

Table S1. Topic “Knowledge about vaccines”: test results pre- e post-course.

Questions n. 1-3	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
Vaccines:	Incorrect	52 (31.71)	10 (6.10)	95 (36.40)	7 (2.68)	6 (26.09)	-	0.430	0.124
• <i>Are biological preparations;</i>	Correct	112 (68.29)	154 (93.90)	166 (63.60)	254 (97.32)	17 (73.91)	23 (100)		
• <i>Are comparable in all respects to drugs;</i>	Missing	1 (0.60)	1 (0.60)	-	-	-	-		
• <i>Allow to treat people;</i>									
• All act only at the level of the individual vaccinated subject.									
Combined vaccines are:	Incorrect	25 (15.24)	3 (1.82)	23 (8.81)	2 (0.77)	1 (4.35)	-	0.069	0.525
• Produced using the recombinant DNA technique;	Correct	139 (84.76)	162 (98.18)	238 (91.19)	259 (99.23)	22 (95.65)	23 (100)		
• Different vaccines administered in the same vaccination session but in different anatomical sites;									
• <i>Are constituted by the merging of several antigens or different vaccines in a single preparation;</i>	Missing	1 (0.60)	-	-	-	-	-		
• Very effective but unfortunately they always result in an exponential increase in adverse events.									
Flu vaccines actually available in Italy are:	Incorrect	81 (49.39)	18 (10.98)	80 (30.65)	5 (1.92)	2 (8.70)	-	0.000	0.000
• <i>Split virus. Sub-units and live attenuated virus;</i>	Correct	83 (50.61)	146 (89.02)	181 (69.35)	256 (98.08)	21 (91.30)	23 (100)		
• Whole inactivated virus;	Missing	1 (0.60)	1 (0.60)	-	-	-	-		
• Based on anatoxins;									
• Based on polysaccharides.									

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S2. Topic “COVID-19 vaccines”: test results pre- e post-course.

Questions n. 4-6	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
What was the first Sars-CoV-2 vaccine to be approved by EMA?	Incorrect	6 (3.66)	-	3 (1.15)	2 (0.77)	-	-	0.156	0.485
• Oxford-Astrazeneca;	Correct	158 (96.34)	165 (100)	258 (98.85)	259 (99.23)	23 (100)	23 (100)		
• Moderna;	Missing	1 (0.60)	-	-	-	-	-		
• <i>Pfizer-Biontech;</i>									
• Sanofi-GSK;									
• J&J (Johnson & Johnson).									
The Pfizer-Biontech vaccine differs from the Moderna vaccine in one of the following options:	Incorrect	66 (40)	13 (7.93)	64 (24.52)	8 (3.07)	1 (4.35)	-	0.000	0.038
• It does not need to be reconstituted with the physiological solution. unlike the Moderna vaccine which must be reconstituted;	Correct	99 (60)	151 (92.07)	197 (75.48)	253 (96.03)	22 (95.65)	23 (100)		
• It exploits the mechanism of messenger RNA (mRNA). unlike the Moderna which is made up of purified antigens;	Missing	-	1 (0.60)	-	-	-	-		
• <i>An interval of at least 21 days between the first and the second dose is required. unlike Moderna vaccine which requires at least 28 days;</i>									
• It cannot be administered to subjects over 55 years of age;									
• None of the above.									
How many doses of Pfizer-Biontech vaccine can be obtained from each vial. according to the latest AIFA legislation?	Incorrect	57 (34.76)	2 (1.21)	63 (24.14)	1 (0.38)	1 (4.35)	-	0.002	0.546
• 1 dose;	Correct	107 (65.24)	163 (98.79)	198 (75.86)	260 (99.62)	22 (95.65)	23 (100)		
• 3 doses;	Missing	1 (0.60)	-	-	-	-	-		
• 6 doses;									
• 5 doses;									
• 4 doses.									

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S3. Topic “Vaccine development”: test results pre- e post-course.

Questions n. 7-9	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
Development phases of drugs and vaccines in which safety is also assessed are:	Incorrect	66 (40)	13 (7.88)	81 (31.03)	9 (3.45)	4 (17.39)	-	0.039	0.064
• Phases 1 and 2;	Correct	99 (60)	152 (92.12)	180 (68.97)	252 (96.55)	19 (82.61)	23 (100)		
• Phases 2 and 3;	Missing	-	-	-	-	-	-		
• Phase 4;									
• <i>All of them.</i>									
The selection of adjuvants is performed:	Incorrect	77 (47.24)	30 (18.40)	133 (50.96)	28 (10.73)	9 (39.13)	3 (13.64)	0.473	0.082
• <i>In the preclinical phase;</i>	Correct	86 (52.76)	133 (81.60)	128 (49.04)	233 (89.27)	14 (60.87)	19 (86.36)		
• In phase 1-2;	Missing	2 (1.21)	2 (1.21)	-	-	-	1 (4.35)		
• In phase 3;									
• After vaccine authorisation.									
The first legislative rules on the development of vaccines date back to:	Incorrect	133 (81.60)	67 (41.10)	185 (70.88)	42 (16.09)	14 (63.64)	15 (68.18)	0.024	0.000
• 1950;	Correct	30 (18.40)	96 (58.90)	76 (29.12)	219 (83.91)	8 (36.36)	7 (31.82)		
• 1970;	Missing	2 (1.21)	2 (1.21)	-	-	1 (4.35)	1 (4.35)		
• 1902;									
• 1802.									

