SPECIAL REPORT

Challenges of "Return to Work" in an Ongoing Pandemic

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As economic and political pressure has built to relax "shelter in place" public health orders for control of coronavirus disease 2019 (Covid-19), industry, professional service firms, retail and service establishments, and educational institutions seek to establish norms that protect workers, customers, clients, students, and visitors. A public health order represents a minimum disease-prevention standard, adherence to which is not elective, but may not satisfy all legal requirements with respect to the personal safety of workers and others.[1] The "general duty" clause of the Occupational Safety and Health Act requires all employers to take reasonable steps to reduce risk to employees,[2] and establishments have common-law obligations to ensure that their premises that are open to the public are maintained in a safe condition without concealed, reasonably avoidable hazards.[3] Responsible conduct of a business or facility in a pandemic represents opportunities for private entities to contribute to public health by implementing traditional and innovative disease-control measures, such as contact tracing with the use of mobile applications ("apps") on personal devices.

The Massachusetts High Technology Council, as the leading technology and biomedical industry association in that state, recently assembled a group of medical, business, and legal experts (including the first author) to address these issues and assist state government in determining reopening standards.[4] In this article, building on the work of that expert panel, we seek to identify the major public health challenges faced by private entities in resuming on-site operations and explore ways in which this might be done most effectively, consistent with applicable regulations. We focus primarily on the operation of commercial establishments, particularly in regard to workers and customers. Educational and other institutional and service settings face broader challenges, because of their custodial and quasi-custodial relationships with students and clients, who most often have no employment relationship to these entities but whose close institutional ties lead them to spend much continuous time within their facilities. We highlight instances in which student and client relationships pose challenges that are substantially different from those that attend commercial establishments. Health care facilities, owing to acute risk of transmission from ill persons, require more intensive infection-control practices already well explored and not recapitulated here.

"Low-Tech" Prevention Measures in Daily Operations

Throughout the country, many industries, services, and offices that are deemed to represent "essential operations" under relevant federal guidance[5] and state public health orders[6,7] have remained open, including hospitals and some clinics, in which the services provided require personal attendance and close contact.[8] Use of personal protective equipment and environmental and sanitation controls in these settings have limited the acquisition of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection by these workers. Indeed, there are multiple low-tech solutions to prevent transmission, including deferral from attending work or public venues by those who feel unwell, frequent hand washing, use of masks of appropriate design and manufacture, and practices of avoiding as far as possible close physical contact with others[9] (Table 1). These measures are labor-intensive, requiring that individual workers and customers take protective actions in real time, and proper adherence requires active monitoring of workplace or public behavior. To ensure adherence, imposition of corrective actions may be warranted, such as employee discipline or exclusion of nonadherent persons from a physical facility. Furthermore, to

Table 1. Potential Policies to Reduce Transmission.*

Policy	Description
Less expensive	
PPE and masks	Mandated, monitored use of masks and PPE
Personal hygiene	Frequent hand washing or sanitizing; avoid touching eyes, nose, and mouth; good respiratory hygiene
Self-diagnosis	Comprehensive checklist of symptoms that each worker considers before leaving home
Distancing and no large groups	Social distancing at work where possible; staggered and reduced-duration shifts and staggered lunch times or breaks
Workspace cleaning	Frequent workplace deep cleaning; hygiene zones with mandatory sanitization checkpoints in between
Employer screening	Temperature measurement and symptom screening on entry
Redesigning workspace	Remodeling of workspace to ensure greater spacing between employees; improved air filtration and ventilation; touch-free handles and interfaces
Telework	Encourage telework when possible
Segmenting workforce	Encourage self-deferral and telework for persons at higher risk (advanced age or coexisting conditions)
Travel limitations	Discourage travel unless necessary; deploy appropriate infection-control practices and PPE while traveling
Smaller transport methods	Limit use of mass transit when possible; encourage carpooling or use of personal vehicles
More expensive	
Tracing	When available, use public health authority; if unavailable, conduct contact assessment directly and encourage testing and treatment referrals
Testing	Employer-administered or employer-contracted testing for work location determinations, with periodic retesting

* Revised and used with permission from the Massachusetts High Technology Council.[4] PPE denotes personal protective equipment.

encourage hourly workers to defer from attending work when ill, employers have found it necessary to offer or extend sick-leave benefits. Although not legally required, this represents ethical employer behavior to accommodate illness and thus prevent transmission.

