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Extraordinary Impacts on the Healthcare Workforce:

COVID-19 and Aging

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Introduction

The COVID-19 pandemic has created challenges in just about every facet of everyday life, for everyone across the world. Offices closing, restaurants closing, zoom meetings and online classes all became the new normal. Our population faced a challenge it has not seen since 1918, when the Spanish Influenza rampaged throughout the world, killing an estimated 50 million people.[1] While COVID-19 may not have the same lethality as the Spanish Influenza, it put a strain on our modern medical system. The pandemic pulled apart the fibers of the global healthcare ecosystem and exposed some major shortcomings in pandemic preparedness, which has caused ripple effects throughout the world.

COVID-19 and Healthcare

During the first wave of the pandemic, COVID-19 patients were being admitted to hospitals at such a rapid pace that it was difficult to keep them isolated from the rest of the patient population. The pressure on healthcare workers and engineers to develop controls for a safe working environment led to some exceptional innovation in minimizing the transferability of airborne illness in efficient and cost-effective ways. Due to the limited number of negative pressure isolation units, regular heating, ventilation, and air conditioning (HVAC) systems could continue to circulate the disease to uninfected units of the hospital.[2,3] In a study conducted at a skilled nursing facility (SKF) in Lancaster, Pennsylvania, negative air pressure isolation of individual rooms using modified HVAC systems seemed to keep airborne disease from escaping the negative pressure space.[2] A similar system was used in South Korea, where existing HVAC systems were adapted to create negative pressure zones in existing hospital units that were turned into isolation units, with a dressing room outside of the individual isolation units as well as a buffer room between the isolation room and the hallway.[3] This process of creating negative pressure spaces could also be used to turn non-hospital buildings like warehouses into temporary COVID-19 units.[3]

Despite innovations in patient isolation, the drastic increase in hospitalizations meant that nurses, who perform much of the direct patient care in a hospital setting, had more dangerous and psychologically taxing work than ever before.[4] A 2020 edition of "The Exchange" notes that "COVID-19 has presented healthcare with a unique set of challenges: constrained resources, a highly infectious, novel pathogen that poses a significant threat to the health of providers and support staff, large numbers of critically ill patients and deaths—often with only the caregivers to accompany the patient in their final moments—limited [personal protective equipment] PPE and therapeutics, restricted social interactions, and a protracted timeline with no clear end in sight. These challenges have contributed to unprecedented mental health impacts among healthcare workers."[5]

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System Burnout and Loss

The Office of the Inspector General of the U.S. Department of Health and Human Services contacted over 300 hospitals asking what challenges they faced because of the pandemic, to which the overwhelming response was a lack of staff and critical care equipment, causing difficulties in resuming routine hospital care.[4] In a meta-analysis paper detailing the impacts of COVID-19 on the nursing workforce specifically, Michelle Cleary of Central Queensland University indicated that the increased workload and inflexibility of hours—as well as significant lack of mental health treatment for nurses—has led to tremendous burnout and an exodus from the profession.[6] The increase in demand for nursing care, coupled with the seemingly ever-decreasing supply due to burnout from inadequate mental healthcare for providers and a significant lack of hospital resources like PPE and critical care equipment, have led to a nursing shortage that extends across the globe.

Nurses were not the only people who felt burnt out or nervous about contracting COVID-19; a 2021 article from Bloomberg suggests as many as three million Americans may have retired early across the job market.[7] Another 2021 article by CNBC quotes a figure of around 3.2 million more Baby Boomers retired in late 2020 than expected, and the number of Americans planning to work past age 67 dropped 32.9%.[8] For the first time in history, healthcare workforce jobs were not recession-proof, and employment rates fell along with other job sectors.[9] A recent AMA study found "20% of physicians said they were likely to leave their current practice within two years, while one third planned to reduce their work hours in the next 12 months."[10] Nurses are leaving the profession at an unprecedented rate due to burnout and aging medical professionals are seeking to reduce their hours or outright retire early due to pandemic fears.[4,7,8,10]

While the outbreak of COVID-19 has certainly impacted the burnout rates both in the U.S. and abroad, excess healthcare worker deaths are also causing shortages across the globe. A 2021 Working Paper by The WHO claims that the 6,633 reported healthcare worker deaths due to the pandemic falls embarrassingly short of reality, which they estimate could be anywhere between 83,000 and 115,000.[11] The WHO states that much of the underreporting comes from their African, South-East Asia, Eastern Mediterranean and Western Pacific regions, where it is reasonable to assume that the excess deaths are contributing to stress and burnout in those healthcare workers that have survived, as well as disparities in access to care across those regions most heavily impacted by the loss.[11]