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S4. Topic “COVID-19 vaccine development”: test results pre- e post-course.

Questions n. 10-12	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
Which of these is one of the main ethical challenges in vaccination against SARS-Cov-2?	Incorrect	100 (61.73)	43 (26.38)	108 (41.38)	11 (4.21)	4 (17.39)	-	0.000	0.000
• Splitting of the doses;	Correct	62 (38.27)	120 (73.62)	153 (58.62)	250 (95.79)	19 (82.61)	23 (100)		
• Adverse effects;	Missing	3 (1.82)	2 (1.21)	-	-	-	-		
• mRNA technology;									
• <i>Social inequalities.</i>									
Which groups of subjects were excluded from pre-marketing testing of SARS-Cov-2 vaccines?	Incorrect	26 (15.85)	5 (3.05)	42 (16.19)	3 (1.15)	-	-	0.144	0.285
• <i>Pregnant and breastfeeding women;</i>	Correct	138 (84.15)	159 (96.95)	219 (83.91)	258 (98.85)	23 (100)	23 (100)		
• Developing countries;	Missing	1 (0.60)	1 (0.60)	-	-	-	-		
• Elderly people;									
• Obese patients.									
Authorisation of the Comirnaty vaccine has been granted:	Incorrect	129 (80.63)	131 (79.88)	206 (78.93)	37 (14.18)	16 (69.57)	6 (26.09)	0.474	0.000
• <i>Firstly from the MHRA in the UK;</i>	Correct	31 (19.38)	33 (20.12)	55 (21.07)	224 (85.82)	7 (30.43)	17 (73.91)		
• Simultaneously on a global level;	Missing	5 (3.05)	1 (0.60)	-	-	-	-		
• Firstly by the FDA in the USA;									
• First. the Chinese government.									

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S5. Topic “Quality Control (QC) and GMPs”: test results pre- e post-course.

Questions n. 13-15	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
How is the Quality Unit structured?	Incorrect	44 (26.83)	4 (2.42)	120 (45.98)	6 (2.30)	6 (26.09)	2 (8.70)	0.000	0.184
• <i>Quality Control + Quality Assurance;</i>	Correct	120 (73.17)	161 (97.58)	141 (54.02)	255 (97.70)	17 (73.91)	21 (91.30)		
• Quality Control + Pharmacovigilance;	Missing	1 (0.60)	-	-	-	-	-		
• Quality Assurance + Device Monitoring;									
• <i>None of the above.</i>									
GMP stands for:	Incorrect	116 (70.30)	108 (65.45)	147 (56.32)	44 (16.86)	11 (47.83)	9 (39.13)	0.006	0.000
• Standards of good manufacturing;	Correct	49 (29.70)	57 (43.55)	114 (43.68)	217 (83.14)	12 (52.17)	14 (60.87)		
• Good Manufacturing Practices;	Missing	-	-	-	-	-	-		
• Standards of good production practice;									
• <i>All the above.</i>									
The materials for the production of a vaccine:	Incorrect	11 (6.79)	3 (1.83)	15 (5.75)	4 (1.53)	-	1 (4.35)	0.428	0.619
• Include only the raw materials purchased;	Correct	151 (93.21)	161 (98.17)	246 (94.25)	257 (98.47)	23 (100)	22 (95.65)		
• <i>Are analysed upon arrival and stored at controlled temperature and humidity;</i>	Missing	3 (1.83)	1 (0.60)	-	-	-	-		
• Include only packaging materials;									
• Are not analysed upon arrival and are stored at controlled temperature and humidity.									

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S6. Topic “Vaccines in community pharmacy”: test results pre- e post-course.

