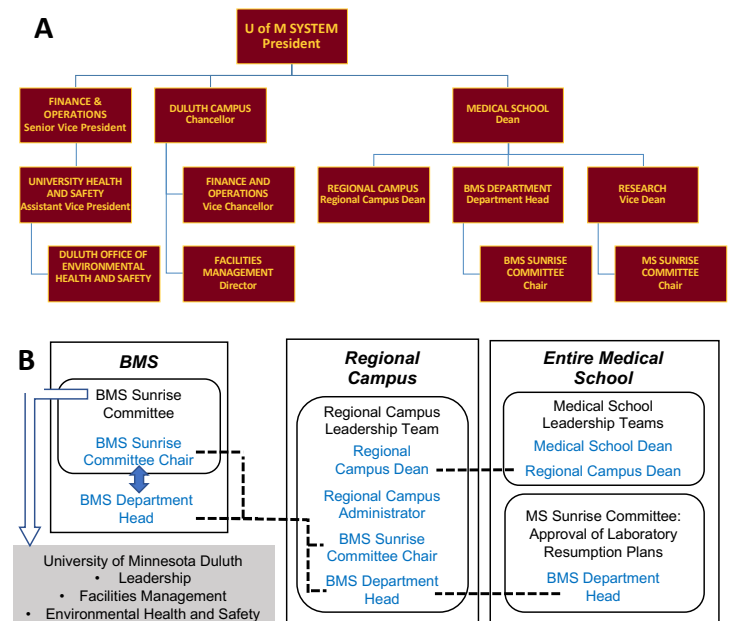


Figure 1. A. Relative relationships of University of Minnesota entities discussed here. BMS, Biomedical Sciences; MS Medical School. B. Structure and connections of the entities necessary for the safe execution of staged resumption of laboratory activities at the University of Minnesota Medical School, Duluth Campus (Regional Campus) during the SARS-CoV-2 pandemic. BMS, Biomedical Sciences Department. Normal black text indicates names of committees while blue text denotes individuals. Only members of each committee/team most relevant to planning for staged resumption of laboratory activities are noted; committees/teams all have additional members. Black dotted lines show individuals that are present on committees/teams at multiple levels. Thick arrows represent informational flow between individuals (blue), or groups (white); arrowheads indicate *main* direction of information flow. Entities in the grey box are not part of the Medical School, they are part of

the campus of the University of Minnesota Duluth, which is a campus of the University of Minnesota system but distinct from the Medical School. The University of Minnesota Duluth campus supports the building that contains the majority of the regional Medical School campus.

State and university pandemic response. The stay-at-home order of the Governor of Minnesota began on March 28 and was only replaced by a series of Stay Safe MN directives starting on May 18. By March 18, prior to the stay-at-home order, the University of Minnesota had already required laboratories to reduce activities to operations essential for preservation of resources or approved COVID-19 research (Fig. 2). Medical student instruction went virtual with all of its attendant challenges. The work from home directives still allowed the faculty to meet the teaching mission of the regional campus. However, the order meant that most BMS laboratories entered a state of formal hibernation with relatively little advance notice. The stress associated with closing research laboratories was heightened by the fact that resumption dates were unknown.

To ease the eventual transition back to activity, the university was planning for resumption of activity well before the expiration of the state stay-at-home order (May 17; Fig. 2). A committee was charged with this planning by the U of M Vice President of Research on April 16. By April 28, the University of Minnesota had devised a plan for staged resumption of select research operations such as basic science research of high priority. Both the University of Minnesota Medical School and UMD participated in the creation of that plan. Following those guidelines, each U of M college developed a process to responsibly implement those guidelines. Wet laboratory-based research was deemed a relatively safe priority for return, but all teaching, community-based research and clinical research were still to be performed remotely or else still on hold.

