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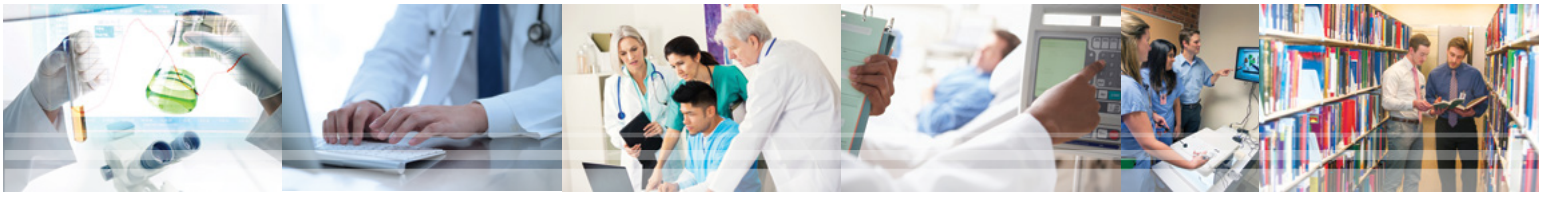
The Innovator

Baystate Health | ADVANCING CARE. ENHANCING LIVES.



Mask Effectiveness on Patients Using Oxygen Delivery Devices

Oxygen therapy is the major treatment method for patients in the hospital with COVID-19 and other respiratory diseases who can't get enough oxygen on their own. In these instances, oxygen is usually delivered through a nasal cannula (a small, flexible tube that contains two open prongs intended to sit just inside your nostrils) or a simple O2 face mask. These delivery devices increase the amount of oxygen that the patient breaths.

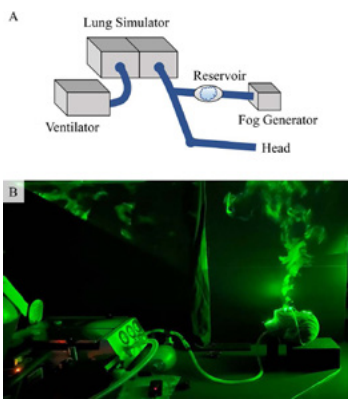
Not only used in the clinical setting, the nasal cannula and the simple 02 mask are also used at home and in assisted care facilities. Furthermore, they are used to provide supplemental oxygen during transportation to healthcare locations, by emergency medical services, and other improvised locations when healthcare support is stressed, such as during the COVID-19 pandemic.

Virus-laden aerosols can be exhaled from patients suffering from COVID-19 which may infect healthy individuals depending on their distance away from infected patients and duration of exposure. Oxygen therapy can be regulated from room air, 21% oxygen, all the way up to 100% oxygen, which is accompanied by supplementing the air the patient breathes with oxygen at various flow rates. Meaning these devices can spread infected aerosols a greater distance, resulting in an increase in risk to caregivers due to the increase in airflow near the patient. "All of these [covid-19] patients are on oxygen," says William T. McGee, MD, MHA, Professor of Medicine, Surgery, and Anesthesiology at UMass Chan Medical School-Baystate. "As doctors, we had a lot of exposure, but nothing compared to what the nurses and therapists were experiencing. They were in patient rooms, literally all day long with continuous exposure to COVID-19-infected exhalations."

Few patients receiving oxygen were wearing masks increasing the risk to caregivers. The idea was to answer the question: what would be the effect of putting the basic surgical mask over the oxygen delivery device and how would that impact the spread of the aerosol that the patients were creating when they were breathing? Would that potentially mitigate the risk to all of the first responders, doctors, nurses, therapists, and anyone else who would see the patients as part of their care?

To find the answers to these questions, Dr. McGee collaborated with Arshad Kudrolli, PhD, Professor of Physics at Clark University; Anton Deti and Jade Consalvi, undergraduate physics students at Clark University; Brian Chang, PhD; Christopher Frechette and Helen Scoville, Respiratory Therapists at Baystate Health; and Geoffrey R. Sheinfeld, MD, to investigate further.