Questions n. 16-18	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
In the pharmacy vaccines can be found:	Incorrect	111 (67.68)	93 (56.36)	148 (56.70)	26 (9.96)	10 (42.48)	5 (21.74)	0.020	0.000
• Only in the refrigerator;	Correct	53 (32.32)	72 (43.64)	113 (43.30)	235 (90.04)	13 (56.52)	18 (78.26)		
• Only outside the refrigerator;	Missing	1 (0.60)	-	-	-	-	-		
• <i>Either in or out of the refrigerator;</i>									
• All the above.									
The most frequent temperature range for thermolabile vaccines is:	Incorrect	48 (29.45)	2 (1.21)	63 (24.14)	7 (2.68)	1 (4.35)	-	0.030	0.453
• Below -15°C;	Correct	115 (70.55)	163 (98.79)	198 (75.86)	254 (97.32)	22 (95.65)	22 (100)		
• <i>Between 2°C and 8°C;</i>	Missing	2 (1.21)	-	-	-	-	1 (4.35)		
• Between 8°C and 15°C;									
• Between 15°C and 25°C.									
The cold chain includes:	Incorrect	55 (33.54)	29 (17.68)	38 (14.56)	4 (1.53)	3 (13.04)	-	0.000	0.000
• The use of temperature-controlled equipment;	Correct	109 (66.46)	135 (82.32)	223 (85.44)	257 (98.47)	20 (86.96)	23 (100)		
• The transport of vaccines cannot be carried out with normal means of transport;	Missing	1 (0.60)	1 (0.60)	-	-	-	-		
• Constant temperature monitoring by drivers and control centres;									
• A final report of the load temperatures along the entire route and during storage in the pharmacy;									
• <i>All the above.</i>									

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S7. Topic “Pharmacovigilance of vaccines”: test results pre- e post-course.

Questions n. 19-21	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
<ul style="list-style-type: none"> • AEFI stands for: <ul style="list-style-type: none"> • Association of Italian Exhibitions and Fairs [Associazione Esposizioni e Fiere Italiane]; • Adverse Events Following Injection; • <i>Adverse Events Following Immunisation</i>; • None of the above. 	Incorrect	47 (28.83)	2 (1.21)	67 (25.67)	6 (2.30)	5 (21.74)	-	0.667	0.571
	Correct	116 (71.17)	163 (98.79)	194 (74.33)	255 (97.70)	18 (78.26)	23 (100)		
	Missing	2 (1.21)	-	-	-	-	-		
Which of these features is NOT used to classify an AEFI: <ul style="list-style-type: none"> • <i>Errors in vaccination</i>; • Age of the patient; • Defects in the quality of the vaccine; • Characteristics of the vaccine. 	Incorrect	102 (61.82)	73 (44.51)	170 (65.13)	18 (6.90)	7 (30.43)	2 (8.70)	0.004	0.000
	Correct	63 (38.18)	91 (55.49)	91 (34.87)	243 (93.10)	16 (69.57)	21 (91.30)		
	Missing	-	1 (0.60)	-	-	-	-		
To perform the causality assessment of an AEFI. The following is used: <ul style="list-style-type: none"> • CIOMS/RUCAM algorithm; • Schumock & Thornton algorithm; • Naranjo scale; • <i>WHO algorithm</i>. 	Incorrect	82 (52.90)	25 (15.24)	108 (41.38)	16 (6.13)	8 (34.78)	2 (8.70)	0.165	0.008
	Correct	73 (47.10)	139 (84.76)	131 (50.19)	245 (93.87)	15 (65.22)	21 (91.30)		
	Missing	10 (6.06)	1 (0.60)	22 (8.43)	-	-	-		

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S8. Topic “False myths on vaccines”: test results pre- e post-course.

Questions n. 22-24		Answers	Pharmacy		Medicine		Hygiene		p-value *	p-value **	
			Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)			
•	Which of the following statements is correct? <i>Formaldehyde is contained in a small number of vaccines but in minimal quantities (<0.1 mg);</i>	Incorrect	85 (52.15)	13 (7.98)	89 (34.10)	9 (3.45)	3 (13.04)	2 (8.70)	0.001	0.101	
	•	Formaldehyde is used in vaccines as an adjuvant;	Correct	78 (47.85)	150 (92.02)	168 (64.37)	252 (96.55)	20 (86.06)			21 (91.30)
	•	The same amount of formaldehyde produced by an infant is present in vaccines;	Missing	2 (1.21)	2 (1.21)	4 (1.53)	-	-			-
•	No vaccine contains formaldehyde.										
•	Which of the following statements is correct? At two months the child’s immune system is not already able to respond to vaccination;	Incorrect	106 (65.84)	13 (7.93)	99 (37.93)	10 (3.83)	5 (21.74)	-	0.000	0.092	
	•	Vaccines weaken the immune system if administered too early;	Correct	55 (34.16)	151 (92.07)	162 (62.07)	251 (96.17)	18 (78.26)			23 (100)
	•	The newborn’s immune system is fragile and cannot be subjected to more than ten vaccinations in the first year of life;	Missing	4 (2.45)	1 (0.60)	-	-	-			-
•	<i>The newborn’s immune system has great potential: it could respond to over 10.000 vaccines at the same time.</i>										
•	Which of the following statements is correct? <i>Aluminium salts are used in vaccines to enhance immune response;</i>	Incorrect	58 (35.80)	6 (3.64)	55 (21.07)	4 (1.53)	3 (13.04)	-	0.001	0.272	
	•	Aluminium salts are used in vaccines as a preservative;	Correct	104 (64.20)	159 (96.36)	206 (78.93)	257 (98.47)	20 (86.96)			23 (100)
	•	The aluminium injected into the muscle with vaccines enters the blood immediately;	Missing	3 (1.82)	-	-	-	-			-
•	Vaccines must not contain aluminium salts.										

