

PROBLEM SOLVING AND DECISION MAKING

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Introduction

Personal Protective Equipment (PPE) has become critical during the COVID-19 pandemic because it protects health care workers from a virus that may be spread through contact with residents in the health care profession. Within the National Health Service, there is a centralised procurement centre (NHS). COVID-19 has had a significant impact in the United Kingdom (UK), while the worldwide supply of Personal Protective Equipment (PPE) has deteriorated as a result of China's decrease (the country that manufactures the most PPE). Providers got increasingly angry with one another as a result. Making it more difficult to alter plans during the epidemic, especially when new information about the virus became available. The procurement process and controls in place during the emergency of health and social care PPE shortages in the health and social care sector are examined in this paper. It looks at how the government prepares, procures, and distributes Personal Protective Equipment (PPE) in the health-care industry.

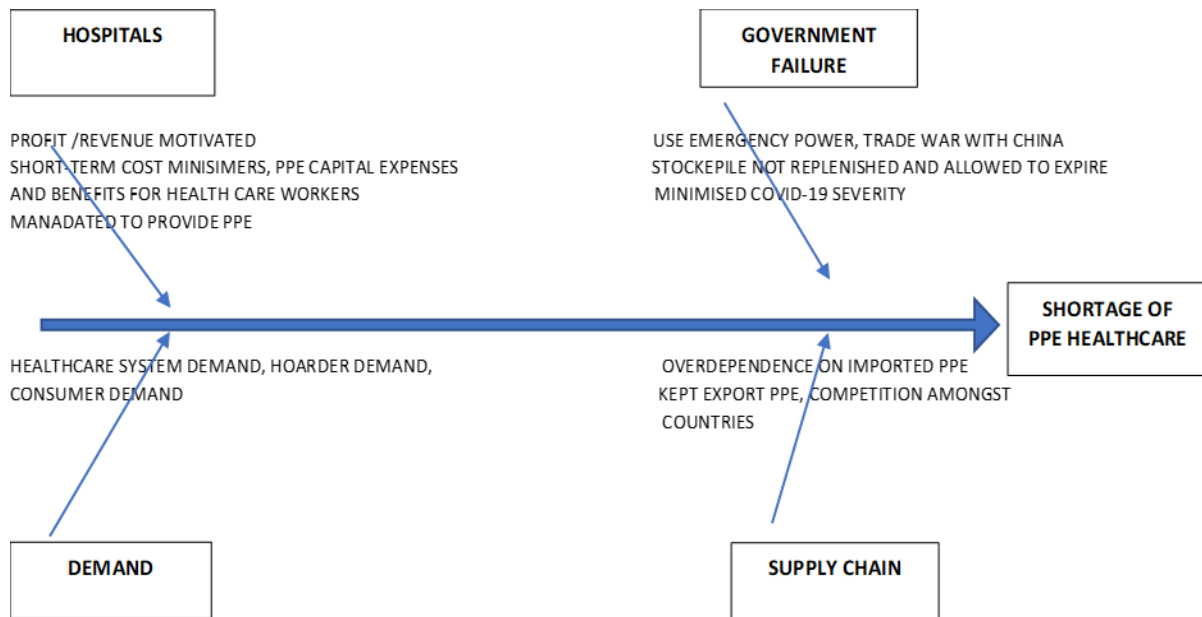
Lack of PPE in the Health Care sector

Personal Protection Equipment (PPE) is a type of clothing that protects employees from health and safety hazards. In the health and social care industry, personal protective equipment (PPE) covers anything from aprons to gowns, disposable gloves, face shields, and respirator masks. Prior to the pandemic, management of PPE supplies and stockpiles was delegated to a variety of governmental and private-sector contractors, but the supplies and stockpiles were intended for an influenza pandemic, rendering them insufficient for a coronavirus pandemic. Furthermore, the NHS Supply Chain sought to fulfil demand for PPE by using existing stocks, but ran into "distribution issues and a shortage of PPE" on hand. A comprehensive assessment of the Personal Protective Equipment (PPE) required in the health and social care sectors. It was projected that huge volumes of PPE will be necessary based on a complete calculation of the PPE required throughout health and social services. Prior to implementing a daily interaction approach with stakeholders to distribute PPE, the NHS Supply Chain had limited PPE. The NHS Supply Chain, on the other hand, developed and improved a method to better inform their distributions and enable quick purchase. However; this resulted in the acquisition of certain PPE that did not "meet" the criteria, resulting in the waste of hundreds of millions of pounds. The frequent changes were confusing, and the safeguards were insufficient to adequately protect health/social carers. Even when it was labelled as such, most of the information was given for "healthcare" i.e., hospitals settings and not for "health/social" care settings. The "British Medical Association" was concerned that the guidelines at the time did not propose that; employees in all hospital environments wear gowns and eye protection.