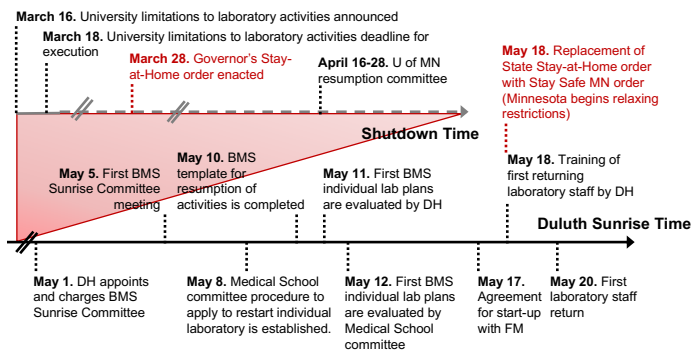


Figure 2. Timeline of integration of University-wide and Medical School-wide guidance into executing return of laboratory activities of the Biomedical Sciences Department (BMS) of a regional medical campus. U of MN, University of Minnesota DH, Department Head. FM, Facilities Management

Department of the regional university that houses the regional medical campus.

By May 4, the Dean of the University of Minnesota Medical School (Fig. 1A) charged a committee: The Sunrise Committee for the Medical School and the Office of Academic Clinical Affairs. In alignment with the Sunrise Plan announced by the University of Minnesota President Gabel, The Medical School Sunrise Committee was charged to review and either approve or deny individual employee requests to return to on-site work, in line with the guidelines established by the entire organization (Fig. 1B). **Regional campus representation on this committee was essential to the smooth resumption of laboratory activities at the regional Duluth campus for reasons detailed below.** The Family Medicine and Biobehavioral Health Department did not initially identify any laboratory-based work slated for immediate resumption. Thus, the DH of the BMS Department was the logical regional campus representative in the Medical School Sunrise Committee given the preponderance of regional campus wet laboratory research it performs (Fig. 1B). The first product generated by the Medical School Sunrise Committee was a template for each laboratory to populate to request resumption of activity (Fig. 3, Table 1).

Upon release of the Medical School-wide Guidelines of Staged Resumption of Activities, BMS determined to develop its own plan for the resumption of activity that would occur within the single on-campus building of the Medical School, Duluth Campus. The BMS DH established and charged a departmental committee to shepherd the department through the first stages of resumed laboratory activity (Figs. 1B, 2), with author Zimmer acting as chair. Upon Dr. Zimmer's agreement to act as chair, the DH requested volunteers for the committee at a departmental faculty meeting. These volunteers, an additional faculty member, a laboratory infrastructure manager and a senior laboratory technician with extensive experience working with many building research teams comprised the 6-person BMS Sunrise Committee.

BMS Sunrise Committee Goals and Actions. The overall goal of this committee was to develop a plan for all BMS laboratories to perform essential research given the working mandates of the Medical School. The department needed to consider its own unique needs, plus consider that the plan it generated would be the de facto on-campus activity resumption plan for the entire regional medical school. Its approach to synthesizing a discrete plan of action from broad dictates and guidelines from larger entities is a model that may serve as a framework for other units and institutions.

In practice, this involved the chair and the DH daily meeting to identify the current most time-sensitive piece of the plan, which would change over time. The BMS Sunrise Committee

would then focus on this element of the plan in a subsequent Zoom meeting or through comments of a Google Document. Some larger, philosophical issues were addressed by email. To begin plan development, the U of MN and Medical School dictates described in Fig. 3 were reviewed by all members ahead of the initial meeting. These, plus other Fig. 3 documents and entities comprise the larger directives that the committee followed in generation of a plan.

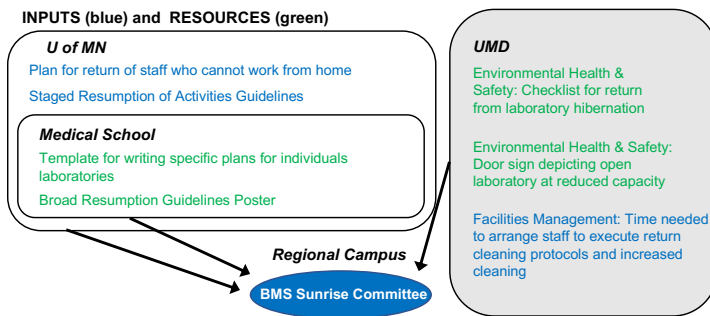


Figure 3. Inputs in blue are the documents and considerations of the larger institution or University of Minnesota regional campus that the BMS Sunrise Committee had to adhere to when formulating a Departmental Plan. In green are the resources from these same entities that the BMS Sunrise Committee was able to use in the execution of its plan. U of MN, University of Minnesota. UMD, University of Minnesota Duluth.

