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High heterogeneity on the accepted vaccines for COVID-19 certificates in European countries

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ABSTRACT

Background: We aimed to elucidate which vaccines were accepted by European countries as valid proof of vaccination against COVID-19 for international travelers.

Method: On 27-September-2021 a cross-sectional study was conducted on VisaGuide.World, that reports on valid vaccines for international travelers. Other databases, lay press and regulatory agencies were also checked. The main outcome measure was which of the vaccines included on the WHO emergency use listing (EUL) [ChAdOx1 (Vaxzevria, Covishield),BNT162b2,mRNA-1273,Ad26.Cov2.S,BBIBP-CorV,CoronaVac] and Sputnik V, were accepted in each country. The influence of the vaccines approved for COVID-19 vaccination programs on the vaccines recognized as proof of vaccination was assessed.

Results: There was a remarkable heterogeneity on the vaccines accepted as proof of vaccination among 46 countries. Russia accepted only one. Cyprus, Greece and Slovenia accepted all vaccines considered. Eleven countries accepted the seven WHO EUL vaccines: eight EU countries, plus Iceland, Norway and Switzerland. Seven EU countries accepted only the four EMA-authorized vaccines. Considering Covishield as equivalent to Vaxzevria, 69% of countries recognized only vaccinated travelers who received any of the vaccines approved for vaccination programs in the country of arrival as valid.

Conclusion: Vaccines accepted as proof of vaccination should be harmonized. Accepting any of the WHO EUL vaccines would be a scientifically sound objective.

1. Introduction

European countries authorized the use of medicinal products based on quality, safety, and efficacy data. These are reviewed and authorized by the regulatory agencies — European Medicines Agency (EMA) for the EU 27 member states and national regulatory agencies for other European countries. In Spring 2021, many countries started to consider the use of a COVID passport or certificate to allow those fully vaccinated to move unhindered within a country and between countries. Such proof of vaccination should also help to return to normal life in areas like work, business, education, and social events. An increasing number of countries are already requiring COVID certificates to access to cultural, leisure venues and even public transportation. Although COVID certificates are not exempt from practical and ethical problems [1], they have come to stay for some time.

Focusing on international travel —tourism is the third largest export sector of the global economy [2]— a significant step forward was taken in Europe when the EU Digital COVID certificate entered into application on July 1, 2021 [3], of which more than 420 million individual certificates had been issued 2.5 months later [4]. These certificates are issued to fully vaccinated travelers but may also indicate individuals recovered from COVID-19 within the preceding six months or those with a negative SARS-CoV-2 test result. The objective of this EU initiative was to facilitate travel within Europe and to avoid repeated testing or quarantine for those fully vaccinated with an EU-authorized COVID-19 vaccine at least 14 days before the travel date. Member states were
allowed to expand the list of accepted COVID-19 vaccines beyond those authorized by the EMA to those included in the World Health Organization (WHO) emergency use listing (EUL) [3]. The EU digital COVID certificate is now accepted by the 27 member states and 16 more countries or territories; likewise, COVID certificates issued in these latter are accepted by all EU member states under the same conditions as the EU Digital COVID certificate [3]. But this good news very much depends on which vaccine a traveler must have received to enter a third country without restrictions or with minimal restrictions.

This study aimed to know which vaccines are accepted by each European country as valid proof of vaccination against COVID-19 for travelers arriving at their destination. The greater the homogeneity of the accepted vaccines, the greater the ease to travel between European countries. This, however, does not exclude that each country (or transport agencies such as airlines) may, in certain circumstances, require additional requirements (e.g., take a COVID-19 test within 48 h after arrival and provide a completed passenger locator form) depending on the country of origin. As a likely factor influencing the vaccines recognized as valid proof of COVID-19 vaccination by each country, the COVID-19 vaccines approved and administered in national vaccinations programs should be considered.

2. Material and methods

This is a cross-sectional study conducted on VisaGuide.World, a free and accessible database, on September 27, 2021. VisaGuide.World data was generated independently, as it is not affiliated with any government or official agency and is regularly updated [5]. VisaGuide.World data was checked to capture all information regarding which COVID-19 vaccines were accepted by each European country as valid proof of vaccination against COVID-19 [5]. In addition, all the information published in Schengenvisainfo.com News from 1 May to September 27, 2021, was checked to confirm the information captured from VisaGuide.World. Schengenvisainfo.com provides relevant visa information (e.g., visa types, validity, insurance, fees) of both the 26 Schengen countries and other European countries. Finally, news and information published on this topic between 1 May and 27 September were searched on the internet and on the websites of the EMA and regulatory agencies of European countries. Any updated data that could modify the information retrieved from VisaGuide.World was registered.