The researchers outfitted a medical manikin with a mechanical lung controlled by a ventilator to simulate human breathing. To visualize and obtain the overall direction and spread of the aerosol, the team used fog to view the exhalations and two types of strategically placed lasers to illuminate the flow under various conditions. A high-speed camera then captured the simulated respiration.



(a) The study apparatus consists of a dual lung simulator driven by a ventilator couple with a second lung chamber which "breathes" air through the manikin head shown with a prescribed frequency and tidal volume. (b) Image of system with laser-sheet lighting used for aerosol visualization. The exhalations are visualized using water-glycerol aerosols (fog) released through the manikin mouth and/or nose during exhalation.

"We were able to perfectly simulate what we see with patients every day on the wards, up in the stepdown units, and even in the ICU. We were able to simulate these scenarios in the lab and measure the impact of putting the mask on the patients and over the oxygen delivery device." says Dr. McGee. "In a lab, you can vary things very accurately. It's a very pure model because the conditions are highly controlled."

The researchers simulated different oxygen flow rates through the oxygen delivery devices that mimic clinical practice and took measurements with and without the mask on the manikin. "It was a simple experiment and it was easy to tell how well this simple intervention helped," says Dr. McGee

The addition of the surgical mask over the oxygen delivery devices worked to dissipate the volume and momentum of the exhaled gas and redirected the exhalation puffs downward and away from clinicians. This simple intervention limited the exhalations in the directions above the mask to about 10% of the total exhalation volume without the mask. "We expected the mask to block a lot of the aerosol particles but what we also found out was it directed the flow out the sides of the mask and down. So the risk zone

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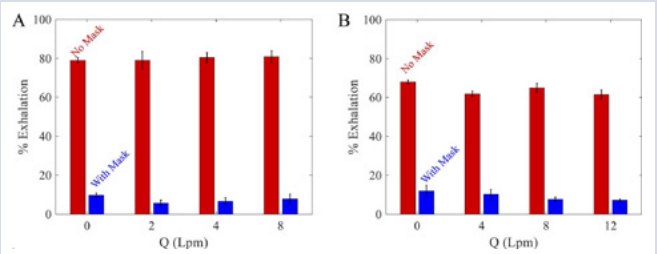
where a lot of the providers work became safer not only because less was coming through the mask, but it was also being deflected in a way so that they were no longer working in the greatest concentration of aerosol and droplets," Dr. McGee says.

"I give a lot of credit to everyone that was involved," Dr. McGee added. "We had great help from the respiratory therapy department in terms of getting some of the equipment and the expertise of some very experienced respiratory therapists to get this research sorted out. Their guidance and insights were invaluable in the creation and execution of this research project."



The percent of breath that is exhaled above the face without and with a surgical mask as a function of flow rates for (a) the nasal cannula and (b) the simple O2 mask. All cases have five trials.

Dr. William McGee has an MD and Master in Health Administration. He is a Professor of Medicine, Surgery, and Anesthesiology and is board certified in Internal Medicine, Critical Care Medicine, Hospice & Palliative Medicine, and Neurocritical Care. He served as President of the Medical Staff at Baystate Health and sat on the Board of Trustees.

William McGee, MD, MHA

Citation: Arshad Kudrolli, Brian Chang, Jade Consalvi, Anton Deti, Christopher Frechette, Helen Scoville, Geoffrey R. Sheinfeld, and William T. McGee, "Mitigating exhalation puffs during oxygen therapy for respiratory disease", Physics of Fluids 33, 081903 (2021) https://doi.org/10.1063/5.0057227

Investigational Pharmacy at Baystate Health

Baystate's Investigational Pharmacy is a division of the Pharmacy Department that provides support and guidance for all research activities involving investigational drug products. An investigational drug is a drug that is either being studied and has not yet received approval form the U.S. Food and Drug Administration (FDA) or a current drug that is being researched at a different dose or for a new indication.