However, many "front-line" personnel in health and social services reported not having access to the PPE they need during the peak of the shortages. A significant number of them thought they were not adequately protected. The 'British Medical Association,' the 'Royal College of Nursing,' the 'Royal College of Physicians,' and 'Unison' conducted member surveys in April and May 2020, and found that a substantial number of participating healthcare professionals (at least 30%) reported having insufficient PPE. During the epidemic, even in high-risk areas. The expense of Personal Protective Equipment (PPE) added to the healthcare system's financial burden. The government has pledged to providing free PPE to healthcare facilities in order to assist them deal with the consequences of COVID-19.

In order to decrease their personal risk of contracting COVID-19 and the danger of forward transmission, all health/social care professionals should have had access to proper PPE and training. Employers reported instances to the '*Health and Safety Executive*' where there was reasonable evidence that infection was caused by work exposure.

However, it is impossible to say if Personal Protective Equipment (PPE) or other infection prevention and control measures were used in these situations. <https://www.bma.org.uk/>



On a Global Scale,

Stakeholders (countries, international agencies, health organisations, and universities) cautioned that a large infectious disease epidemic, particularly pandemic influenza, was possible, but that most governments were unprepared.

Between 2015 and 2020, the ‘World Economic Forum’'s annual Global Risks Report indicated a decrease in the frequency and effect of infectious disease transmission as an anticipated risk factor (WEF, 2015, WEF, 2020).

The high transmissibility of COVID-19 and the severity of symptoms worsened the issues caused by a lack of preparedness. The lack of Personal Protective Equipment (PPE) was reflected in survey data on PPE use as well as statistics on COVID-19 morbidity and mortality. In May 2020, 87 percent of healthcare workers said they had to “reuse” a single-use disposable mask or “N95” respirator, and 27% of nurses said they had been exposed to verified COVID-19 patients while without wearing proper PPE. To revert to our evaluation of PPE shortages, we found four contributing factors: the way hospitals budget for PPE, domestic demand, and the way hospitals budget for PPE. These four variables emerged as a result of a variety of processes, and they all worked together to create severe shortages. The first element, the hospital funding model, is a structural flaw in the healthcare system's ability to provide free PPE to healthcare personnel (Barniv et al., 2000; OSHA, 2007).

PPE is an expense—a cost in the eyes of health care workers. All other equipment used to treat patients, such as catheters, bed pans, and medicines, work on a cost-passing basis, which means they are billed to the patient/insurer.

PPE is different. Employers, healthcare workers, and patients would all benefit from a model for budgeting PPE that aligns their interests and facilitates effective, efficient, and safe treatment for everyone. Instead, the current arrangement confronts businesses who want to save costs against healthcare workers who want to safeguard their own safety and the health of their patients, leaving governmental agencies to manage the conflict.

<https://www.rcplondon.ac.uk/news/third-doctors-working-high-risk-covid19-settings-unable-access-full-personal-protective>

Employer objection is naive, but understandable given the current price structure. Other goods, like as catheters, have a price structure that permits employers to pass costs on to patients and insurance. The conclusion is that the NHS has no financial incentive to encourage staff to use Personal Protective Equipment (PPE), update it regularly, or have a lot of it on hand, at least until any cost-cutting benefits are lost owing to employee sickness.