The analysis included the 27 EU member states as well as those 16 countries that have recognized the EU digital COVID certificate (which include three non-European countries, Israel, Morocco, and Panama) and all other European countries. The study was restricted to those countries with at least one million international arrivals in 2018, according to the statistics published by the United Nations World Tourism Organization [6]. The countries included in this study accounted for >99% of all international arrivals in Europe.

The number of COVID-19 vaccines approved worldwide varied from 17 [5,7] to 22 [8] depending on the vaccine tracker checked. Many of them—between 3 and 10—were available only in one or two countries. We focused the analysis on 7 vaccines (ChAdOx1, BNT162b2 (Comirnaty), mRNA-1273 (Spikevax), Ad26.Cov2S, Gam-COVID.Vac (Sputnik V), and two inactivated vaccines from Sinopharm (BBIBP-CoV2) and Sinovac (CoronaVac)) that were being distributed in more than 20 countries around the world as of September 27, 2021 [5,7,8]. However, the WHO EUL includes two ChAdOx1 vaccines, one manufactured in Europe by AstraZeneca (Vaxzevria) and the other by Serum Institute of India (Covishield). The VisaGuide.World [5] provided distinct information on both as different vaccines: the same approach was respected in the study since it provided very relevant insights on the topic assessed.

The COVID-19 vaccines approved by each country and the percentage of the population that had been partially or fully vaccinated were retrieved from the COVID-19 vaccine tracker [8] and Oxford’s Our World in Data [9], respectively. We reported the percentage of the population that has been vaccinated in each country as an important contextual factor, but we did not take virus variants into consideration since SARS-CoV-2 Delta variant is close to be 100% prevalent across Europe [10].

3. Results

Forty-six countries were included in the study: 27 EU member states, 10 countries and territories that accepted the EU digital COVID certificate, and 9 more European countries. There were three (Israel, Morocco, and Panama) non-European countries included. Seven European countries and territories were excluded as they did not reach 1 million international arrivals in 2018 (Table 1).

Table 1 shows that there are great differences between countries on the vaccines recognized as proof of vaccination against COVID-19. Russia only accepted Sputnik V as valid evidence of correct vaccination, whereas four countries (Belarus, Bosnia & Herzegovina, Israel, and Montenegro), only accepted two vaccines. Conversely, Cyprus, Greece, and Slovenia accepted all eight COVID-19 vaccines considered in the analysis, whereas nine countries recognized seven (all excluded Sputnik V, except Hungary that excluded CoronaVac). Eleven countries accepted all WHO EUL vaccines – within the EU, plus Iceland, Norway, and Switzerland. Conversely, seven EU member states only accepted the four EU-approved vaccines. Six EU countries (Croatia, Cyprus, Greece, Hungary, Slovenia, and Slovakia) recognized a full vaccination course with Sputnik V as valid proof of vaccination against COVID-19. Sputnik V was also accepted by 10 of the 19 non-EU countries included in this study.

Seven European countries accepted vaccination with heterologous COVID-19 vaccine doses [17,18]: Denmark, Germany, Italy, France, Spain, Norway, and the UK. Of note, France started on September 23, 2021 to accept as valid proof of vaccination full courses with any of the two Chinese COVID-19 vaccines (BBIBP-CoV2, CoronaVac), provided that travelers have received one additional dose of an mRNA-based vaccine (Comirnaty or Spikevax) at least 7 days before arrival [11]. Norway accepts the administration of BBIBP-CoV2, CoronaVac or Covishield as a valid booster dose [15]. Finally, Comirnaty and Vaxzevria were recognized as valid proof of vaccination against COVID-19 by almost nine of 10 countries; conversely, Sputnik V was accepted only by over one third of them (Table 1).

