

New York Corona Virus Epidemic in Bronx, NYC: Offense and Defense

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Abstract

From March 16th 2020 onwards, our university-affiliated hospital ICU (20 beds) started getting covid-19 patients in Acute Respiratory Distress Syndrome (ARDS), Acute Kidney Failure and Shock. By March 25th, all 20 (+2 flex) beds have had ventilator patients, about 2 - 3 being manually proned every day per unit (positioning patients on their belly to help open the lungs); we are learning to strategize the division of scarce labor and overcoming the fear of getting infected. Our civilian patients, nurses, physicians, administrators, housekeepers and assistants are providing exceptional support. We are providing help for nursing and physicians with multiple unstable patient events happening simultaneously. When the healthcare soldiers are stressed, hungry and thirsty, then the experience of serving these patients becomes painful and compromised. Although we are not trained to fight a world war, we know a good balance to the "offense" and "defense" section of the army helps us win the war. Nurses, doctors and assistant staff are the "soldiers" and the virus particles are the "opponents". The "civilians" that fight alongside the soldiers during war are analogous to our patients. We need to balance being self-protective and self-destructive while serving for these patients if we want to fight till the end and save lives. Logistical experiences, teachings from various scriptures and world war strategies are described further in this article as seen at our hospital. We are learning unique strategies from other countries like India, how to address coronavirus public health through channels like Women's health, Maternal and child health welfare.

Keywords: *Acute Respiratory Distress Syndrome (ARDS); Corona Virus*

Part 1: Offense and defense during COVID-19 world war 3

The battlefield

Our entire hospital is becoming a mega ICU and we have new emergency construction plans. As of April 1, we are efficiently using our n95 masks for our staff; not all of our patient rooms are under negative pressure, but we have portable Microcon filters. We are receiving 3 - 4 non-covid critically ill ICU patients per day such as TB, seizures, sickle cell disease, cancer, diabetes flare ups with other medical problems from all over New York city to help unload other ICUs in Queens and Brooklyn etc. We are open to admissions from all over NYC. Besides the ICU and PACU/OR ventilated patients, we have had 10 - 15 new moderate and mild ARDS cases of covid patients on oxygen nasal cannula 5 - 6 L/min every day in general floors and some of them end up going home while others get worse. We liberated our first patient off of the ventilator on March 27; he is weak from the illness, will need life-long dialysis and is getting physical therapy. From March 27th, we started losing covid patients every week, sometimes multiple in a few hours span. We are balancing quality of care for

current patients alongside accepting more quantity of patients from other ERs (scarce CVVH staffing, challenges due to negative pressure rooms, dialysis capable rooms, device malfunctions, exhausted staff). Handling covid-19 suspects, patients and non-covid patients at the same time in the same location is a big challenge. Some of our patients have been on IL-6 research and now some enrolling for plasma. We have 2 ICU physicians trying to handle the 20 - 22 unstable patients (one receives phone calls and triages patients while taking care of 8 patients and the overflow unit in the OR and the other physician handles the other 12 ICU patients). During the night shift, we have 1 critical care physician covering all 20 patients and the new anesthesiology/OR covid unit and we are actively recruiting. We have 5 - 6 nurses per shift, 2 respiratory therapists and 2 nurse assistants for 20 patients. and April onwards, traveling nurses & docs from all over the country joined us to get to 9-10 nurses per shift for every 20 patients across ICU, PACU and the new ER-ICU covid unit.

World war 3

When healthcare soldiers and civilians are reminded consistently and when each one of us practice personal protection and defense measures in balance with the offense activities such as giving medications, entering the patient room, securing the airway, doing lifesaving procedures (or public leaving their homes for essential services), then we will preserve our soldiers and civilians one by one in the next 2 weeks. The cascade of spreading the disease is likely further magnified by our healthcare soldiers as they go back into the community every day after work; nurses and doctors infecting their families and the community. Numerical facts from China Dawei Wang, *et al. JAMA* publication suggest 41% of their 138 cases reported in February were hospital acquired and 40 of the 138 were healthcare workers. The same study suggests 1 patient can infect around 10 healthcare soldiers [1]. Let's talk about how to focus on defense and when to implement offense. The take home message is for our healthcare soldiers to keep reminding themselves about defense: offense ratio.

Defense: (Timely food, warm liquids, cleaning hands, protection gears and equipment, keeping mental hygiene).

