Ref. Ares(2020)1855146 - 31/03/2020

Guidance for allocating procured COVID-19-related medical equipment across European Union Member States[1]

Version of 30 March 2020

Scope of this document

This document provides guidance for the European Commission to allocate available COVID-19-related medical equipment across European Union Member States[2] to achieve the best possible public health outcome within the EU/EEA. The general objectives of the document are:

- to provide guidance to Member States for reporting their national-level needs and deficits of COVID-19-related medical equipment.
- to provide guidance to the Commission for allocating available COVID-19-related medical equipment across Member States, according to national-level deficits.

This document is based on current COVID-19 knowledge and best practices. ECDC may update this document based on the evolving situation and if new relevant information arises.

Target audience

Member States personnel responsible for COVID-19 surveillance and reporting, and the European Commission.

Background

What are SARS-CoV-2 and COVID-19?

SARS-CoV-2 is the causative agent involved in the current outbreaks of COVID-19. It is a virus belonging to the family of Coronaviridae (genus: Betacoronavirus), a large family of enveloped, positive-sense single-stranded RNA viruses. Coronaviruses are transmitted in most instances through large respiratory droplets and contact transmission, although other modes of transmission (e.g. airborne and faeco-oral) have also been proposed.

The average incubation period is estimated at 5 to 6 days, ranging from 0 to 14 days [1]. There is currently no specific treatment or vaccine against COVID-19.

More disease background information is available online from ECDC [2] and WHO [3], and in the last ECDC Rapid Risk Assessment [4].

---

[1] As well as Union Civil Protection Mechanism (UCPM) Participating States for activities taking place under the framework of the UCPM.
[2] Ibid.

Equipment to be procured

The COVID-19-related medical equipment can be broadly described into three categories of equipment (covered in this version), plus therapeutics and vaccines (not covered in this version)[3]:

1) Personal Protective Equipment (PPE) to protect healthcare workers from contact, droplet and airborne transmission of SARS-CoV-2 from infected people.
2) Laboratory equipment to test and diagnose suspected COVID-19 cases.
3) Intensive Care Unit (ICU) equipment to treat critical cases of COVID-19.
4) Therapeutics to treat critical cases of COVID-19 (not covered in this version).
5) Vaccines to offer immunisation against COVID-19 (not covered in this version).

The specific items to be procured and distributed are further described by type and subtype. Table 1 describes these item types grouped by category. The full set of item subtypes are listed in Appendix 1. This list is not exclusive and additional items can be incorporated, should the need arise.

Category	**Type**
PPE	Respiratory protection
PPE	Eye protection
PPE	Body protection
PPE	Hand protection
Laboratory	Sample collection
Laboratory	Sample transport
Laboratory	Testing kits
Laboratory	Reagents for diagnosis
Laboratory	Laboratory machinery
Laboratory	Other items
ICU	Ventilators
ICU	Other items
Therapeutics	*To be determined in later versions*
Vaccine	*To be determined in later versions*

Table 1: Non-exclusive list of item types to be procured and distributed across Member States.

[3] This list is non-exhaustive. For rescEU, see for example the Commission Implementing Decision (EU) 2020/414 of 19 March 2020 amending Implementing Decision (EU) 2019/570 as regards medical stockpiling rescEU capacities (notified under document C(2020) 1827). For joint procurement, this considers medical countermeasures for serious cross-border threats to health (Decision 1082/2013/EU).

[4] Note that this assumption would not be appropriate in the absence of transmission-reducing interventions, but can be justified where interventions have been implemented. A 3-day time period is used to offset any potential impact of incomplete or 'noisy' daily cumulative confirmed case data.

Guidance to Member States for reporting resource needs and deficits

The following formulae are recommended for Member States to estimate 7-day national-level resource *needs* for PPE sets (n_{PPE}), laboratory equipment (n_{LAB}), and ICU equipment (n_{ICU}). The concept is that short-term future needs are estimated using current and recent estimates of cumulative confirmed cases. Inherent in these formulae is an assumption that there is a 10-day linear relationship between the cumulative number of confirmed cases 3 days ago, the current number of confirmed cases, and the number of confirmed cases 7 days into the future. The number of PPE sets required (3 per suspected case requiring testing, 14 per day per confirmed case that requires hospitalisation excluding cases requiring intensive care, and 15 per day per confirmed case requiring admission to intensive care) are informed by the lower bound of current ECDC recommendations [5], but are subject to change.