Most of the equipment of the BMS Department is shared yet placed within the laboratories of individual investigators on 3 floors of a single building. Under these circumstances, one laboratory's agreed-upon procedures would profoundly affect the work and well-being of individuals in other laboratories. Therefore, the initial committee meeting determined that most working policies and procedures would have to be consistent among laboratories. Developing these according to larger institutional guides in Fig. 3 was largely accomplished in the first meeting. Further meetings were set up with the goals of developing a training mechanism to communicate new policies and procedures to initial returnees, and the concrete steps to execute resumption of laboratory activities using our plan. The department had to particularly consider how it would marry its extensive degree of shared space with Medical School Sunrise Committee dictates. Because of size and scope of research, the regional campus does not operate with equipment cores in contrast to the larger TC campus.

Communication occurred daily between the BMS Sunrise Committee chair and the DH during this time. Immediately after the BMS Sunrise Committee's first meeting, Medical School Sunrise Committee released the template individual laboratories would use to apply for resumption of activities (Fig. 3). The DH therefore could work with the BMS Sunrise

Committee to pivot to the most immediate challenge of generation of individual laboratories' safety plans that would have to be submitted to the Medical School Sunrise Committee for approval for resumption of activities. The BMS Sunrise Committee used what it had already generated as SMED building-wide resumption policies and procedures to pre-populate safety plan templates for each individual laboratory. This allowed for both consistency and a time savings for individual investigators. The DH sent the pre-populated template to all BMS faculty for them to add their laboratory-specific details. Such laboratory-specific details included which members of the laboratory would be allowed to return in what stages of resumption, and how use of the investigator space would be apportioned to ensure social distancing. All BMS investigators were instructed by the DH to wait for the overall department plan on this template before adding their lab specific information and personnel for return. This minimized faculty and DH time and effort devoted to generating 17 lab specific plans for approval.

The Sunrise Committee could then turn its attention back to other priorities important for resumption of research. At times it became necessary for one member of the committee to interface with UMD facilities management team and Environmental Health & Safety to keep them apprised of our progress. The BMS Sunrise Committee also had one meeting with the regional campus's Information Technology group to establish an electronic sign in and sign out interface that allowed storage of the collected data. A timeline of actions leading up to resumption of laboratory activities is shown Fig. 2. Throughout the process, BMS department faculty were updated almost daily by the DH regarding the pathway for approval of resumption of their lab activities. The documents and other supports generated by the BMS Sunrise Committee leading up to and allowing for laboratory activity resumption are described in Table 1.

A final key element in planning for laboratory activity resumption was communication with other entities whose research and facilities intertwined with the Medical School, Duluth Campus. Much of our shared equipment is also used by the regional College of Pharmacy faculty and the UMD Swenson College of Science and Engineering faculty. Shared physical plant services and oversight by UMD Environmental Health and Safety as well as shared facilities and equipment connect these units on the UMD campus. In parallel with the Medical School, these 2 entities were developing separate application procedures for resumption of laboratory work. Thus, informal discussions with the leaders of these units was also key to success for a smooth resumption of activities. Because of the continued output of central directives and the beginning of planning for laboratory activity resumption within UMD departments, BMS department faculty were instructed to ignore University of Minnesota Duluth and central directives, and focus on Medical School directives,

specifically those that had been transformed to discrete investigator action items by the BMS Sunrise Committee and DH.

Table 1. Tangible supports generated by Departmental (BMS) Sunrise Committee. Versions of asterisked outputs are included as Supplementary Information.

Dictate or need addressed	Tangible Output
Organizational	Duties list for individuals internal and external to Departmental Sunrise Committee
Organizational	Rules for spaces held in common
Training	Slides detailing new protocols and procedures for Department Head to use in training returning staff*
Staged Resumption of Activities Guide (Fig. 3) – dictate of documentation that new policies are understood by staff	A standard form for returnees to sign acknowledging understanding and promising adherence to the basic policies and procedures*
Medical School template (Fig. 3)	Template for laboratory-specific reduced and safe operation plan pre-populated with the Department and building-wide policies that would be consistent across all returning laboratories*
Staged Resumption of Activities Guide (Fig. 3)	Building-wide sign-in/sign out survey
Organizational	Postings for building entrances listing policy of admission including a link to the electronic health sign-in/sign out survey*
Staged Resumption of Activities Guide (Fig. 3)	Points of contact for assuring voluntary return, unsafe conduct reporting, and mental and physical health contacts*
Staged Resumption of Activities Guide (Fig. 3)	Off-limits posting for conference rooms and social/eating areas
Organizational	Posting with instructions for cleaning of shared equipment or shared space following each use