Taking care of oneself is one of the most selfless acts of Man.

Immunity and mental sanctity of the healthcare soldiers: Gut is the home of our immunity and health. Serving warm nourishing food and warm water with herbs and spices, fruits, vegetables, to our gut bacteria every 3 - 4 hours in small bites and when eaten slowly, swallowed after chewing well with saliva, with a calm approach will strengthen our soldiers and the defense section. We have ensured a continuous supply of food for our staff delivered to the break room and night shift snacks; thanks to the team effort of our staff and organizations like Bloomberg Kitchen. We struck a balance between charting, performing certain forward moves alongside finding time to strengthen our defense. Imagine an NBA game where opponent LeBron James targets the weakest defenders amongst the best defending team, Toronto Raptors [2]. Our weakest soldiers can weaken the defense of other soldiers by misleading them and forcing offense moves (invasive testing/procedures/contact without adequate PPE, back to back shifts without nourishment and rest, emotional lability); we actively searched for above areas of weakness. The Nursing Administration and educators are key strengths to our ICU program and patient care. We attempted to head out on time at the end of our shift and learnt to share the responsibility - both giving and taking; Remember Defense Defense Defense!! Closed loop communication between ICU managers and administration (central supply) is core to our ICU and is helping us keep the staff protected. If and when such defense strategies are strong in hospitals, that is a time when making a forward offense move might save lives and protect soldiers. The defense executed by the public civilians will reduce case load in the hospitals and therefore the soldiers will be able to effectively work on lesser viral opponent burden and not burn themselves out in the war.

High yield information: Respecting the Circadian Biological clock (known for centuries) strengthens our defense (the 2017 Nobel Prize) [3]. Our objective is to be available here right now to fight the war intellectually, not overwhelmed by emotions that affect our defense. When one doesn't care for oneself according to the bio-clock or attend to timely bodily needs, our natural forces of fire, water, earth, space and air that control our MOVE-DIGEST-REST apparatus (called Vatta Pitta Kapha) are out of balance and these disrupt the gut microbiome tremendously leading to chronic disease and dysregulated immune response to viral, flu and other infections. Please refer to Ayurvedic

Indian, Chinese, Greek, Latin, Roman, European humorisms-traditional medicine aspects) principles of Daily routines, called DinaCharya. When unfed, the digestive fire called "Agni", manifests as inflammation - seen as migraine, headaches, being hangry, brain fogging, greying of hair, hair loss, mushy stools that burn, lower immunity, chronic diseases like HTN, heart disease, diabetes, and coronavirus morbidity as the worst-case scenario [4-7,13]. This applies to the general public in their daily lives fighting the virus called "stress" as much as it applies to frontline health care soldiers.

Forward or offense

We see the need for cautioned aggression in the offense strategies for covid patients given their fragility. Our ego/experiences may suggest to us that our clinical skills may overcome any magnitude of acute respiratory and kidney failure. Transient improvement in vital signs or lab values of severely ill elderly patients and abrupt recovery of milder COVID patients may make us over-aggressive on the sickest patients. We need to remind ourselves to put our offense very gently when there is best 'bang for the buck'. Note that we may be exposing our defense during the times we step forward as offense (such as steroids, invasive diagnostics, anticoagulation etc).

We are learning from the navy workers about strategizing offense. The ADP 3-90 Document from the US Army is an excellent resource to review where you can compare this epidemic to the battlefield and plan the offense moves.

Examples of forward moves: Spying on the opponent (virus) through ongoing pharma research, learning from past experiences with SARS/flu epidemics, controlling the spread of the virus by individual quarantine/precautions, and most importantly, strategizing/timing the supportive treatment given by the healthcare soldiers. For the public, a forward move/offense would be analogous to joining the soldiers in this effort in their own respective fields of profession and duty. Individual desires to focus on the respective jobs that completely compromises community safety/national interest may not be helpful. Converting or transforming their current skills and jobs with innovation to inspire the nation and help the world fight this epidemic will be powerful (equipment/manpower/nutrition/leadership). Holding on to positive interpretations of actions in the community, positively encouraging and intellectually bringing the community and world together will get us thru this challenge - coming from the Intellect (IQ) and not from the emotional mind (EQ). This will create harmony of actions starting from home to all the way across continents. All the leaders will utilize the same secret tool of action in the interest of nation. We will execute our actions with a consistent balance to: duty towards the globe, duty towards nation, duty towards home, duty towards self and finally personal desires.