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S9. Topic “Italian national immunization plan (NIP)”: test results pre- e post-course.

Questions n. 25-27	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
According to the Italian National Immunization Plan 2017-19. which of these vaccinations are recommended in pregnancy?	Incorrect	57 (34.55)	17 (10.30)	74 (28.35)	5 (1.92)	-	-	0.003	0.000
• <i>Influenza and diphtheria-tetanus-pertussis;</i>	Correct	108 (65.45)	148 (89.70)	187 (71.65)	256 (98.08)	23 (100)	23 (100)		
• Hepatitis B;	Missing	-	-	-	-	-	-		
• Varicella (Chickenpox);									
• Measles-Mumps-Rubella.									
Which of the following vaccines are mandatory for school attendance under Law 119/2017 in Italy?	Incorrect	28 (16.97)	6 (3.66)	22 (8.43)	2 (0.77)	-	-	0.005	0.073
• Anti-pneumococcal;	Correct	137 (83.03)	158 (96.34)	239 (91.57)	259 (99.23)	23 (100)	23 (100)		
• Anti-influenza;	Missing	-	1 (0.60)	-	-	-	-		
• Hexavalent and MPRV;									
• Anti-meningococcal.									
The impact of vaccination programmes is assessed through:	Incorrect	28 (17.18)	26 (15.76)	37 (14.18)	5 (1.92)	2 (8.70)	-	0.481	0.000
• Monitoring the trend of mandatory disease notifications;	Correct	135 (82.82)	139 (84.24)	224 (85.82)	256 (98.08)	21 (91.30)	23 (100)		
• Monitoring of vaccination coverage;	Missing	2 (1.21)	-	-	-	-	-		
• The monitoring of the disease burden (notifications and hospitalizations) based on the vaccination coverage achieved;									
• Monitoring the hospitalizations trend.									

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.

Table S10. Topic “HTA”: test results pre- e post-course.

Questions n. 28-30	Answers	Pharmacy		Medicine		Hygiene		<i>p-value</i> *	<i>p-value</i> **
		Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)	Pre-course N (%)	Post-course N (%)		
A vaccine. To be included in the National Plan for Vaccine Prevention and.	Incorrect	34 (20.61)	4 (2.45)	20 (7.66)	1 (0.38)	-	-	0.000	0.125
Therefore. Be offered actively and free of charge:	Correct	131 (79.39)	159 (97.55)	241 (92.34)	260 (99.62)	23 (100)	23 (100)		
• <i>Must be assessed according to the HTA approach;</i>	Missing	-	2 (1.21)	-	-	-	-		
• It is sufficient that it is not too expensive;									
• It is sufficient that has proven effective;									
• It is sufficient that it has been shown to be safe.									
The HTA applied to vaccinations includes assessing:	Incorrect	41 (25.15)	2 (1.21)	36 (13.79)	1 (0.38)	-	-	0.001	0.539
• Organisational aspects;	Correct	122 (74.85)	161 (98.77)	255 (86.21)	(99.62)	23 (100)	23 (100)		
• The ethical aspects;	Missing	2 (1.21)	2 (1.21)	-	-	-	-		
• Possible alternative interventions;									
• <i>All the above.</i>									
The economic evaluations of vaccinations show that:	Incorrect	42 (25.77)	11 (6.75)	21 (8.05)	2 (0.71)	-	1 (4.35)	0.000	0.003
• There is no need to carry out economic assessments for vaccination;	Correct	121 (74.23)	152 (93.25)	240 (91.95)	259 (99.23)	23 (100)	22 (95.65)		
• Only in some rare cases vaccination is cost-effective;	Missing	2 (1.21)	2 (1.21)	-	-	-	-		
• <i>Vaccinations are an investment for the NHS (National Health System);</i>									
• Vaccinations are only a cost to the NHS.									

Correct answers are in italics. * Difference in the distribution of correct/incorrect answers between Faculties pre-course. ** Difference in the distribution of correct/incorrect answers between Faculties post-course.