An Aging Population

The impact of the reduction in the healthcare workforce is being compounded by an overall aging population. A Chinese study conducted on patients with COVID-19 found that the elderly [60+] were more likely to have comorbidities that influence the outcome of COVID-19 infection than those who are not elderly [<60].[12] This study also indicates that the proportion of severe cases was higher in the elderly than in the non-elderly. Addressing the Health Needs of an Aging America states "[b]y 2050, adults over the age 65 will make up 20 percent of the U.S. population."[13] The surge in retirees, not just from the healthcare workforce but from the overall population, has left the tenability of certain social programs, such as Social Security and Medicare, questionable at best. The National Academy of Social Insurance predicts that social security will face significant challenges by the year 2030, as more adults age 65+ will be taking benefits from Social Security than there are adults in the workforce paying into it.[14] These

figures indicate a growing shortage of healthcare providers that is expected to keep growing, as well as an aging population that will inevitably require increased care in the coming years, with high potential for limited availability of social programs, greatly exacerbating the growing shortage of providers in the healthcare workforce.

Shortages and Disparities

In the United States, the shortage within the primary care workforce and the disparities in available primary care both between and within different states have been a known issue for over a decade. As stated previously, the U.S. also faces the challenge of an aging population that will require increased primary care. In 2014, the Stern Center for Evidence-Based Policy at the University of Pittsburgh contends that "[w]hile the U.S. population of adults aged 65 and older currently account for only 13% of the population, this cohort consumes more 34% of national health expenditures."[13] A 2013 review conducted by the Robert Graham Center estimated that, by 2030, Delaware would need an additional 177 primary care physicians—a 27% increase from 2010.[15] This review only considered physicians, and not the significant number of physicians assistants, nurse practitioners, specialists (e.g. obstetricians, gynecologists, cardiologists), and mental health professionals who also either practice primary care or are deemed a primary care provider by patients. Data sourced from the Delaware Professional Regulatory Online Services (DELPROS) in March 2020 indicated there are an additional 709 adult, family, or gerontological nurse practitioners actively practicing in Delaware.

Primary care disparities exist not just between states but also within states. In Delaware, more than half of the land area is federally designated as a healthcare shortage area (HAS).[16] Of the three counties in Delaware, the entirety of Kent and Sussex Counties are designated HSAs with large rural populations that lack access healthcare. Even parts of New Castle County are designated as HSAs, despite the more urban/suburban landscape.[16] However, these designations are based on studies that fail to assess the importance of physicians assistants, nurse practitioners, and other types of primary care that do not fall under the "physician" category.

Seeking Primary Care

While the trend in hospitalizations over the past two years increased, fewer people sought necessary medical treatment, and elective procedures were deferred. Even now that significant mitigation measures have been put in place, preventative care is being put off.[9] A study conducted by the Australian Institute of Health Innovation revealed that "[a]n estimated 1.3 million (13.2%) fewer manual therapy services, with a total cost of AUD 84 million, were provided within the Australian private healthcare setting during the first half of 2020."[17] Another study conducted by the U.S. Centers for Disease Control and Prevention (CDC) estimated that 41% of Americans deferred necessary healthcare, including a 12% reduction in emergency care and a 32% deferral of routine medical care.[18] Emergency department visits were down 40%, while office visits were cancelled in favor of telehealth appointments, and elective procedures were delayed indefinitely.[19] Despite decreased use of medical services across the board, a December 2021 press release from the Centers for Medicare and Medicaid Services (CMS) stated that 2020 saw a 9.7% overall increase in healthcare spending due to the pandemic.[20] With an aging population and their chronic diseases in mind, these delays in routine and emergency care will likely lead to worsening overall health outcomes, increased healthcare costs, and worsening of chronic conditions.

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Delaware Health Care Workforce Database

The challenges faced during the COVID-19 pandemic exposed significant flaws in the current medical systems' ability to provide adequate care for those in need during times of exacerbated strain. From severe lack of PPE and critical care equipment (CCE), to nursing shortages and fears of accessing care during a pandemic, hospitals and other critical care facilities were woefully unprepared. While the U.S. has taken significant measures to shore up hospital reserves of PPE and CCE, every state is taking its own precautions and putting measures in place to prevent another such epic disaster. Delaware has chosen to create a Health Force Database, to include every licensed and unlicensed healthcare practitioner in the state, from chiropractors to dentists to physicians and more. This database provides a clear picture of what access to different types of healthcare looks like across the state, and will help to inform decisions on workforce development.