Table 2 shows the vaccines approved for national vaccination programs (see Supplementary material-A for individual country data) and those accepted as valid proof of COVID-19 vaccination for travelers arriving to each country, ordered according to the percentage of the population fully and partially vaccinated. Of the 45 countries assessed (Andorra was excluded due to lack of data), 21 (47%) accepted as valid only vaccinated travelers who received any of the vaccines approved for vaccination programs in the country of arrival. This is the case of seven EU member states and 14 of non-EU countries—all but Iceland, Morocco, Norway, and Switzerland. In addition, 19 EU countries accepted travelers arriving vaccinated with Covishield, although this ChAdOx1 vaccine version was only approved for vaccination programs in Hungary. Norway and Switzerland, that have not approved Vaxzevria for national vaccination programs, accepted the seven WHO EUL vaccines as proof of valid vaccination for travelers. Russia has approved only one vaccine (Sputnik V) for vaccinating their citizens, the same that is accepted for travelers arriving to this country.

Within the EU, Cyprus, Greece, Slovenia, and Slovakia recognized Sputnik V as valid proof of vaccination, although this vaccine was not approved in these countries. Croatia and Hungary approved Sputnik V for national vaccination programs and accepted travelers arriving fully vaccinated with this vaccine. Most non-EU Eastern European countries accepted only those vaccines that have been approved for national vaccination campaigns as valid proof of vaccination against COVID-19; Sputnik V was approved and accepted by all of them except Bosnia & Herzegovina, Georgia, and Ukraine.
Table 1 - Accepted vaccines (after full vaccination course) as valid proof of vaccination against COVID-19 for travelers arriving in any of the 27 EU member states and other countries and territories recognizing the EU Digital COVID certificate [3] and other 9 European countries. Among non-EU countries only those having more than 1 million international arrivals in 2018 are considered [7]. Eight most worldwide distributed COVID-19 authorized vaccines. Data as of September 27, 2021 from Visaguide.World [6], unless otherwise stated.

| Country of destination (Millions of arrivals) | WHO-authorized vaccines | EMA-authorized vaccines | No. of accepted vaccines |
|-----------------------------------------------|-------------------------|-------------------------|--------------------------|
|                                               | ChAdOx1, Vaxzevria, AstraZeneca (N = 145) | ChAdOx1, Covishield, Serum Institute of India (N = 62) |                        |
|                                               | BNT162b2, Comirnaty, Pfizer/BioNTech (N = 125) | Inactivated, BBIBP-CorV, Sinopharm (N = 73) |                        |
|                                               | mRNA-1273, Spikevax, Moderna (N = 87) | Inactivated, CoronaVac, SinoVac (N = 49) |                        |
|                                               | Ad26. CoV2.S, Janssen | Gam-COVID. Vac, Sputnik V, Gamaleya (N = 74) |                        |

### EU member states

| Country                  | WHO-authorized vaccines | EMA-authorized vaccines | No. of accepted vaccines |
|--------------------------|-------------------------|-------------------------|--------------------------|
| Austria (31)             | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 7                        |
| Belgium (9)              | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 5                        |
| Bulgaria (9)             | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 5                        |
| Croatia (17)             | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 6                        |
| Cyprus (4)               | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | 8                        |
| Czech Republic (14)      | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | No                       | No                       | Yes                      | 4                        |
| Denmark (12)             | Yes                     | Yes                     | Yes                      | No                       | No                       | No                       | No                       | No                       | 4                        |
| Estonia (3)              | Yes                     | Yes                     | Yes                      | Yes                      | No                       | No                       | No                       | No                       | 5                        |
| Finland (3)              | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 7                        |
| France (89)              | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | No                       | No                       | No                       | 5                        |
| Germany (39)             | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 5                        |
| Greece (30)              | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | 8                        |
| Hungary (17)             | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 7                        |
| Ireland (10)             | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 5                        |
| Italy (62)               | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 5                        |
| Latvia (2)               | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | No                       | No                       | No                       | 5                        |
| Lithuania (3)            | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 4                        |
| Luxembourg (1)           | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | No                       | No                       | No                       | 4                        |
| Malta (3)                | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | No                       | No                       | No                       | 4                        |
| Netherlands (18)         | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 7                        |
| Poland (20)              | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 4                        |
| Portugal (23)            | Yes                     | Yes                     | Yes                      | No                       | No                       | No                       | No                       | No                       | 4                        |
| Romania (3)              | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 5                        |
| Slovakia (5)             | Yes                     | Yes                     | Yes                      | No                       | No                       | No                       | No                       | No                       | 5                        |
| Slovenia (4)             | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 4                        |
| Spain (83)               | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | 7                        |
| Sweden (7)               | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | No                       | 7                        |