Reconnaissance is a military term used to survey unfriendly territories to understand the enemy better [8]. The field where EMS pick up patients from their homes, encounters with patients that are vomiting/coughing, the unprotected ER and waiting hallways are analogous to unsafe territories and we have planned carefully the war zone into Hot Zones and Cold Zones. Early and brief group huddles/discussions with the nurse and the resident physicians taking care of each patient are very powerful so that the number of entries into patient rooms is minimal.

In the ICU, removing unnecessary foley or central line catheters, gathering in-channel endotracheal samples to identify bacterial sepsis, using non-invasive percussion vibration techniques to keep mucus moving up the airways, taking guidelines from medical societies for identifying patients with good prognostic signs are other important offense strategies. The mental health of Chinese healthcare workers was significantly impacted during this epidemic and this is a major blow to the strength of frontline offense team [9]. We are learning how not to overanalyze consequences of offense moves (irrespective of positive or negative outcomes), and instead use caution and small quantities of therapies that support these critically ill patients (be it paralytics, tube feeds, sedation, proning, invasive procedures); less is more.

In sum, it is 'how' we do this more so than 'what' we do that will remain engrained in history; the experience we have depends on how well we balance our professional approach, emotions, planning skills, passionate care to critically ill patients and self-protection and self-nourishment. Defense! Defense!

Part 2: Logistics and Clinical Challenges

Logistics of offense and defense strategies in COVID-19 care

- Isolation precautions needed (contact + airborne): Infection control department gathering CDC and WHO data and spreading awareness of best utilization of available resources and the need to readdress frequently during the epidemic.
- Flow of patients into ER and wards into segregated sections when coming in with respiratory symptoms: hospital and system chief medical officers disseminating system-wide information about allocating triaging manpower upfront at the entrance; Closing all other entrances to the hospital.
- Diagnostic workflow for patients coming in with respiratory symptoms: Emphasizing on asking for travel history or sick contacts initially; later, for all comers with symptoms from community spread. Effect of contact tracing can never be over-emphasized.
- Limited availability of negative pressure rooms in the hospital wards and ICU: For instance, in our hospital, Approximate counts of 20 ER closed rooms with 10 being pods with closed curtains, 20 closed ICU beds, 40 general medicine/surgical rooms, 2 PACU closed rooms with 6 - 8 open pods with curtains: This is where we strengthened the defence strategies of our staff by ensuring adequate N95 mask usage, additional face mask with eye shield, a contact gown, goggles and a cap. Frequent reminders to maximize effective PPE usage especially before attending to cardiac arrest codes. Specific transport precautions were used when suspects and covid-positive patients were taken for testing to radiology suite from the ER on the way to ICU.
- Upfront planning: Patients with hypoxia that respond to low flow nasal oxygen- ICU attending notified by ER and admitting residents about potential case of coronavirus patient being admitted to the floor. Upfront planning for high-flow cannula use in negative pressure rooms or closed rooms with portable negative pressure generators to prevent need for intubation. Using aerosol boxes (like thalia box) are going to make the procedures safe for staff.
- Logistics of dialysis-capable rooms and equipment sharing will need prior planning: Our first covid case was admitted to ICU on March 17th. By March 25th, our ICU was overflowing with all covid patients except for 3 non-covid patients and by then, it was day 6 - 7 of ICU stay for some of the patients that started needing dialysis: planning sessions with 2 dialysis technicians (one working day shift and other working evening shift). Assessing patient rooms that are capable of administering dialysis.
- Covid patients took more time and manpower compared to non-covid patients: During the peak week starting from March 23-31, we expedited tracheostomy for 2 of the ventilated non-covid COPD/pneumonia patients; thanks to the surgeons. Working with the neurologist helped us allocate and secure the care for a third non-covid patient with uncontrolled seizure disorder. Expediting tracheostomy patient coming off of their ventilator in 24 hours, and later transferred to regular floors.
- Quality of care vs quantity of care: Accepting patients being transferred from other hospital ERs/ICUs within the system vs being able to help already existing patients at our hospital was a challenge that we overcame by choosing to place the patients at the most suitable location that will give them the best possible care. i.e. an ICU bed. The state government's arrangement for the Javits Center and the US Comfort naval ship will continue to help this and still need to consider redistributing patients to nearby counties/tri-state area.