$$
\begin{aligned}
n_{PPE} &= 3N_T(7 + R_{7day}) + 14N_H(7 + R_{7day}) + 15N_I(7 + R_{7day}) \\
n_{LAB} &= N_T(7 + R_{7day}) \\
n_{ICU} &= N_I(1 + 7r)
\end{aligned}
$$

Where:

N_T is the 3-day average number of suspected COVID-19 cases that require testing on a daily basis. The last 3 days of data should be used. Note that this does not necessarily equate to the actual number of tests administered. In scenarios 1 and 2 (as defined by the ECDC [6]), testing of all suspected cases and contacts of confirmed cases is recommended. In scenarios 3 and 4, testing of all suspected cases is recommended.

N_H is the current number of COVID-19 cases that have been hospitalised – or require hospitalisation – excluding cases requiring intensive care. Note that this does not necessarily equate to the number of cases actually hospitalised.

N_I is the current number of COVID-19 cases that have been admitted - or require admission - to intensive care. Note that this does not necessarily equate to the number of cases actually admitted to intensive care.

r is the rate of change in the number of hospitalised cases of COVID-19 over the previous 3 days. r is calculated using the current number of hospitalised COVID-19 cases excluding cases requiring intensive care, N_H, and the number of hospitalised COVID-19 cases excluding cases requiring intensive care 3 days ago, N_{H-3}. The formula is as follows:

$$r = \frac{N_H - N_{H-3}}{3N_H}$$

R_{7day} represents the change in additional resources required for one-time consumables (PPE and laboratory equipment) over the next 7 days dependent on the rate of change, r. The formula is as follows:

$$R_{7day} = \frac{7(7+1)}{2}r$$

Some potential ambiguity may exist in the national-level estimates of N_T (daily suspected cases requiring testing), N_H (current confirmed cases requiring non-ICU hospitalisation) and

N_I (current confirmed cases requiring ICU hospitalisation). These parameters are not identifiable from routinely collected data. Where a country or sub-national region is beyond testing or hospital capacity, there may be a large divergence between the number of cases requiring testing or hospitalisation and those receiving it. Where necessary, ECDC is able to assess national-level estimates of N_T, N_H, and N_I against the output of a mathematical transmission model (described in detail in Appendix 2), which is calibrated to national confirmed case and mortality data. Should the need arise, the Commission and ECDC will request a brief description of the methodology applied by the Member State to ensure homogeneity and consistency.

The following formulae are recommended for Member States to estimate national-level resource *deficits* for PPE sets (d^i_{PPE}), testing equipment (d^i_{TEST}), and ICU equipment (d^i_{ICU}). These quantities should be defined for each piece of equipment defined in table 1. For example, separate quantities should be provided for deficit of hand protection (d^{hand}_{PPE}) and deficit of eye protection (d^{eye}_{PPE}). Note that in the case of sufficient resources for a particular item, the deficit for that item is defined to be zero and is never negative.

$$d^i_{PPE} = \max(0,\ \ n_{PPE} - a^i_{PPE})$$
$$d^i_{LAB} = \max(0,\ \ n_{LAB} - a^i_{LAB})$$
$$d^i_{ICU} = \max(0,\ \ n_{ICU} - a^i_{ICU})$$

Where a^i_{PPE}, a^i_{TEST}, a^i_{ICU} is the number of PPE items, testing items, and ICU items (as defined in Appendix 1) currently available at the national level plus additional surge capacity resources that are able to be produced or procured through national supply routes.

Working example

To illustrate this methodology, consider an example in which a country identifies that the number of hospitalised COVID-19 cases (excluding cases requiring intensive care) is currently 800, and was 740 cases 3 days ago. That is, $N_H = 800$ and $N_{H-3} = 740$.

Further, the country estimate that the current number of suspected COVID-19 cases that require testing today is 100, and the current number of COVID-19 cases that have been admitted (or require admission) to intensive care is 120. That is, $N_T = 100$ and $N_I = 120$.