### Other European countries

| Country                  | WHO-authorized vaccines | EMA-authorized vaccines | No. of accepted vaccines |
|--------------------------|-------------------------|-------------------------|--------------------------|
| Albania (5)              | Yes                     | No                      | No                       | No                       | No                       | No                       | Yes                      | Yes                      | 4                        |
| Andorra (3)              | Yes                     | Yes                     | No                       | No                       | No                       | No                       | No                       | Yes                      | 4                        |
| Iceland (2)              | Yes                     | Yes                     | Yes                      | No                       | No                       | Yes                      | Yes                      | No                       | 7                        |
| Israel (4)               | No                      | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | No                       | No                       | 2                        |
| Morocco (12)             | Yes                     | Yes                     | No                       | Yes                      | Yes                      | Yes                      | No                       | Yes                      | 5                        |
| Norway (6)               | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | 7                        |
| Panama (2)               | Yes                     | Yes                     | No                       | No                       | No                       | Yes                      | Yes                      | Yes                      | 4                        |
| Switzerland (9)          | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | 7                        |
| Turkey (46)              | No                      | Yes                     | No                       | No                       | No                       | Yes                      | Yes                      | Yes                      | 3                        |
| Ukraine (14)             | No                      | Yes                     | No                       | Yes                      | Yes                      | No                       | Yes                      | No                       | 4                        |
| Armenia (2)              | Yes                     | No                      | No                       | No                       | No                       | No                       | Yes                      | Yes                      | 3                        |
| Azerbaijan (3)           | Yes                     | Yes                     | No                       | No                       | No                       | No                       | Yes                      | Yes                      | 4                        |
| Belarus (2)              | No                      | No                     | No                       | No                       | No                       | Yes                      | Yes                      | Yes                      | 2                        |
| Bosnia & Herzegovina (1) | Yes                     | No                      | No                       | No                       | Yes                      | Yes                      | No                       | No                       | 2                        |
| Georgia (5)              | Yes                     | Yes                     | No                       | No                       | No                       | No                       | Yes                      | Yes                      | 4                        |
| Montenegro (2)           | No                      | No                      | No                       | No                       | No                       | Yes                      | No                       | Yes                      | 2                        |
| Russia (24)              | No                      | No                      | No                       | No                       | No                       | No                       | Yes                      | Yes                      | 1                        |
| Serbia (2)               | Yes                     | Yes                     | No                       | Yes                      | Yes                      | Yes                      | Yes                      | Yes                      | 5                        |
| UK (37)                  | Yes                     | Yes                     | Yes                      | Yes                      | Yes                      | No                       | No                       | No                       | 5                        |
| No. (%) of countries accepting this vaccine | 40 (87) | 41 (89) | 34 (74) | 32 (70) | 25 (54) | 18 (39) | 20 (43) | 16 (35) |

EMA: European Medicines Agency. EU: European Union. N: Number of countries where the vaccine is authorized. WHO: World Health Organization.

- Vaccines included in the WHO’s emerging use listing.
- Conditional marketing authorization granted by the EMA.
- Number of countries that have approved this vaccine for use [5].
- This vaccine is accepted only after 7 days of receiving a third dose of a Pfizer/BioNTech or Moderna vaccine [11].
- Countries and territories with <1 million international arrivals: Faroe Islands, Liechtenstein, Monaco, North Macedonia, San Marino, and The Vatican.
- Countries with <1 million international arrivals: Rep Moldova.
4. Discussion

To the best of our knowledge, this is the first analysis assessing the vaccines accepted in all European countries as valid proof of vaccination against COVID-19. The study showed two major findings: a marked heterogeneity in the list of accepted vaccines in the different countries; and a remarkable tendency to recognize as valid proof of vaccination any vaccine that was approved for the national vaccination programs.