In commercial and other public settings, operational considerations and concerns for transmission risk are broad and encompass areas traditionally not within management's ken or responsibility. Resumption of day care and school operations is a crucial factor, because many employees are simply unable, given family circumstances, to return to work if education and day care for children and elderly or disabled family members remain closed. In revising public health orders, state and local governments therefore must coordinate reopening of industry with resumption of schools, day care, and day treatment. Transmission concerns include conditions of transportation (e.g., mass transit) to and from work, as well as social, religious, and leisure activities of workers outside of work hours, in which failure to maintain personal protective measures can put the person at risk for infection. Transmission risk from outside of the workplace or institution is then transferred into it when the person returns on subsequent days for work or study. To assess these risks, many essential-workplace employers that have continued operations throughout the pandemic have administered daily health questionnaires, with review of symptoms suggestive of Covid-19 (Table 2) and inquiries about household and social contacts with a recent diagnosis of infection or presumed infection. Some employers and institutions have adopted pre-entry temperature screening with the use of equipment that scans foreheads or measures body temperatures with ease of use that prevents undue delays and entry bottlenecks. Posi-

Table 2. Daily Symptom Checklist.*

Symptom	Percent of Patients†
Fever[11-13]	64
Sinus pain[13]	50
Cough[11-13]	46
Altered sense of smell[13]	44
Expectoration[12]	32
Stuffy nose[13]	25
Chills[11]	18
Fatigue[11,12]	18
Sore throat[11]	13
Headache[11,13]	13
Difficulty breathing[11,13]	11
Joint or muscle pain[12,13]	10
Diarrhea[11-13]	6
Vomiting[11]	3

* Revised and used with permission from the Massachusetts High Technology Council[4] and Cahill et al.[10]
† Shown is the percentage of patients with Covid-19 who have these symptoms, according to published studies.

tive responses on daily questionnaires, or an elevated body temperature indicated by electronic scanning, lead to detailed analysis of whether the employee, visitor, or student presents a risk to others meriting exclusion from entry and referral to testing and an at-home quarantine period.[14] In residential settings, such as residential colleges or schools, quarantine may require that the institution itself provide facilities for this purpose, unless the person can be safely referred or transferred to a personal home setting.

ENVIRONMENTAL, ENGINEERING, AND ADMINISTRATIVE CONTROLS

Environmental and engineering controls can enhance infection control and safety.[15] By changing the architecture of how we work, study, shop, and interact within facilities, such environmental measures do not depend on individual cooperation and thus require less monitoring. Placing partitions or other barriers between workers or between employees and customers, rigorously adhering to standards for heating, ventilation, and air-conditioning systems[16] and improving air exchange and air filtration in closed settings,[17] and reducing personnel density through staggered work schedules can reduce transmission risk among workers, customers, and visitors, supplementing continued work-at-home practices by a portion of the workforce.[17] The use of short-wavelength ultraviolet (ultraviolet C) light in facilities to sterilize surfaces and air also may offer some preventive effect.[18,19] These mechanisms are more expensive than low-tech interventions that depend on individual adherence but reduce the need for monitoring and corrective action, with the architecture itself preventing deviations from infection-control practices.

Administrative measures under consideration by employers and institutions include excluding from the physical workplace — on a voluntary or mandatory basis — any person at elevated risk for symptomatic disease and severe clinical outcomes from Covid-19. The most common criteria for elevated risk are exceeding an age threshold or having certain coexisting conditions, such as diabetes, obesity, and hypertension.[20] Because contagiousness does not always correlate with the clinical severity of disease,[21] exclusion of broad categories of workers and others may not have the desired effect of entirely reducing transmissions. Exclusion from the physical workplace or facility based on these categories is replete with clinical, ethical, and legal challenges, primarily because exclusions rest on statistical generalizations applied to individual persons. Under principles of antidiscrimination law as embodied in the Americans with Disabilities Act,[22] the Age Discrimination in Employment Act (ADEA),[23] and similar state civil rights laws, discriminatory employment actions are prohibited when based on demographic characteristics or disability status.[24] Decisions with regard to persons with disabilities must be based on individualized assessments. Exclusion is justifiable only if based on demonstrated "direct threat" (to self or others) that cannot be abated through work adjustments that in turn do not impose an undue hardship on the employer.[25] Similarly, exclusion of a person with an actual or perceived disability from a public facility, such as a school or university, is not allowed under federal civil rights laws and many state laws, unless the person presents a direct threat that cannot be abated by reasonable program or facility changes.[26,27]