- Use of ultrasound imaging in guiding covid patients: balancing the time available on a given day based on the level of stability of the other ICU patients and exposure time to patients. While performing diagnostic tests/manoeuvres on one patient, others would frequently de-stabilize. We overcame such challenges by dividing and allocating roles.
- Number of times that a healthcare worker entered a patient room: We organized strict vigilance on the risk: benefit ratio of offense: defence strategies during patient care; for instance, monitoring the use of n95masks and other PPEs for our surgeons who came forward to help us with procedures.
- Offense: defense balancing in every aspect of this epidemic: Nourishing our healthcare staff with food and water on a consistent basis every few hours so as to keep mental faculties and efficiency of the soldiers at the best levels to achieve best patient care and make a lasting experience for all of us. Wearing the PPE/masks and goggles felt very restricting and we encouraged staff to use nose pads, take a 1-minute breather (and hydration) outside of the ICU hot zone so that they stay comfortable but secure with the PPE while inside the ICU - Solidifying internal defense as well as external defense.
- Portable radiology imaging at bedside: Similar instances include risks of aerosol exposure due to tube dislodge, balancing aggression and caution when letting X-ray technicians move delicate patients by themselves.
- Relative scarcity of physician manpower for multiple events at the same time: We improvised spontaneously with division of labor and a sense of boundless humility amongst physician/surgeon/anesthesiology groups.
- Residents and interns trying to understand their role in such busy times: Balance between data gathering, reporting, documenting, self-defense, teamwork (TEAMSTEPPS and iCARE) principles.
- Nursing charting and documentation: Easing demands on nursing staff on charting routines and instead focusing on patient comfort, patient safety and self-defense. We emphasized on the importance of the experiences in balance with the outcomes.
- Equipment troubleshooting: Dialysis catheters not functioning well due to various reasons: clotting of blood in catheters, hypovolemic patients, obese patients, prone positioning, limited availability, need for refilling supplies, planning ahead of time and expecting shortages of kits (Using SLED mode of dialysis).
- Limited nurse staffing influencing needs for CVVH dialysis and prone positioning: We held on to the concept of working with we have during war, rather than we want. Contentment as opposed to expectations; at the same time, reporting the needs to higher authorities so that skilled physicians could focus on their areas of expertise - recruiting more nurses from out of state - same day credentialing. Inviting physical therapists to help with establishing prone team. Inviting social workers to help with video calls with family showing patients.

Clinical parameters and challenges in this unique novel disease

Attempting to protocolize a multi-system disease to reduce uncertainties: balancing the differences yet similarities amongst covid patients:

- Our assumption that the respiratory failure and renal failure may be similar to common etiologies of ARDS that we usually see during the year was being tested: Group discussions with team leaders to help protocolize - approach to hypoxia without hemodynamic instability, the safety of using high-flow helped. The renal failure behaved in such a way that the Creatinine tripled and quadrupled in patients within 72 hours in some cases and the debate between fluids for the kidneys

vs caution to the lungs was dealt with small volume boluses with caution: planning ahead of time for catheter placement. Sudden cardiac deaths were noticed and we are attempting to learn to predict this in our current patients. Questions about anticoagulation and steroids are being studied.