The first finding hampers the main objectives of the COVID-19 vaccine certificates, i.e., exempting vaccinated individuals from free movement restrictions and to resume safe travel [3]. There is a significant variability in the acceptance of vaccines as proof of vaccination against COVID-19 for arriving travelers even among EU member states, where most (19 of 27) did not accept several vaccines listed on the WHO EUL. Furthermore, full vaccination course with ChAdOx1 Covishield was not accepted as valid proof of COVID-19 vaccination for travelers by EU Member states

### Table 2

Vaccines approved for administration on COVID-19 national programs and vaccines accepted as valid proof of COVID-19 vaccination in the countries included in the study sorted by population vaccinated.

| Country               | Vaccines approved for national COVID-19 program, N | Vaccines accepted for travelers arriving, N | Population partially/fully vaccinated, % |
|-----------------------|---------------------------------------------------|---------------------------------------------|-----------------------------------------|
|                       | EMA-authorized vaccines (N = 4) | WHO-authorized vaccines (N = 7) | Gam-COVID. Vac, Sputnik V | EMA-authorized vaccines (N = 4) | WHO-authorized vaccines (N = 7) | Gam-COVID. Vac, Sputnik V |
| EU Member states      |                                                   |                                             |                                         |                                                   |                                             |                                         |
| Portugal              | 4                                                  | 4                                           | No                                       | 4                                                  | 4                                           | No                                       | 88/85                                    |
| Malta                 | 4                                                  | 4                                           | No                                       | 4                                                  | 4                                           | No                                       | 82/82                                    |
| Spain                 | 4                                                  | 4                                           | No                                       | 4                                                  | 4                                           | No                                       | 80/78                                    |
| Denmark               | 3 [18]                                             | 3                                           | No                                       | 4                                                  | 4                                           | No                                       | 77/75                                    |
| Ireland               | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 76/74                                    |
| Belgium               | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 74/72                                    |
| France                | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 74/65                                    |
| Finland               | 4                                                  | 4                                           | No                                       | 4                                                  | 7                                           | No                                       | 74/61                                    |
| Italy                 | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 74/68                                    |
| Netherlands           | 4                                                  | 4                                           | No                                       | 4                                                  | 7                                           | No                                       | 71/64                                    |
| Sweden                | 4                                                  | 4                                           | No                                       | 4                                                  | 7                                           | No                                       | 70/64                                    |
| Germany               | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 67/64                                    |
| Cyprus                | 4                                                  | 4                                           | No                                       | 4                                                  | 7                                           | Yes                                      | 67/62                                    |
| Luxembourg            | 4                                                  | 4                                           | No                                       | 4                                                  | 4                                           | No                                       | 65/60                                    |
| Lithuania             | 4                                                  | 4                                           | No                                       | 4                                                  | 4                                           | No                                       | 64/60                                    |
| Austria               | 4                                                  | 4                                           | No                                       | 4                                                  | 7                                           | No                                       | 64/60                                    |
| Greece                | 4                                                  | 4                                           | No                                       | 4                                                  | 7                                           | Yes                                      | 62/59                                    |
| Hungary               | 4                                                  | 6                                           | Yes                                      | 4                                                  | 6                                           | Yes                                      | 61/59                                    |
| Czech Republic        | 4                                                  | 4                                           | No                                       | 4                                                  | 4                                           | No                                       | 57/55                                    |
| Estonia               | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 57/46                                    |
| Slovenia              | 4                                                  | 4                                           | No                                       | 4                                                  | 7                                           | Yes                                      | 54/48                                    |
| Poland                | 4                                                  | 4                                           | No                                       | 4                                                  | 4                                           | No                                       | 52/51                                    |
| Latvia                | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 49/45                                    |
| Slovakia              | 4                                                  | 4                                           | No [19]                                  | 4                                                  | 4                                           | Yes                                      | 45/41                                    |
| Croatia               | 4                                                  | 4                                           | Yes                                      | 4                                                  | 5                                           | Yes                                      | 44/42                                    |
| Romania               | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 29/28                                    |
| Bulgaria              | 4                                                  | 4                                           | No                                       | 4                                                  | 5                                           | No                                       | 16/16                                    |