Under the ADEA, advanced age by itself would never be a lawful reason to exclude a person from the workplace or to subject a person to differentiated work rules, despite aggregate sta-

tistics indicating that risk of severe symptoms of Covid-19 rises with age, especially over 60 years of age.[28] Under these principles, for example, a 65-year-old triathlete with diabetes who lives alone and responsibly practices social distancing can convincingly argue that she not be excluded from the workplace when a 25-year-old coworker who flouts public health recommendations nevertheless is allowed to continue to work. Antidiscrimination laws and principles suggest that employers and institutions can encourage persons over a certain age limit or who have a clinically significant coexisting condition to remain working, participating, or studying from home but cannot mandate exclusion from the physical facility without a case-specific determination of direct threat to others. The corollary under disability rights laws is that employers have a duty to make a reasonable accommodation to allow self-deferring workers to perform their duties remotely or through job-duty alterations that reduce risk.[22] Arranging for continued remote work, or altered job duties, for self-deferring workers until community-wide risk abates — as long as this does not pose undue burden on the employer — therefore will be a necessary part of return-to-work strategy. If an employer is not reasonably able to offer accommodation such as work at home or job changes, then the employer's legal obligation to the employee ends. In educational institutions, although most students will not fall into the category of persons of advanced age, some may have coexisting conditions that would put them at higher risk, and program enhancements or accommodations, such as extending remote learning opportunities, will be required.

Some employers and institutions have considered requiring that workers, customers, and others execute a waiver that informs them of risks of returning to physical workplaces if their personal health conditions or age place them at higher risk and that prospectively waives claims for on-site acquisition of illness. Although providing written information regarding workplace or facility risks may be useful to promote prudent personal choices about attendance, an employee cannot waive liability prospectively for worker's compensation recovery,[29] and in some states, it is illegal for an employer to ask an employee to do so.[30] For nonemployees present in a facility, such as customers and students, such waiver forms may be offered and may have some limited legal effect, although waivers are typically not enforceable to shield a party from liability for a violation of a regulatory obligation.[31] In the context of Covid-19, therefore, if a facility operator has not taken appropriate preventive measures consistent with applicable public health authority orders and guidance, then a waiver by a customer, visitor, or student would be ineffective.

WORKFORCE SEGMENTATION AND WORK TRAVEL POLICIES

Because reduced density in facilities decreases transmission risk, employers have explored various methods of segmenting their workforces, both by timing of work presence and by encouraging continued remote work schedules. A strategy of staggering work shifts and allowing both very early and very late shifts reduces workplace density and allows employees and others to use mass transit at off-peak, less crowded hours, thus also reducing commuting risk. Some employers have separated their workforce into teams, with assigned workplace and work-from-home days for each team. Concurrently, employers can also stratify their workforces according to necessity of on-site work for each employee and the employee's membership in categories of workers for whom transmission risk is enhanced. Thus, for example, an employer might choose first to bring back those for whom workplace presence is job-essential; second, to bring back in stages those for whom remote working remains feasible; and third, to ask those who are of advanced age or have coexisting conditions to delay their return to the physical workplace until community spread has been greatly reduced. These independent variables — timing of shifts, shift duration, degree of necessity of on-site work, feasibility of continued remote work, and degree of personal health risk — complicate planning for return to the workplace and require individualized, employee-by-employee analysis. Educational institutions and other services providers should consider undertaking a similar segmentation strategy, with individualized assessment of appropriate time and circumstance for return of students and others to physical presence.

Before the COVID-19 pandemic, many workers spent a majority of work time in travel for customer service and for business negotiations.

