ARTICOLO ORIGINALE

Knowledge and expectations of young residents in public health on HTA: an Italian study

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Abstract

Objectives: HTA is defined as a bridge between science and policy. An adequate teaching on this topic in Public Health residency in Italy has never been mapped. This study aimed at assessing Public Health residents' knowledge and expectations on certain aspects of HTA. We consider only residents in the first three years of their specialisation, because they were the most interested.

Methods: We administered an online questionnaire to all Italian residents in the first three years in Public Health (July-September 2017), covering the courses offered on HTA in their School and their willingness to learn more about it. We investigated the knowledge part with specific questions.

Results: 178 residents from 32 Schools of Public Health took part in this survey. 77.5% (95% CI [70.7%, 83.4%]) claimed they didn't know/ there was not a course in their University. 96.1% (95% CI [92.1%, 98.4%]) would like to know more about HTA. The majority did not take part in courses (74.2%; 95% CI [67.1%, 80.4%]). The most suitable solution for them was reading something on HTA (51.7%; 95% CI [44.1%, 59.2%]). We used twelve questions to probe knowledge: the mean score for each respondent was 67.2% (95% CI [64.9%, 69.5%]).

Conclusions: Young residents in Italy understand the importance of HTA. However, universities across Italy seems to be ineffective to offer an appropriate preparation. This reflects in poor knowledge on certain aspects. Reading something on HTA has a positive correlation with the level of preparation.

Introduction

The Italian NHS (National Health System) is a universalistic system: health is considered as a right and is protected and extended to all Italian residents by law, regardless of personal income. The principal aim is to ensure high standards of care, to choose the best way to allocate resources and to maximize benefits by reducing waste [1].

In this scenario, Health Technology Assessment (HTA) is a powerful instrument of governance: it represents a scientific approach to evolve from a governance based on personal, opinion-based decisions to an evidence-based and multidisciplinary process, shared with several stakeholders [2]. HTA is a powerful tool for the so-called 'health system stewardship', as stated by the World Health Organization, and should be considered as a way to promote the careful and responsible management of the well-being of the population [3].

As a matter of fact, HTA is not a recent introduction in Italy: it first appeared at the very beginning of the 1980s, when the 'Istituto Superiore di Sanità', the scientific bureau of the Health Ministry in Italy, introduced an instrument to evaluate big and expensive technologies (e.g. CT scanners) with special attention to security. In 2006 the 'Carta di Trento' (Trento Statement) established the creation of SIHTA (Italian Society of Health Technology Assessment) [4,5].

In Italy, young postgraduate doctors can choose to enrol a specialization in Hygiene and Preventive Medicine, which is the counterpart of post-graduate traineeships and masters in Public Health in Europe. In addition, residents learn how to apply and implement their skills under the supervision of tutors in different settings [6]. The rotation between different public health settings should improve knowledge and skills of young residents, but the level reached in each subject may vary significantly between students.

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In addition to this, rotation is also present in other specialties, but it is particularly relevant for Public Health residencies, which should create professionals capable of entering a new health setting, characterized by the demographic and epidemiological transition, lack of resources, inequity and chronicity. In this context, HTA plays an important role in addressing the health demand and in matching it with the health system needs, supporting decision-making at macro, meso and micro levels. Although the National Health System is strongly regionalized, HTA is fundamental to integrate different issues of knowledge from a political, economic and social point of view and to use them for a decision-making process at the local level [7].

From the empirical analysis of the international scenario, we found that Health Technology Assessment teaching does not seem to play a significant role with specific courses and lessons in the postgraduate courses (residency) in most countries. HTA is often included in broader teaching modules (e.g.: decision making for Public Health, evidence-based practice) or in Master programmes.

On the other hand some research analysing the results of surveys conducted amongst Public Health residents in Europe, showed that the issue of renewed public health teaching is considered crucial, in order to learn core competencies (included those preparing to meet the challenges of new health technologies); however, the process towards this goal is still seen as slow and very incoherent between different countries [8]. As a matter of fact, education in Public Health in Europe is considered absolutely inadequate to prepare future workers for global challenges, such as health inequalities and emerging new technologies [9].

In Europe, attempts have been made to create a modern model of public health specialist training which could be shared between the various States (Agency for Public Health Education Accreditation, APHEA).

Even in the core subjects for APHEA's MPH curricula, however, *technology assessment* has been included in cross-disciplinary training subjects, required or elective ones, along with many other contents (such as nutrition, mental health, leadership, decision-making) [10]. This is particularly important if we consider that writing or simply reading a report, according to the specific criteria by EUnetHTA [11], is essential for the future specialist in Public Health and it is a transversal skill useful for example for the evaluation of the cost-effectiveness of a vaccination campaign, the assessment of an emerging technology in the hospital setting or the cost-utility analysis for the introduction of a new prosthesis for leg amputees [2]. In this sense, a guide is fundamental for technicians to orient the instrument of HTA to various public health interventions [12].

Materials and methods

As a working group of the board in the field of Health Technology Assessment of the Italian Society of Hygiene, Preventive Medicine and Public Health (SItI), we created an online questionnaire which was administered to all Italian residents in Hygiene and Preventive Medicine between July - September 2017. The questionnaire was divided into two sections. The first part tried to investigate the training offer inside the different Schools and to discover the interests and expectations of Italian residents about HTA. Instead, with the second part, we wanted to map the knowledge of residents in the specific field.