Clinical research pharmacists play a crucial role in the coordination of human drug research activities for clinical trials conducted at Baystate Health. They have the knowledge to understand the appropriate handling of investigational drug products and the proper documentation clinical research requires. "We are responsible for making sure the investigational drug gets to the right patient, at the appropriate time, at the intended study dose," says Molly Sears, RPh, Clinical Pharmacist II at Baystate Health. "We must make sure it is compounded and documented accurately."

At Baystate, investigational drugs are stored and dispensed at two different locations depending on the type of study. Investigational products for oncology studies are stored and dispensed at the D'Amour Cancer Center, while non-oncology outpatient studies and studies involving patients that have been enrolled while they are admitted into the hospital, are handled at Baystate Medical Center. The products are handled, dispensed, and stored in accordance with study protocol and sponsor requirements. "Each individual study has a binder that includes a study summary, protocol, dispensing procedures, patient list and pharmacy manual. The pharmacist is responsible for accurate and efficient dispensing of Investigational medications and documentation," says Molly Sears. "Data collection is extremely important for research and it is imperative that we do this appropriately to help the study coordinators determine if the study has met its objectives."

Proper storage of investigational drugs is crucial to the overall success of the studies. "You have to be very forthcoming with where you are storing the investigational product for the study sponsor. They need to know the environment for which their product is being stored. We maintain a segregated inventory

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2022 Society for Epidemiologic Research Conference

Alexander Knee, MS, Assistant Professor of Medicine, UMass Chan Medical School-Baystate

I was recently invited to sit on a panel of Master's-level epidemiologists at the annual Society for Epidemiological Research (SER) conference in Chicago, IL. This panel highlighted career pathways at the Master's level in the areas of consulting companies, safety-net health systems, healthcare technology, and academia. I was honored to give my perspective based on 15 years at Baystate, first as a research coordinator in Ob/Gyn, then as a Biostatistician and now as the Program Manager of the Epidemiology/Biostatistics Research Core (EBRC) and a Research Assistant Professor at UMass Chan Medical School-Baystate. In addition to my work at Baystate, for the last seven years I have also taught courses in Epidemiology and Biostatistics at the Elms College Doctor of Nursing Practice program. Baystate Health, along with many colleagues and mentors have played a pivotal role in my growth and success. For me, the combination of teaching and collaborative research has led to a rewarding career, and I was proud to represent Baystate!

Conferences are a great way to network and stay on top of current science; epidemiology is no different. The conference highlighted how we think about and analyze data related to diversity, equity, and inclusion (DEI). There is extensive scientific literature on analytic methodology to address DEI which truly requires a diverse team to be able to address them. The EBRC is making sure we are up to date on this methodology to improve our contributions to these teams. I was also pleased to note that another highlighted topic was on causal inference methods. While not yet pervasive in the clinical research literature, the EBRC has been studying causal inference methodology for the last several years. It is nice to know that our efforts to stay current are well-placed. Don't be surprised to hear us talk about Directed Acyclic Graphs (DAGs), Target Trial Emulation, or inverse propensity score weighting during your next consult!

Alexander Knee, MS

Pilot and Feasibility Studies: The Keys to Successful Research

Paul Visintainer, PhD, Professor of Medicine, UMass Chan Medical School-Baystate

When conducting a large study, such as a randomized clinical trial, the last thing that an investigator wants to encounter is a surprise or obstacle in administering the protocol – particularly one that may compromise the conduct or validity of the study. Common obstacles, such as the pool of eligible participants is too small to support enrollment, data collection and surveys take too long to complete, participation is too burdensome resulting in attrition over time, can cause substantial delays in studies or even result in early closure. If only these obstacles could have been identified earlier... If only we had conducted some feasibility and pilot studies beforehand... Feasibility and pilot studies are the concrete evidence that the study which exists on paper actually works in practice.

While feasibility and pilot studies are often used interchangeably, there are differences in their purpose. Feasibility studies are preliminary efforts to gather information necessary to address one question: can this research be done? They address issues directly related to successful completion of a larger study or trial.