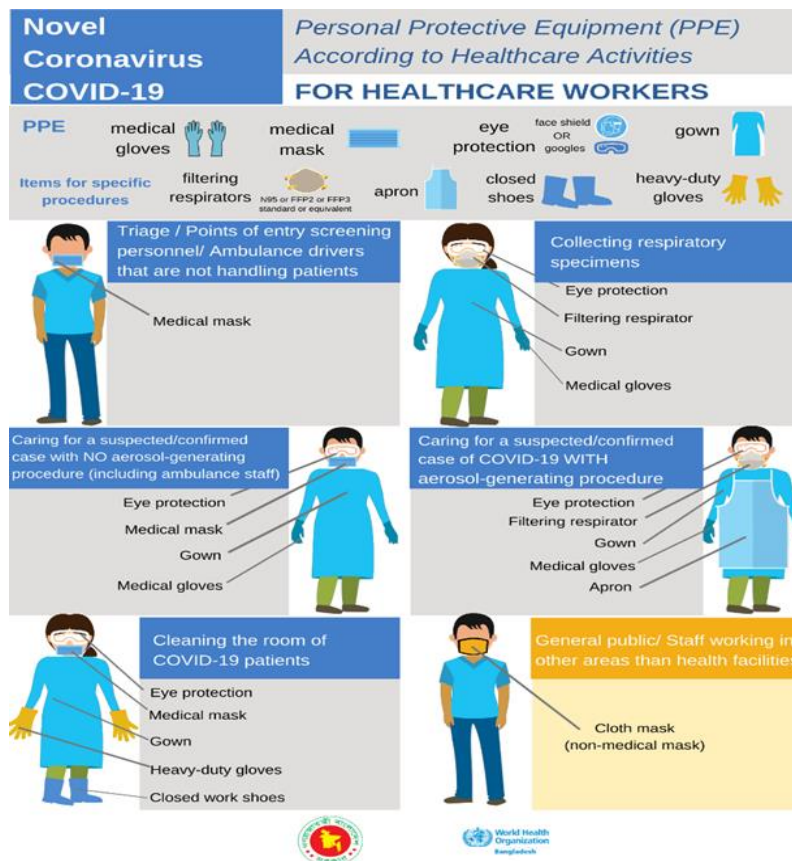
Patients and health carers were incentivized to prevent shortages by passing PPE costs on to them, just as they were for other goods used in treatment, but this was not the norm. This cost-passing alternative likewise left a lot to be desired. Whereas; the present approach creates conflict between employers and health/social care providers, a cost-passing model essentially pits the NHS against the health/social care sector (*Cerminara, 2001*).

If health/social care providers pay for PPE, they may prefer that the NHS be less safe in order to save money. Both healthcare professionals and patients suffer as a result of this paradigm. The NHS should "NOT" introduce stress into a relationship founded on caring and trust. The NHS and health/social care providers should be able to work together to improve the well-being of their patients. The current budgeting approach, as well as the cost-passing mechanism, do not align the interests of healthcare professionals and patients. Nonetheless, these three agents have a common interest in the use of PPE by practitioners. PPE, like catheters, are health inputs. However, unlike catheters, the major beneficiary of PPE usage is less obvious than other inputs. While it may appear that healthcare providers are the major benefactors of PPE, the advantages are more widespread.

Patients benefit from having healthy nurses who do not transmit infections, nurses' profit from having a healthy workforce, and hospitals gain from having a healthy workforce.

Health/social care is an input to the hospital's and healthcare system's operations. To put it another way, every benefit is reliant on the practitioners' health, which is reliant on PPE.

Nonetheless; employers' short-term profit motivation continues to outweigh the interests of healthcare workers and patients, implying that non-profit alternatives should be investigated



The NHS Supply Chain was established in 2006 to supply items to NHS trusts. The Department of Health and Social Care (the Department) established Supply Chain Coordination Limited (SCCL) in 2018 to oversee the NHS Supply Chain. SCCL intends to save the NHS £2.4 billion by 2022-23, and to raise the amount of trust procurement that goes through the NHS Supply Chain from 40% to 80% by that time.

Supply Chain Coordination Limited (SCCL) was operating effectively against its main goals prior to the pandemic, according to its performance report. It stated it saved £193 million in 2019-20, compared to a target of £150 million (a 29 percent rise) for the year, and raised the percentage of all eligible persons products and services bought by trusts through the NHS Supply Chain to roughly 56 percent, up from a target of 49 percent (trusts are free to buy through the NHS Supply Chain or directly from suppliers).

During the epidemic, the NHS Supply Chain's resilience became a major concern. SCCL's corporate key performance indicators don't contain a resilience metric, and the company's operational strategy wasn't built to deal with a pandemic. SCCL stated that it considers supply chain resilience when granting contracts to suppliers, for example, by assessing the plans of its contractors to ensure that they reflect the market's long-term viability.

The NHS Supply Chain is a business strategy for sourcing, delivering, and distributing healthcare supplies. The NHS Supply Chain is managed by Supply Chain Coordination Limited. After issues were discovered with certain 'eye protectors' purchased prior to the COVID-19 pandemic, the government commissioned the Government Internal Audit Agency (GIAA) to investigate the procurement and storage methods for 16 types of PPE in the PIPP stockpile. The GIAA determined that quality assurance systems for purchasing, receiving, storing, and issuing personal protective equipment (PPE) were insufficient. There was a

dearth of documentation to show that the PPE in the stockpile was bought to a predetermined quality level.