Practitioner Demographics

The development of the database began in early 2020, using Excel to capture licensing information on all the existing practitioners listed in the Delaware Division of Professional Regulation (DELPROS). This initial picture of active and inactive practitioners across various healthcare sectors in the state was limited to a name, a general profession (e.g., nursing, dentistry, occupational therapy), a license type (e.g., Registered Nurse, Dentist, Occupational Therapist), and the activity status of that license (e.g., Active, Inactive, Expired, Deceased).

The lack of available information was a major challenge, for a project that would include demographic information, schooling or higher education information, Medicare & Medicaid acceptance, and several other data points. Since the beginning of the project, a data use agreement has been established with DELPROS that provides a slightly more detailed picture of each practitioner. Some data acquired through this agreement, such as birth year, is instrumental in determining which practitioners are likely to retire in the coming year(s). This data is also strictly unavailable through any other means of data collection: the DELPROS provided data is the one source of truth for the ages of the practitioner population in Delaware.
Early attempts were made to "scrape" internet sources (WebMD, Healthcare4ppl, Doximity, etc.) using several different third party applications that specialized in collecting large amounts of data from web sources and compiling them into excel files. This process was used to gather publicly available information on thousands of practitioners, although much work was needed to be done to remove duplicate practitioner profiles, combine information for individual practitioners, and correct or refine the information gathered (e.g. incomplete addresses, separating combined fields). After data refinement, it was found that not all practitioners were captured and not all profiles were complete. Despite this, there is a considerable amount of usable data concerning schooling and higher education data points that are not available through other, more robust data sources.

After evaluating the data from the scraped websites and the data from DELPROS, it was apparent that another major data source would be necessary to gather specialty and sub-specialty information. The National Provider Identifier (NPI) Registry contains a highly detailed and organized taxonomical structure of profession, specialty, and sub-specialties, as well as practitioners whose profession may not require a license (e.g. home health-aides, technicians). The NPI Registry is a service of the Centers for Medicaid and Medicare Service which operates on a national level. In the future, access to information about the neighboring regions of

Philadelphia, Baltimore, Atlantic City, and Ocean City, Maryland. This report do not rely on or include NPI Registry data, but future work will after data integration hurdles have been overcome. It should be noted that the NPI Registry data is only as up to date as providers maintain their own records, so this is a limitation of that source.

In addition to DELPROS, the scraped websites, and the NPI Registry, claims data is also being collected from the Delaware Health Information Network (DHIN) as a way of verifying practitioners are in fact practicing some form of medicine in Delaware. This information also helps validate specialty information gathered from the NPI Registry.

Dataset

With so many different data sources, Excel became inadequate as a data storage and aggregation tool. The Health Force Database moved to Salesforce, a cloud-based data storage and computing software, which can handle significantly larger data sets and organize them in drastically shorter time frames than are possible in Excel. Of equal importance, the DELPROS system is also based in the Salesforce environment, making data transfer between systems easier once all components are configured and reconciled. The creation of the Salesforce database required adjustments as the team learned how the aggregate inputs came together to form an individual practitioner profile. A contract was given to a third-party to build out the database, however it did not adequately meet the needs of the project, and the contract was terminated after a year of work with no system implemented. The contract was instead given to a new third-party system, Agile Cloud Consulting (ACC), which has a better understanding of the Salesforce system and how to leverage existing components of the system to best meet the needs of the project.

The desired output of the Health Force Database is a structural system that includes a profile of all Delaware practitioners and their specialties as individual practitioners, as well as a profile of all practice locations in Delaware (e.g. Nemours Children's Hospital-Delaware) with a full list of practitioners providing care at these locations.

To accompany the individual and institutional profiles, two statistical analysis tools will be used to better understand the data. Geopointe, a mapping tool, will provide a visual display of how many practitioners of a given type are in a geographic area as well as the demographic breakdown of the population of that area. This will provide an understanding of where the Delaware health workforce is practicing, the populations they are serving, and whether the healthcare needs of that population are being adequately met. The second statistical tool, Tableau, will use practitioner age data acquired from DELPROS to help to predict future changes to the healthcare workforce due to provider retirement, and help determine locations and specialties that may need to be filled in the future.

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