Although those activities largely shifted to remote means in recent months, face-to-face business meetings may be deemed essential by some workers and employers. The risks of business travel can be mitigated by well-established infection-control strategies, such as avoiding crowding and the wearing of masks.[32] Employers should consider segmenting the workforce for any resumption of work travel, using such variables as necessity of in-person meetings, disease risk in destinations, personal health risks, and destination policies that require quarantine of arrivals for defined periods.[33,34]

TESTING

To limit risk in returning employees to the workplace and receiving customers and visitors, employers have begun to consider two other primary strategies, each of which has received considerable public and government attention: first, testing workers for infection with SARS-CoV-2, with the use of either molecular or antibody methods, and second, deploying electronic tracking of infection through apps downloaded onto employee mobile telephone devices. Each of these strategies holds promise for controlling workplace transmission but also has serious limitations.

Under guidelines issued by the Equal Employment Opportunity Commission (EEOC), mandatory testing of employees for Covid-19 to identify and prevent direct threats to workplace safety is allowable under federal antidiscrimination laws, as long as the testing is reliable and accurate and the confidentiality of employees' medical information is maintained.[22] The EEOC has opined that antibody tests, owing to the uncertain meaning of results, do not meet the standards for return-to-work testing.[25] Testing for Covid-19 has intrinsic appeal for workplace safety and for safety in custodial or quasi-custodial institutions. Not only is it allowed by the EEOC as the cognizant federal employment authority in this area, but a comprehensive testing program appears to offer a high degree of certainty about what persons to allow back into the workplace.

However, practical issues surrounding testing for SARS-CoV-2 limit the applicability of this strategy. First, molecular testing (and more recently available antigen testing[35]) yields a valid result only for the time at which the specimen for testing was obtained.[36] It is unclear with what frequency such testing should take place, which would necessarily vary depending on the incidence of Covid-19 in a community, with testing needed to be conducted more frequently in a high-incidence setting. As an example, long-term care facilities in New York State currently require workers to undergo twice-weekly tests.[37] Second, if testing is offered or arranged by an employer, results that are processed by laboratories typically can be returned directly to the employer only with an authorization or consent executed by the tested worker — execution of which may be required by the employer — under Clinical Laboratory Improvement Act regulations,[38] as well as the Privacy Rule requirements of the Health Insurance Portability and Accountability Act[39] and various state medical-privacy laws. Without such an authorization, the employer must rely on an employee's own report of a positive test result for infection. Third, increasing evidence suggests that not all positive molecular tests require exclusion of a person from the physical workplace, provided the onset of symptoms was sufficiently remote. Centers for Disease Control and Prevention (CDC) guidelines include a provision allowing a person who has had a positive infection test but who has been completely asymptomatic for at least 10 days to end isolation even without a subsequent negative test result.[40] This provision is based on emerging data showing that positive test results may reflect shedding not of replication-competent virus but instead viral fragments that may pose no risk of infection to others.[41]

Fourth, even if molecular testing is required for return to work, it is a personal medical procedure — one that is potentially quite uncomfortable — for which consent is needed, and consent should include disclosure of the nature of the testing and the consequences of testing either negative or positive. Fifth, testing is dependent on both the quality of the specimen obtained and the reliability of the laboratory performing the test, and antibody tests are of uncertain significance for personal immunity. Most recently, the CDC has actively discouraged the use of antibody testing for making return-to-work determinations about individual employees.[42] When widely available, antigen tests probably will have greater specificity but may have reduced sensitivity.[35] Given the rapid develop-

ment and refinement of all three categories of testing, it is not possible at present to make a durable recommendation about the use of testing for workplace and institutional safety. Testing will be most useful if accurate and periodic and if administered in higher-prevalence populations. Judgments about testing programs should be revisited as testing improves and as the trajectory of illness in the relevant community becomes clearer.