- We began manual proning for the first time in more than 10 years since the H1N1 pandemic. We brought nursing educators in 24 hours and spread the awareness amongst other staff and other hospitals within the Health Hospitals Corporation HHC system within 3 - 4 days. There are multiple therapeutic events happening and it is going to be hard to pick and choose which one or two actually helped the patient live or die. The fascinating immune system of our human body is the driver and we physicians and nurses are mere instruments providing supportive care.
- Etc_{o2} - end tidal co₂: pco₂ gradient: It helped to get a sense of where the lower limit of arterial carbon dioxide levels could be. But we know that the arterial pco₂ levels in patients with lung injury may be much higher compared to the end tidal CO₂ due to inability of alveoli to empty co₂ into the tidal breaths.
- Patients were edematous the longer they stayed: Challenges with blood draws for testing; utilizing existing central catheters and educating phlebotomists to work in conjunction with nurse/residents helped.
- Working with system and out-of-system hospitals to generate protocols for steroid medication, anticoagulation for high d-Dimer.
- Sedation: Elderly patients became constipated with fentanyl; this led to difficulties with potassium clearance if we had to use oral agents like kayexalate for renal failure. Compliance of the chest wall and lungs was also a concern for us due to constipation. Rotation of sedative with different mechanisms every few days helped.
- Central lines being inserted in patients coming from outside hospitals and patients requiring dialysis: concern for line sepsis with ongoing fevers when patients were received from outside ERs and hospitals, empiric antibiotics started in many local and outside patients without endotracheal samples and decision- making regarding empiric antibiotics once Covid positive results confirmed.
- Telephone communication with patient families: Patient families calling in asking regarding patient updates: addressed them with a balance to positive and negative feedback, listening to their experiences at home, trying to get social workers and case managers to give phone calls; residents working on small prospective covid patient projects attempting to check on patient families and also requesting consents for prospective chart reviews research. CPR related questions were dealt with by initially asking about presence of advanced directives and followed by our recommendations of no CPR for patients with poor prognosis based on guidelines from medical societies, sharing the pros and cons of the entire process to both patient and the healthcare staff.
- Holding on to fears of consequences of action did not help during therapies for this novel disease and our positive reinforcement made us stronger every day. Variable responses to PEEP: balancing between benefit and harm during times of treating an unknown disease; small steps at a time. Understanding if this is even ARDS or if this is a microthrombi induced disseminated coagulation causing v/q mismatch (like arterio-capillary-veno-occlusive disease) or a cytokine storm leading to dys-regulated vasoconstriction and dilation. Staying detached but cognizant to the outcomes of therapies we omit and commit; not taking outcomes personal so that we can receive signals from the patient response and learn the disease; understanding the magnificence of the creation and the creator. Engaging in action, with a balanced affect: Detached attachment [10-12].

Potential areas to address

- We need to prepare for the second peak. Questions remain as to whether we are going to prolong the first lockdown to keep the second peak and lockdown smoother. There is an urgent need to address chronic disease and the direct relationship between lifestyle choices and immune dysregulation as indicated by scientist clinicians like Dean Ornish.
- Future antigenic drifts and shifts of the coronavirus is highly likely just like the Influenza virus strains; and hence vaccines may partly reduce the future deaths. The onus is on each one of us in the human race to work on strengthening immunity by gut-healthy lifestyle practices and community welfare measures (host and environmental factors). Understanding the vpk cycle of Move-Digest-Rest [4-6].
- Role of nutrition and psychological support and ways to monitor and improve staff nourishment during high volume disasters so as to strengthen the defence section of our healthcare army; similarly, addressing such habits in the general public during similar high-pressure situations in their professional life: addressing the virus called “self-induced stress”.
- Continued follow up of our public and healthcare workers to track mental health: H3 services at HHC hospitals - Helping healers heal.
- Good response from telephone clinic visits with non-covid ambulatory care patients at their homes. All elective and semi-urgent surgeries, cancer and cardiac therapies are being put on hold, and we are strategizing the approach towards getting them treated before they transform into emergency. This will require case by case discussions backed by governmental directions.

Summary

As early as August 2019, we seemed to have known that multiple events of global tension and natural disasters were going to happen around this time based on astrophysics (Abhigya et al). We are all going to go through this phase, but what’s going to make this experience fruitful is how we work as a team with values. The Higher Power (or Mother Nature) is the Doer here. We function as His or Her instruments and we are going to remember how balanced and privileged we were to serve these patients [10]. Per The Gita Chapter 2 verse 47, “To action alone hast thou a right and never at all to its fruits; let not the fruits of action be thy motive; neither let there be in thee any attachment to inaction [11].

Traditional practices like value-based eating habits, herbal foods/medicines, austere living styles, the power of Yoga, values like happiness, moderation, contentment are being tested real time. The public have been given an opportunity to focus on wellbeing and health. Use the survival of the fittest principles and work as a team to make the entire community and nation fit. It’s time we asked The Higher Power (intellect) to help us. We are creating churches, mosques and temples in our hearts and meditating when able. Practicing detached attention in actions as long as it protects the land, the community and yourself is the key. One may not see the effect of your dutiful actions right away; it will be rewarded when ‘Time’ allows.

The protective effect of us practicing social distancing will be seen in April-May and is going to be immensely helpful. Stay active at home and work as a team on household duties. Wash hands with hot water especially when touching mucus membranes. Keep yourself nourished and balanced while you handle the virus called ‘stress’ in your respective lives. “Stress” is a choice, not a mandate [13].

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