Evaluating success. Our major goals during planning for resumption of regional campus laboratory activities was for the transition to be rapid, smooth, and safe. On the day that stay-at-home orders were relaxed in Minnesota, remote training was executed by the DH with presentation slides developed by the BMS Sunrise Committee. The department head trained Principal investigators and staff of 14 of the 17 departmental research programs. The approved portion of the laboratory workforce returned 2 days later to set up resumption of activities, which allowed time for Facilities Management to fulfill a building cleaning protocol prior to their arrival. The following day, laboratory research activity was resumed under the new policies and procedures that minimize transmission of SARS-CoV-2. Since then, all 17 of the laboratories have had their resumption plans approved and at least one representative trained for return. The BMS Sunrise Committee’s work is viewed as completed, with the possible exception of updating training resources for individuals that will resume activities at later times according to their individual laboratory’s plan for scheduling of returnees. We feel that we have met our temporal goals for laboratory activity resumption. A smooth transition suggests that individuals resuming their activities were at all times clear on what they needed to do, and from what entity the directives would come. For the most part, this was true, although there were some central directives issues prior to the start of BMS Sunrise Committee that resulted in minor duplication of effort by a few of the most eager investigators to return. One thing we have not yet discussed is whether differing conditions between the 2 campuses and their respective cities might warrant progression to a forward step in the staged resumption process before it is warranted from

the other campus. Thus, there may be a need for less cohesive progress forward in the future.

The measure of how safe our laboratory activity resumption was, and remains to be, will take longer to evaluate. There are still a number of unknowns. We do not yet know how many of COVID-19 cases will occur within the regional campus laboratory staff, and whether or not our methods of transmission reduction will be sufficient to prevent spread of the infection within the Medical School Duluth Campus. Individual laboratory plans required description of activity resumption all the way to normal operation to occur in a series of 3 steps, and we are currently in the first of these. We do not know whether one of these stages will inadvertently introduce an unsafe practice. Finally, with the discussion of resumption of clinical activities now occurring, it is unknown whether the resumption of non-bench research and teaching will find our policies useful and whether procedures set by the initial cohort of returning bench scientists and trainees at the regional campus level will remain intact.

In both our methods and our unknowns, it is interesting that there are some parallels to the development of specific practices to maximize safety for the continuation and resumption of procedures for cancer surgery during COVID-19 pandemic times, termed a “Covid-minimal pathway”⁷. Obviously, this situation is far different than ours in that extremely vulnerable populations are being brought into institutions in which the presence of SARS-CoV-2 is known. In contrast, early stages of our return are voluntary, staff returnees are relatively healthy individuals, and the existence of the actual virus within our building is unknown. Thus, it is all the more telling that we see similarities in their use of a leadership team (our Sunrise Committee), identification of stakeholders, consideration of use of the space and its physical preparation for safe usage, effective communication of the details of the new policies and the reasoning behind them to the end users, and use of screening for COVID-19. Like us, they stress that while their planning process may be of use to other institutions at this time, they can only suggest that their pursuit of best practices would logically lead to a reduction in the possibility of SARS-CoV-2 transmission to their vulnerable surgical population. In fact, they also must wait for any outcomes to understand fully the impact of their safety measures.

Lessons learned.

It is important to evaluate our development and decision-making process for resumption of laboratory activities in this pandemic situation now that resumption is actively underway. It is certainly possible that another event could unfold in the future that requires resumption of research activities following cessation for an emergency. Also, other

institutions, particularly the parts that are in a remote or subsidiary situation, may only be in the resumption planning stages now. For the regional campus experience specifically, we have identified several factors in planning for this resumption that may be useful more broadly.