Research studies, particularly randomized clinical trials, are only successful if they are completed with a high degree of scientific rigor. For any statistical analysis to be valid and support meaningful interpretation, the integrity of the study protocol must be guaranteed. Attending to the structure and conduct of the study is paramount. Thus, feasibility studies help ensure study integrity by addressing such issues as:

- Do I have a sufficient pool of eligible patients to support a study?
- Can I recruit patients for my study?
- If my future study is a clinical trial, how will I randomize patients and keep them blinded to their treatment assignments?
- How well will patients comply with their treatment assignments?
- If my future study has long-term follow-up, what is the attrition over time? Will patients continue to complete their visits and assessments?

Paul Visintainer, PhD

- Do I have sufficient personnel to implement the protocol and support regulatory requirements?
- Are my assessments too burdensome for patients and staff?

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Compliance Corner: Importance of Timely Effort Certification

Chief Research Compliance Officer, Jennifer Pacheco, MPH, CIM, CIP

Effort certification is a necessary task that everyone engaged in research must understand and perform. The Federal Government requires that every employee who has salary charged to a Federal grant must verify that the amount the government is billed for their labor (effort) is reasonably accurate in relation to the work actually performed. The procedures involved in doing so typically are called "effort certification."

The proportion of an employee's total labor that is performed on a given project is called their "effort." Effort is expressed as a percentage of the total monthly work for an individual. Total effort for an employee must equal 100% and include all Baystate compensated activities. It does not represent hours worked, but rather a percentage of work time.

Why is Effort Certification necessary?

Effort Certification is a process designed to meet regulatory requirements for maintaining records that accurately reflect the work (effort) performed on federally sponsored agreements. Office of Management and Budget ("OMB"), as part of 2 CFR 200.430 (i), provides standards for documentation of personnel expenses to federally sponsored research projects. Federal agencies are accountable to Congress and to the public for the use of public funds. Appropriately certified effort is an important compliance element to Baystate Health research enterprise, which provides auditable documentation to demonstrate that the sponsor did in fact receive the level of effort committed through the award process.

When and how is effort certified?

Because Baystate is a hospital, we are required to collect effort certification monthly. The electronic Actual Effort Entry form is available for certification in Lawson in the second half of each month. All employees with grant support will receive an email on the 15th of the month informing them that the form is available in Lawson. The emailed instructions contain a clickable link and steps to complete certification within two weeks of email receipt. We realize that the entry process in Lawson is clunky, but with monthly practice it is easily mastered.

Why is Timely Certification Important?

When certification is not done monthly, funds for those salaries cannot be charged to the right account. Salaries are paid anyway, and get charged to the wrong place (e.g. a clinical cost center). This situation creates extra work for Finance, Sponsored Programs and other personnel (e.g. BMP payroll) having to go back often months later to reverse the charges and transfer funds one-by-one for hundreds of employees. This extra work reduces their ability to meet researchers' needs in other areas like grants submissions, issuance of subcontracts, etc. So if your effort changes on a funded project, or if personnel are added or removed from a project, please contact your pre-award grants manager or sponsored.programsadministration@baystatehealth.org as soon as the GM65.2 accurately reflect the distribution of your work among those projects.

Jennifer Pacheco, MPH, CIM, CIP

Remember, you are certifying that the final GM65.2 is reasonably accurate. If you do not recognize an activity/account or are unsure which one should be charged for one of your projects, or if the form is otherwise inaccurate, contact Sponsored Programs Administration before certifying.

Questions? Contact your pre-award grants manager or email *Sponsored.ProgramsAdministration@baystatehealth.org.*

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Whereas feasibility studies address issues of logistics, pilot studies, such as Phase II studies, go beyond demonstrating that the protocol may be conducted successfully. In addition to feasibility, the primary reasons to conduct pilot studies are:

- To gather estimates of variability, attrition, and missingness to compute realistic estimates of sample size.
- To serve as a "go-no-go" assessment of the planned intervention.