Prior to the pandemic, the Department maintained two different stocks of PPE, neither of which was designed for a Coronavirus Pandemic. The stockpile's strategic goal was to supply Personal Protective Equipment (PPE) to health and care professionals in England and the devolved administrations. PPE was physically kept in a warehouse, as well as 'just in time' contracts that allowed "Public Health England" (PHE) to purchase PPE in the case of a pandemic. The second stockpile was kept in case the United Kingdom left the EU without an agreement. It lacked the complete complement of several forms of personal protective equipment (PPE) that it was supposed to have (based on the estimated demand), with specific deficiencies of gloves and aprons. Except for a considerable quantity of gloves, the EU Exit stockpile included few items of PPE.

Second, visors and gowns had not been added to the stockpile. The "New and Emerging Respiratory Virus Threats Advisory Group" suggested these items for inclusion in June 2019. (NERVTAG). The role is to act as an Advisory Group to provide scientific risk assessment and mitigation advice on the threat posed by new and emerging respiratory viruses, as well as options for their management, to the "Chief Medical Officer" (CMO), the "Department of Health" (DH), and other Government departments.

The arrangements for providing Personal Protective Equipment (PPE) as part of an emergency response There were preparations in place for the government and the NHS to assist handle an influenza pandemic, but no arrangements for the distribution of PPE other than the "*Movianto*" contract to distribute the PIPP stockpile. Local resilience forums, which are multi-agency collaborations comprising members from local public agencies, including emergency services, local governments, and NHS organisations, were included in the larger plans. Under the "Civil Contingencies Act of 2004", certain partner organisations are needed. To plan and prepare for localised events and catastrophic crises, such as infectious illnesses, refer to <https://www.gov.uk/guidance/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others>.

NHS England & NHS Improvement (NHSE&I) has an established method for reacting to pandemic influenza through the NHS Operating Framework and its established NHS Emergency Preparedness, Resilience and Response system, in addition to local resilience forums. The NHS Supply Chain has challenges in providing PPE to health and social care providers.

Despite the fact that the stocks were released in February and March, trusts and other suppliers had trouble acquiring adequate PPE, including:

- Warehousing - in February, requests for personal protective equipment (PPE) and other goods surged dramatically, making it impossible for the NHS Supply Chain to properly distribute it. Furthermore, the PIPP PPE inventory was kept in a 'deep storage' warehouse rather than being distributed immediately to trusts, making it impossible to deliver supplies quickly.
- Stockpile Quality - Some PPE had expired or did not meet current safety requirements, and there were insufficient inspections on the stockpile's PPE. As a result, PHE was forced to recall products that did not satisfy the required requirements. Furthermore, the pandemic forced SCCL to put a halt to its efforts on transforming the NHS Supply Chain digitally. The NHS Supply Chain required to acquire, store, and distribute as a result of the epidemic, and it was unable to add more warehouses to the IT system.

As a result, finding trustworthy PPE suppliers on the worldwide market became difficult, and when it was feasible, costs were higher than usual. The difficulties were exacerbated by the inability of SCCL-contracted vendors to supply the PPE required under the 'just in time' contracts that are part of the stockpiling arrangements.

Five important functions were provided by Supply Chain:

- Make a plan based on the PPE required and the relative importance of forms of PPE.
- Source: Chinese vendors found through relationships in the UK, as well as new UK providers who provided assistance in locating PPE via a government web site.
- Make: Encourage manufacturers in the United Kingdom to reuse their operations.
- Order: Advising the Department's suppliers on how to proceed with a contract. Suppliers to the NHS who already exist
- Deliver: Receiving, storing, and distributing personal protective equipment

By comparing the projected overall demand for PPE in health/social care with the stored PPE plus the PPE it had previously bought, the NHS Supply Chain was able to determine how much PPE it needed to acquire. Samples analysed, for example, revealed two situations (totalling £214 million) in which PPE would not be utilised for its intended purpose. The FFP2 respirator masks purchased and supplied in both cases were of the agreed-upon design and met the BS EN149 standard.

However, at the time the contracts were signed, the masks did not match the government's published standards, which needed head straps. The standards did not indicate clearly that masks with ear-loops did not fulfil the criteria at the time, but they did state that FFP2 masks required straps that could be wrapped around the back of the head. Ear-loop issues on FFP2 respirator masks are expected to affect tens of millions of masks from other manufacturers. Most other forms of PPE have had issues adhering to technical requirements as well. It has not, however, supplied enough information to validate these statistics.