CONTACT TRACING AND THE USE OF MOBILE APPS

The identification and assessment of the contacts of an index patient with a diagnosed case — often referred to as "contract tracing" — is traditional public health practice. It has proven useful in efforts to prevent Covid-19 transmission in various locations, including Israel,[43] Singapore, China, and South Korea,[44] but when the pandemic appeared in the United States, the limited availability of testing meant that Covid-19 spread widely before contact tracing could be effectively implemented.[45] This was unfortunate in light of our current understanding that many cases arise from "super spreader" events, in which one person may spread the infection to multiple others at a single encounter."[46,47] Contract tracing — if done rapidly at the onset of symptoms — might allow the isolation of contacts before they in turn could transmit infection during their own presymptomatic state. Even if testing had been widely available at the outset of the U.S. pandemic, many public health departments had insufficient capacity for contact tracing.[48,49]

Employers with diagnosed cases among their workers often have not been able to obtain contact-tracing assistance from local and state public health departments, owing to personnel shortages; this is regrettable because employer jurisdiction to trace contacts, unlike that of a local public health authority, extends only to workplace contacts, not the contacts made during private, off-duty worker activities.[50] Some employers have chosen to perform tracing of workplace contacts using their own resources, such as employee health services or contracted physicians. Workers who were identified as having had close, sustained contact with a person who had received a diagnosis of Covid-19 were, consistent with public health guidelines, asked to remain at home for a defined period to ensure that they remained symptom-free and then were able to return to work. Owing to restricted availability of testing, many identified contacts were unable to receive testing that could have identified transmission from the index patient. With increases in testing capacity, contact tracing with the use of testing can be more widely deployed; indeed, the use of testing as an adjunct to contact assessment can become the most useful deployment of testing in the workplace, as well as in other environments in which the facility operator has a robust relationship to the index patient and to the patient's probable contacts, as, for example, in a university or human services setting.

Methods of performing automated contact tracing with the use of mobile apps have emerged, with such entities as PricewaterhouseCoopers,[51] Apple, and Google,[52] among others, offering such electronic approaches. Some apps for this purpose — such as one deployed as a statewide strategy in Utah — have been designed for specific geographic areas.[53] These solutions use geolocation or associational information relayed by personal devices to identify, through electronic algorithms, recent close contacts of persons who have received a diagnosis of Covid-19. Such contacts can be notified, either through their personal devices or through direct personal contact, and advised to seek testing or self-quarantine. Like testing, electronic contact tracing in the workplace has attracted employer interest and has attracted institutional interest in using this technology in residential and human services settings.

Like testing, however, the strategy of using electronic mobile apps has limitations. The algorithms depend on an index patient voluntarily reporting a diagnosis through the app. These apps cannot identify use of infection-control measures, such as room partitions and wearing of masks, and therefore could produce results that overestimate risk based solely on proximity. Even if required, adoption of the app by workers and visitors may not be uniform, which would have the opposite effect of failing to identify at-risk persons. Practical issues in certain jobs could make employees choose not to carry their devices during the workday: in manufacturing settings, workers often place street clothes and

telephones in lockers before proceeding to the factory floor. In addition, contact tracing with the use of an app has the same ultimate limitations as traditional contact tracing: it depends on the cooperation of the identified contact to act on information regarding risk, which an app itself cannot guarantee. Even though employers (and custodial institutions) are able under federal and state law to defend, as a strategy of preventing direct health threats, mandatory downloading of apps by employees and others (in some cases subject to applicable collective-bargaining agreements or other contracts), employers and institutions will need to consider limitations of the technology, particularly before taking any adverse or exclusionary action against someone on the basis of information produced by an app. Mandating the downloading and activation of the app for return to work or school would require employers and institutions to make smart phones available to those who lack them, in order to ensure equal treatment among workers and students, and apps should clearly describe the probable consequences of their downloading and use.

ENSURING AN ORDERLY AND SAFE RETURN TO WORK

The current pandemic poses challenges — unprecedented in the modern developed economy of the United States — for a broad range of workplaces, businesses, and institutions. All are struggling in their activities and on their premises to prevent transmission of a dangerous, highly infectious airborne pathogen. The foundations of employer and institutional prevention are relatively inexpensive personal protective equipment whose use is taught and monitored; basic administrative controls such as segmenting the workforce, reducing density, and mandating self-deferral from work for those who feel ill; and environmental controls such as the use of physical barriers and the careful management of air exchange and filtration. Testing, at present, is most effectively used for accurate assessment and follow-up of contacts, whereas the use of contact-tracing apps and mandatory screening by means of molecular, antibody, or antigen tests currently appears to be more complicated, less efficient, and less effective than more traditional public health measures.

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