The "go-no-go" decision analysis is an attractive feature of Phase II pilot studies. Phase II Pilot studies as decision nodes have seen extensive use in oncology, as a way of screening out ineffective treatments prior to committing to large efficacy trials. Popular designs, such as the Simon Two-Stage approach, are single-arm studies with two decision nodes: the first node sets a minimally sufficient expectation of the intervention and a second node sets an expectation that is sufficient to justify further study. If the treatment fails to meet either criterion, the study may be terminated at that point. The result is that ineffective treatments may be identified early, reducing the time, cost, and the number of patients that are exposed to ineffective treatments. Another attractive feature of this type of pilot study is that may be considered a formal evaluation of the decision whether to move the treatment forward to a larger study.

It is important to note that neither feasibility nor pilot studies are designed to test intervention efficacy. Moreover, they should not be interpreted as formal tests of efficacy, even if a statistical test, by chance, is statistically significant. One critical reason to avoid over-interpretation of statistical tests on pilot data is that the sample sizes are likely to be too small to provide sufficient precision on the treatment effect – even if the test is statistically significant. Rather, feasibility and pilot studies are preparatory efforts that demonstrate that the investigator can complete a larger study of the treatment with a high degree scientific rigor and that a larger study of the intervention is justified.

Finally, similar to the Consolidated Standards of Reporting Trials (CONSORT) for clinical trials and observational studies (STROBE), there are guidelines for reporting feasibility and pilot studies (http://www.consort-statement.org/extensions/overview/pilotandfeasibility). While the CONSORT guidelines are written for randomized pilot studies, they have many features that may be applied to pilot studies employing observational or single-arm designs.

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We are interested in ensuring that Baystate employees and patients (and their families) are aware of the important research that goes on at Baystate and how it contributes to better patient care. *The Innovator* welcomes feedback and story ideas. Contact Matthew Hamel at *matthew.hamel@baystatehealth.org* to submit yours.

OnCore Clinical Trials Management System Goes Live

On September 28, the new OnCore Clinical Trials Management system went live for the three pilot departments (Critical Care, Clinical Trials Office, and Heart & Vascular). As a reminder, the OnCore CTMS Implementation project advances Baystate's commitment to research billing compliance, protocol standardization and monitoring, streamlined operational reporting, and patient safety.

The three pilot departments and their studies will experience three types of benefits:

1. **OnCore CTMS**
2. **Research Subject Registration**
3. **Research Patient Charge Review Process Improvement**

We continue work on the design of additional functions, which will include Research PowerPlans in CIS, automated billing interfaces, and other OnCore CTMS enhancements. We will incorporate the successes and lessons learned from the pilot in our rollout plan for all remaining clinical research areas.

For more information, the latest updates, and training guides please visit the CTMS Page on The Hub or contact *Research_Office@baystatehealth.org.*

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within the main pharmacy for all the investigational products," says Adam Pesaturo, PharmD, Clinical Pharmacist at Baystate Health. In addition, the products have to be kept in temperature-controlled environments with continuous temperature monitoring. "Temperature logs must be maintained and monitored as part of the study data collection," adds Molly Sears.

Adam Pesaturo, PharmD, Clinical Pharmacist

Molly Sears, RPh, Clinical Pharmacist II

only after several years of lab testing and an approved Investigational New Drug (IND) application by the FDA that a company can then begin testing in humans. The IND will then enter 3 phases of clinical trials. The D'Amour Cancer Center is involved in Phase 2 and Phase 3 trials. Phase 2 trials determine a drug's effectiveness. Phase 3 trials involve several thousand patients worldwide to further determine effectiveness and side effects. "Investigational Pharmacy is very specific. Patients are monitored for side effects and the pharmacy manual precisely lays out how to adjust the dosing according to the level of severity. In Investigational Pharmacy, documentation is paramount for study accuracy and data collection. We must follow exactly what is in the study protocol with no deviations." says Molly Sears. "If the study is successful, the company then submits all of the data along with a New Drug Application to the FDA with hopes of gaining approval for a new drug to market."