<https://www.bsigroup.com/globalassets/localfiles/en-za/ppe/guide-to-masks-and-face-coverings.pdf>

PPE Test Evaluation

Medical equipment and Personal Protective Equipment (PPE) are subject to strict quality controls; thus, "testing" is an important step in meeting the required requirements. Some of these can be tested with "*James Heal instruments*", which are listed below along with the applicable specifications, standards, and test procedures.

Face Coverings

Protective Face Masks and Surgical Face Masks are two forms of protective face coverings. The major standards and test techniques necessary for each are listed below.

- EN 149:2001+A1:2009 - Respiratory protection devices are a European standard. Polypropylene is more commonly utilised because of its hydrophobic nature and wicking ability, which creates a dry and pleasant microclimate between the mask and the user's face. In the present COVID-19 scenario, the World Health Organization (WHO) recommends wearing an FFP2 mask as a minimal level of protection.

FFP3 in high-risk regions and FFP2 in lower-risk areas are mandated by the NHS. These items are CE-marked and conform with the European Personal Protective Equipment (PPE) Regulation. They must be certified by a Notified Body. They must have the CE Marking and a four-digit number identifying the Notified Body certifying it since they are a Category III

product under the PPE Regulation.” Standard EN 14683:2019-Medical / Surgical/Medical Masks are meant to prevent the transmission of infectious agents and can also include a microbiological barrier that is intended to reduce the emission of infectious agents from a carrier's nose and mouth or a patient with clinical symptoms.

- Type II and Type IIR masks are designed for use by healthcare workers in operating rooms and other medical situations that have comparable needs. Type II is further split into splash-resistant and non-splash-resistant masks. Splash resistance is indicated by the R. Both types of masks are put through a series of testing to see how effective they are in the end.
- Inhalation and exhalation resistance - the equipment also requires a "*Sheffield dummy head*" on which the mask is attached and the air flow recorded.

Use EN 13274-7 to filter penetration.

- The ISO 6941 burner's flammability

Clothing to Keep You Safe

The following are the main requirements for protective clothing:

- Surgical garments and drapes (EN 13795-1:2019). Test techniques and requirements Surgical robes and drapes
- Surgical garments and drapes (EN 13795-2:2019). It is beneficial to breathe clean air.
- Standard Specification for Surgical Gowns Intended for Use in Healthcare Facilities (ASTM 2407-06)

Solutions for Recommendations

To better safeguard health care providers, this research highlights the need for revolutionary reforms and remedial actions. In examining a wide range of methods that not only provide incentives to protect health-care workers with PPE, but also develop effective system capacity and guarantee that healthcare is mobilised promptly in the event of a pandemic.

Here are a few suggestions:

- Why help hospitals (health carers) better safeguard their practitioners by eliminating the economic motivation from the purchase and management of personal protective equipment stocks.
- Boost municipal, state, and federal government stockpile management and distribution capabilities.
- Improve the enforcement of current PPE rules, such as the obligation to get the appropriate size for each employee;
- Consider strategic industrial policy to increase medical supply production and reduce reliance on the global supply chain for PPE (*Cohen and Venter, 2020; Fairfax, 2020*);
- Improve the government's ability to coordinate supply and distribution across the healthcare/social care industry (*Patel et al., 2017*);

These adjustments will solve the costing-model issue, the demand problem, government failings, and supply-chain vulnerabilities, but they will be unpopular politically. Developing institutional ability to create and maintain a viable stockpile of PPE is a key component of all of these policy approaches. Such changes will assist to define what global health should look like in the future. COVID-19 was not the first pandemic, and it is unlikely to be the last, especially given climate change's inevitable consequences.

Conclusion

The NHS Supply Chain deserves credit for developing components of PPE supply in the event of a pandemic, including proven strategies and a stockpile. However, neither stocks nor standard PPE purchasing and distribution methods were able to meet the unprecedented demand caused by the COVID-19 epidemic. Given the human and financial costs of a reaction, it's critical that lessons are recognised, understood, and implemented as quickly as feasible. A comprehensive lessons-learned exercise including all key stakeholders, including local government, worker and supplier representatives, would guide future emergency planning. In the event of a pandemic, emergency plans must include enough inventories of high-quality PPE, as well as extensive and robust procedures for the fast procurement and distribution of PPE based on accurate data. PPE distribution to health/social care and other elements of the health system must be included in plans. Organizations in charge of maintaining and testing their plans must keep an eye out for emerging risks that might derail them. Despite efforts throughout the years to combine them, health/social care have remained a distinct system. During this crisis, the health/social care sector was badly impacted by PPE shortages, and the government must figure out why national bodies supported hospitals more than health/social care, and how to avoid this occurring again.

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