The rate of change for equipment needs, r, and the 7-day coefficient for one-time consumables, R_{7day}, can then be calculate using the formulae above:

$$r = \frac{N_T - N_{T-3}}{3N_T} = \frac{800 - 740}{3 \times 800} = 0.025$$

$$R_{7day} = \frac{7(7+1)}{2} r = \frac{7 \times 8}{2} \times 0.025 = 0.7$$

The 7-day national-level resource *needs* for PPE sets (n_{PPE}) can then be calculated:

$$\begin{aligned} n_{PPE} &= 3N_T(7 + R_{7day}) + 14N_H(7 + R_{7day}) + 15N_I(7 + R_{7day}) \\ &= 3 \times 100 \times (7 + 0.7) + 14 \times 800 \times (7 + 0.7) + 15 \times 120 \times (7 + 0.7) \\ &= 2{,}310 + 86{,}240 + 13{,}860 \\ &= 102{,}410 \end{aligned}$$

Where 2,310 sets of PPE are needed for performing diagnostic tests, 86,240 sets of PPE are needed for the care of confirmed cases outside of intensive care, and 13,860 sets of PPE are needed for the care of confirmed cases in intensive care.

The 7-day national-level resource *needs* for testing equipment (n_{TEST}), and ICU equipment (n_{ICU}) can also be calculated:

$$n_{LAB} = N_T(7 + R_{7day}) = 100 \times (7 + 0.7) = 770$$
$$n_{ICU} = N_I(1 + 7r) = 120 \times (1 + 7 \times 0.025) = 141$$

The country further report that the following availability of items at the national level, including additional surge capacity resources that are able to be produced or procured through national supply routes:

Equipment type	Item	Availability
PPE	Respiratory protection	80,000
PPE	Hand protection	140,000
PPE	Eye protection, body protection	*Sufficient*
Laboratory	All items	*Sufficient*
ICU	Ventilators	130

The national-level resource *deficits* for these items can then be calculated using the above formulae:

$$d_{PPE}^{\text{mask}} = \max(0, n_{PPE} - a_{PPE}^{\text{mask}}) = \max(0,\ \ 102{,}410 - 80{,}000) = 22{,}410$$
$$d_{PPE}^{\text{hand}} = \max(0, n_{PPE} - a_{PPE}^{\text{hand}}) = \max(0,\ \ 102{,}410 - 140{,}000) = 0$$
$$d_{ICU}^{\text{ventilator}} = \max(0, n_{ICU} - a_{ICU}^{\text{ventilator}}) = \max(0,\ \ 141 - 130) = 11$$

Guidance for allocating resources according to national-level deficits

The ECDC recommends that available items be distributed to Member States reporting deficits for the particular item in a manner proportional to the national deficit of that item. That is, the number of an item available to allocate multiplied by the fraction of national deficit and total deficit of that item. As a formula:

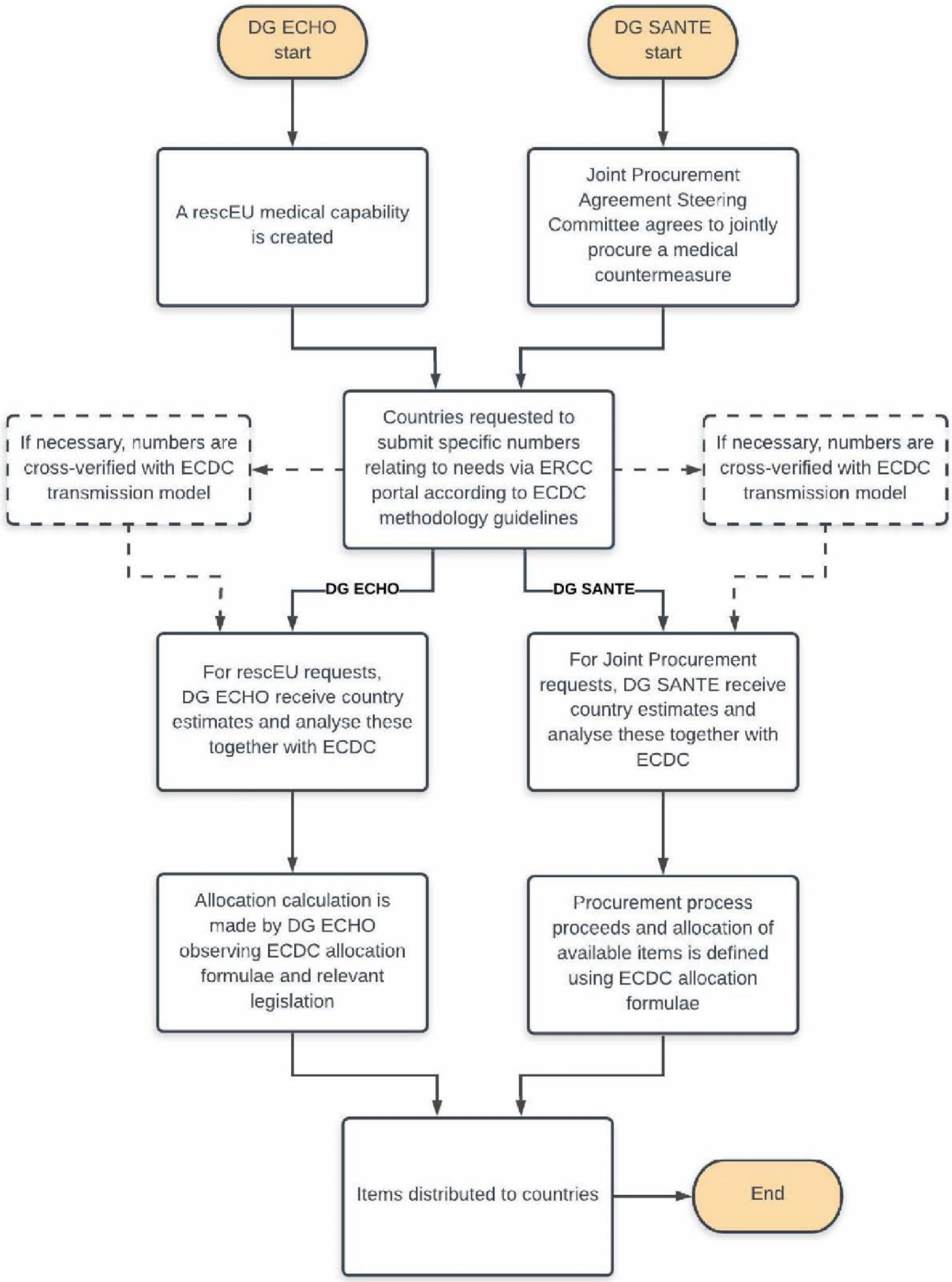
$$\text{national allocation} = \text{available} \times \frac{\text{national deficit}}{\text{total deficit}}$$

To illustrate this methodology, consider an example in which 100 ventilators are available for distribution across 3 countries with a national deficit of ventilators.

Country	National *need* of ventilators	National *deficit* of ventilators	Recommended number of ventilators to distribute	Remaining gap
Country A	80	40	100 * (40 / 160) = 25	15
Country B	100	40	100 * (40 / 160) = 25	15
Country C	200	80	100 * (80 / 160) = 50	30
Total	**380**	**160**	**100**	**60**

Step-by-step illustration

The following flow chart illustrates the various steps of this allocation methodology process.



References

1. *World Health Organization (WHO). Coronavirus disease 2019 (COVID-19).* 2020 [cited 2020 24 March]; Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200219-sitrep-30-covid-19.pdf?sfvrsn=6e50645_2.
2. *European Centre for Disease Prevention and Control (ECDC). COVID-19.* 2020 [cited 2020 March 24]; Available from: https://www.ecdc.europa.eu/en/novel-coronavirus-china.
3. *World Health Organization (WHO). Coronavirus disease (COVID-19) pandemic.* 2020 [cited 2020 March 24]; Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019.
4. *Eurosurveillance Editorial Team. Coronavirus disease 2019 (COVID-19) pandemic: increased transmission in the EU/EEA and the UK – seventh update.* Eurosurveillance, 2020. **25**(9).
5. *European Centre for Disease Prevention and Control (ECDC). Personal protective equipment (PPE) needs in healthcare settings for the care of patients with suspected or confirmed novel coronavirus (2019-nCoV).* 2020 [cited 2020 March 24]; Available from: https://www.ecdc.europa.eu/sites/default/files/documents/novel-coronavirus-personal-protective-equipment-needs-healthcare-settings.pdf.
6. Johnson, H.C., et al., *Potential scenarios for the progression of a COVID-19 epidemic in the European Union and the European Economic Area, March 2020.* Euro Surveill, 2020. **25**(9): p. 2000202.