- *Nimbleness of Sunrise Committee.* Under typical situations, anticipating the necessary next steps and future challenges and acting on them in a proactive fashion is an effective way to organize and govern. However, in this situation, the specific demands that would be placed on individual investigators in order for them to re-open their laboratories were not known. Nor could it be anticipated exactly how transmission of the virus would continue, and on what time frame. The “rules” for staged resumption of activity varied somewhat depending on the institutional level that was issuing them. In these unique circumstances, we found it advantageous for the BMS Sunrise Committee to function in a reactive rather than proactive capacity. Despite pivoting from one focus to another and back as the dictated format for re-opening became clear, we as a committee were surprisingly efficient. The initial explicit acknowledgement of the committee members that the committee would have to be primarily responsive to institutional forces and leadership needs was helpful in that regard.
- *Frequent check-ins at the departmental level.* The BMS Sunrise Committee focused primarily on how to get BMS Department faculty laboratories running again. The DH was ultimately responsible for the collective resumed activities of the Department. Therefore, daily communication of the chair of the BMS Sunrise Committee with the DH was essential to the rapidity at which we progressed.
- *Association with the entity in which the institution is physically placed.* Many research nonprofits and start-ups are physically placed in a building or buildings within a larger institution’s campus. Research groups can have varying arrangements with the larger entities in which they are placed. These arrangements must be included in considering resumption of activities. In our case, management of our facilities – our regional medical campus building – is in the hands of the Facilities Management Department of UMD. Likewise, safety oversight of research activities is largely also at this local level. It was important for our committee to have non-faculty participants with significant ties and connections to UMD Facilities Management and Environmental Health & Safety. Immediately after the committee’s first meeting, committee individuals began communicating with on-the-ground supervisors of janitorial staff, and their responses to our plans were communicated back to the committee. Furthermore, even prior to formation of the BMS Sunrise Committee, regional campus leadership

(Regional Campus Dean and Administrator) were communicating with their UMD counterparts and also with the College of Pharmacy Duluth Campus leadership. All of this was effective. However, we could have been more effective if we had also made connections at the mid-supervisory level. It may also have been useful for the entire committee to have a dedicated meeting with relevant individuals in UMD administrative, regulatory, and facilities management roles to ensure that all connections to the UMD community heard the same message from our Regional Campus. This would have been helpful because UMD’s resumption of laboratory activities is largely taking place on a more delayed time frame than the Medical School.

- *Regional Campus representation at the Medical School level.* Leadership teams and committees of the University of Minnesota Medical School normally involve representation from both Duluth and TC campuses. Fig. 1B shows the Regional Campus leadership entities that are also part of larger Medical School teams and committees. In particular, having the BMS DH have membership on the larger Medical School Sunrise committee that was responsible for approval of return-to-work laboratory plans was critical for the rapidity at which we executed resumption of activities. Early knowledge of the template to be issued for application to return to work was instrumental in the quick re-start of our laboratories without confusion. It was also important because the way that research is performed and important considerations on a regional campus can be vastly different from considerations and expectations of the research community of a large multi-building, multi-department medical school. We found that representation by even a single person makes a big difference.
- *Regional campus advantages.* The reduced scope of the research mission on our regional campus permitted a more unified and less complex return to work. The size of the Duluth community and the placement of the workplace in a less congested part of the city also makes travel to campus, and safety on campus, less of a concern than in a major metropolitan area. This may be a factor primarily for regional medical campuses physically located in smaller cities or towns.
- *Traditional style of laboratory building advantages.* The SMED building is a traditional academic laboratory building with closed-off, individual laboratories. This architectural style is increasingly becoming replaced with open floorplan laboratory buildings that allow for efficient use of space and equipment between increasingly collaborative individual laboratories. However, in a pandemic situation, the traditional style of laboratory building is a great advantage when it comes to reducing transmission of an airborne virus.

In summary, our regional medical school campus had unique challenges and advantages for resumption of laboratory activities during this pandemic but found a workable structure in which to execute resumption and minimize duplication of effort by BMS department faculty. Returning to the laboratory, even with a new normal, has allowed faculty to find some semblance of control of their careers and those of their trainees and has reduced angst over the indeterminate nature of the shutdown. We are not at full force, but we are operational and again collecting data in a safe environment. It is our hope that other institutions will extract useful nuggets in our experiences to apply to their own challenges.

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