Non-EU countries with mutual recognition of COVID certificates with that of the EU

| Iceland               | 4                                                  | 4                                           | No                                       | 4                                                  | 7                                           | No                                       | 82/80                                    |
| Norway                | 3 [20]                                             | 3                                           | No                                       | 4                                                  | 7                                           | No                                       | 76/66                                    |
| Israel                | 2                                                  | 2                                           | No                                       | 2                                                  | 2                                           | No                                       | 69/64                                    |
| Panama                | 2                                                  | 3                                           | Yes                                      | 2                                                  | 3                                           | Yes                                      | 67/51                                    |
| Switzerland           | 3                                                  | 3                                           | No                                       | 4                                                  | 7                                           | No                                       | 63/57                                    |
| Turkey                | 1                                                  | 2                                           | Yes                                      | 1                                                  | 2                                           | Yes                                      | 63/52                                    |
| Morocco               | 1                                                  | 4                                           | Yes                                      | 2                                                  | 4                                           | Yes                                      | 58/49                                    |
| Albania               | 2                                                  | 3                                           | Yes                                      | 2                                                  | 3                                           | No                                       | 32/27                                    |
| Ukraine               | 4                                                  | 4                                           | No                                       | 2                                                  | 4                                           | No                                       | 16/13                                    |

Other European countries

| UK                    | 4                                                  | 5 [21]                                     | No                                       | 4                                                  | 5                                           | No                                       | 71/66                                    |
| Azerbaijan            | 2                                                  | 3                                           | Yes                                      | 2                                                  | 3                                           | Yes                                      | 46/36                                    |
| Serbia                | 2                                                  | 3                                           | Yes                                      | 2                                                  | 3                                           | Yes                                      | 44/33                                    |
| Montenegro            | 0                                                  | 1                                           | Yes                                      | 0                                                  | 1                                           | Yes                                      | 38/23                                    |
| Russia                | 0                                                  | 0                                           | Yes                                      | 0                                                  | 0                                           | Yes                                      | 33/29                                    |
| Georgia               | 2                                                  | 4                                           | No                                       | 2                                                  | 4                                           | No                                       | 24/20                                    |
| Belarus               | 0                                                  | 1                                           | Yes                                      | 0                                                  | 1                                           | Yes                                      | 20/16                                    |
| Bosnia & Herzegovina  | 2                                                  | 2                                           | No                                       | 2                                                  | 2                                           | No                                       | 19/13                                    |
| Armenia               | 2                                                  | 2                                           | Yes                                      | 2                                                  | 2                                           | Yes                                      | 9/5                                      |

EMA: European Medicines Agency. EU: European Union. N: number of vaccines. WHO: World Health Organization.

a Data from Covid-19 vaccine tracker [6].

b Data from VisaGuide.World [5].

c Data from Oxford’s Our World in data [9].

d Hungary has approved Ad5-nCoV (CanSinoBio, China).

e Andorra is not included since there were no data available on which vaccines have been approved for administration in the national vaccination program.

f Russia was also administering three other nationally developed vaccines: Sputnik Light, KoviVac and EpiVac Corona.

g Belarus has approved Sputnik Light.

h Armenia has approved Sputnik Light.


eight EU countries, while all of them accepted ChAdOx1 Vaxzevria, despite the fact that basically both are the same vaccine and thus raises doubts about the scientific rationale of this decision. Several of the observational studies that have shown the effectiveness of the ChAdOx1 vaccine in the real-world, had to include many individuals who received Covishield, as about five million doses of this vaccine were administered in the UK [23]. Furthermore, Covishield has shown its effectiveness in observational studies conducted in India [24,25].

The second finding was that 47% of the countries assessed accepted the same vaccines approved for their vaccination campaigns as proof of vaccination against COVID-19 for arriving travelers. Covishield, the ‘twin’ of Vaxzevria, has been temporarily authorized by the regulatory agencies of Canada [26] and the UK [22], and is considered to have the same clinical efficacy as Vaxzevria by the Australian regulatory agency [27], however has not yet been temporarily authorized in the EU, because a formal marketing authorization application has never been submitted by Serum Institute of India. Considering Vaxzevria and Covishield as ‘equivalent and interchangeable’ as the WHO does [28], then 69% countries -31 of all considered in this study (Fig. 1) were accepting travelers vaccinated with the same vaccines approved for their vaccination programs. Accepted vaccines for COVID certificates should be based on scientific evidence and taking into consideration both the assessments of national regulators and health authorities and those of international organizations like the WHO. We argue that a vaccine that has been included in the WHO EUL should be sufficient to guarantee that the vaccine is efficacious and safe, to a degree that should be acceptable as proof of vaccination against COVID-19 for arriving travelers in any country. This, however, is far from being the case for health authorities in many countries, despite the increasing number of observational studies published confirming the effectiveness on preventing COVID-19 severe cases, hospital admissions and deaths due to the SARS-CoV-2 Delta variant of the WHO EUL vaccines in several countries and settings [24,25,29-37].

Two highly restrictive countries must be mentioned: Russia and Israel. Russia had only one vaccine (Sputnik V) approved and accepted for international travelers. Israel had only approved and accepted as valid proof the two mRNA vaccines (Comirnaty, Spikevax). Conversely, the most permissive were Norway and Switzerland that approved only three vaccines for their vaccination programs but accepted the seven WHO EUL vaccines as proof of vaccination against COVID-19 for arriving travelers. We believe that the 11 western European countries that accepted travelers vaccinated with the seven WHO EUL vaccines have made an evidence-based decision.

This analysis has three main limitations. Firstly, it is possible that some of the information of VisaGuide.World was incorrect or not updated. However, VisaGuide.World is repeatedly mentioned in Schengenvisainfo.com News as a reliable source of which vaccines are authorized for entering a given country. The data that could be checked with other sources showed that VisaGuide.World was almost always correct. Secondly, unfortunately the information of each country required to complete the analysis (i.e., that of the approved vaccines, the authorized vaccines as proof of COVID-19 vaccination for travelers, and the percentage of the population that was vaccinated) had to be taken from three different sources, since there is no one providing all this information. The information on the number of countries that have approved for vaccination programs each of the vaccines considered in this study showed differences between the various databases, which demonstrates the difficulty of gathering reliable information on this subject. For instance, the number of countries that have approved Comirnaty and CoronaVac varied from 100 to 136 and from 40 to 49, respectively, in the three COVID vaccination trackers [5,7,8]. However, the information regarding each individual country included in this analysis was consistent across the two databases providing this information [5,8] (Supplementary material-B). Finally, the scope of the analysis was limited to Europe and to late September 2021: results could change dramatically since Europe is in a rapidly evolving situation. For instance, we did not assess the impact on covid policies due to the introduction of vaccine boosters. In addition, the results cannot be extrapolated to countries of other continents, although it would be reasonable to expect that such a study will provide similar or even more heterogeneous results regarding which vaccines are accepted as proof of vaccination against COVID-19 for arriving travelers.

The sanitary measures affecting international travelers arriving to any European country depend on the COVID-19 pandemic situation of the country of origin and the vaccination status of the traveler. Any country, at any given moment, can impose mandatory travel restrictions such as negative PCR or antigen test, quarantining for up to two weeks or even ban the entry from given countries. To fully exploit the potential of COVID certificates, the vaccines accepted as proof of vaccination against COVID-19 of travelers by European countries should be harmonized.

We argue that to solve this issue, the first step should be that the 27 EU member states must agree on which vaccines should be accepted as valid proof of vaccination of any traveler arriving to any of these countries. Accepting as valid any full vaccination course as recommended with any of the vaccines included in the WHO EUL would be a reasonable, scientifically sound objective. This could mean that with certain vaccines (e.g., the two inactivated Chinese vaccines) an extended primary series of two doses plus one booster dose will be needed for older individuals (≥60-year-olds), or an additional dose for any of the seven WHO EUL vaccines for moderately and severely immunocompromised patients [38]. This approach could help hundreds of millions of international travelers across Europe (and the world) to travel with no or little restrictions. Countries in the top destinations list like China, Japan, Mexico, Russia, Thailand, Turkey, and the USA, must be persuaded—as has happened with the USA [29]—that having a common list of acceptable vaccines that have been thoroughly assessed and approved by the WHO, is a safe and evidence-based decision. This will have two positive consequences. First, it will encourage future novel vaccines to undergo WHO evaluation, as their inclusion in the EUL will ensure their acceptance in COVID certificates as a proof of valid vaccination against COVID-19 for international travelers. Second, it will be aligned with the WHO International Health Regulations regarding the provision of public health response to a disease that has spread internationally [40].
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CReditI authorship contribution statement
Rafael Dal-Re, Conceptualization, Investigation, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. Rita Banzi: Data curation, Formal analysis, Writing – review & editing. Sören L. Becker: Formal analysis, Writing – review & editing. Odile Launay: Formal analysis, Writing – review & editing. Androula Pavli: Formal analysis, Writing – review & editing.

Declaration of competing interest
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Appendix A. Supplementary data
Supplementary data to this article can be found online at https://doi.org/10.1016/j.tmaid.2022.102321.

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