In order to facilitate the comprehension of the results, the questions in the second section were divided into four sections to evaluate performances in:

1. Definitions (e.g. "What does it mean the acronym HTA?");
2. HTA utilization (e.g. "HTA studies are used to verify…?");
3. HTA regulation (e.g. "Which are the organisation which do HTA evaluations in Italy at an institutional level?")
4. Methodological aspects and indicators. (e.g. "Where are QALY (Quality Adjusted Life Years) used"?)

We presented the numbers of correct answer to questions as percentages and binomial exact 95% Confidence Intervals (95% CI).

North-South of Italy trend for specific questions was analyzed by univariate logistic regression with quasi-binomial link function to account for overdispersion.

Mean section correctness score to the knowledge part of the survey was computed by taking for each respondent the proportion of correct answers per section and then computing the mean (and normal 95% CI) along the respondent's section scores. Mean section scores were summarized as: $0-40\%$: $--$, $41-60\%$: $-$; $61-80\%$: $+$, $81-100\%$: $++$.

Correlation between specific answers to attitude and formation question and per-respondent fraction of correct answers (correctness rate) to the knowledge part of the survey was analyzed via multilevel univariate logistic regression with random intercept at the school level (to account for the expected less variability of knowledge between students attending the same school) and at the individual level (to account for overdispersion).

All regression models underwent a Bayesian regularization with a Cauchy prior applied to coefficients, to avoid extreme, not-realistic estimates [13]. Effect size as Odds Ratio (OR), 95% CI, statistic score (ie.: effect size / standard error, on log scale) and p-values are presented; levels of statistical significance are summarized by * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001.

A classification and regression tree method was used to find which combinations of answers to other questions of the survey correlated to the correctness rate [14].

Results

215 out of the 549 Italian Public Health residents answered the questionnaire. Since residents in the fourth and

fifth year did reach their specialization in August 2017 and for this reason were not interested in giving information about their willingness to learn more about HTA during residency, we thought that was more interesting to concentrate our analysis in the first three years. The number of respondents in the first three years was 178 out of 271 with a response rate of 65.7%. We analysed the organization of HTA courses in Italy. 77.5% (95% CI [70.7%, 83.4%]) of people claimed that there was not a course/they did not know about the presence of a course on HTA in their schools; on the other hand, 71.3% (95% CI [64.1%, 77.9%]) heard something about the acronym 'HTA'. The knowledge of the existence of a specific course was not the same all over Italy. In the schools of Hygiene in the North of Italy, 33.8% of the students who responded to the questionnaire (95% CI [23.6%, 45.2%]) were aware of the presence of a course on HTA. Only 17.2% students of the first three years in Centre Italy (95% CI [5.8%, 35.8%]) and 10.9% (95% CI [4.5% - 21.2%]) in the South of Italy had the same perception; we found a statistically significant decreasing trend between the schools of North, Centre and South Italy (OR: 0.5; 95% CI [0.3, 0.75]).

Then, we aggregated the answers by training school: we found that in just one schools (3.1% of the total number of schools; 95% CI [0.1%, 16.2%]) all respondents agreed on the presence of an HTA course while in 6 (18.8%; 95% CI [7.2%, 36.4%]) all agreed on the absence of it. Students did not agree in the remaining schools (78.1%; 95% CI [60.0% - 90.7%]) although the majority of the students reported the absence of a specific course.

We tried to consider how young trainees who knew something about the topic 'HTA' acquired this information. Apparently it seems that the majority did not participate to seminars, masters or courses on HTA (74.2%; 95% CI [67.1%, 80.4%]) but the most suitable solution for them was to read books, papers or studies on HTA (51.7%; 95% CI [44.1%, 59.2%]).

We believed that such preference was due to the greater accessibility and the lower cost of articles, books and publications compared to masters or other university courses. On the other hand, we found that following a course was a positive predictor of reading something on HTA, as we expected. In particular having followed a course organized by the school increases of 11.5 times (95% CI [4.88, 35.1]) the odds of having read literature under suggestion. On the other hand, having followed seminars and course autonomously was associated with a spontaneous search for information in the literature (OR: 4.1; 95% CI [1.69, 13.4]). It was interesting that the opposite wasn't true, that is students who went to courses organized by the school didn't use to read by their own initiative (OR: 0.84; 95% CI [0.33, 1.97]), while students who attended courses by themselves didn't read (or more probably weren't proposed to read) literature suggested by the faculty (OR: 1.03; 95% CI [0.51, 2.03]). We expected although a confounding effect from the relative interest in HTA that increased the probability of both following external courses and reading literature spontaneously.

We noticed that 96.1% (95% CI [92.1%, 98.4%]) of young residents would like to receive more information on the principles of HTA; 60.7% (95% CI [53.1%, 67.9%]) would like to follow specific courses with practical examples and 38.8% web-based courses (95% CI [31.6%, 46.3%]) (Figure 1).

Then, we explored previous knowledge about HTA of young residents: the participants answered correctly to 8 questions out of 12 (average result: 67.2% correct response rate; 95% CI [64.9%, 69.5%]). We calculated the average percentage of correct answers for each sections and we attributed specific scores to summarise performances (Table 1).

In particular, residents were well informed on the meaning of Health Technology Assessment. 94.9% (95% CI [90.6%, 97.7%]) and 92.7% (95% CI [87.8%, 96.1%]) of young trainees in the first three years gave the correct an-

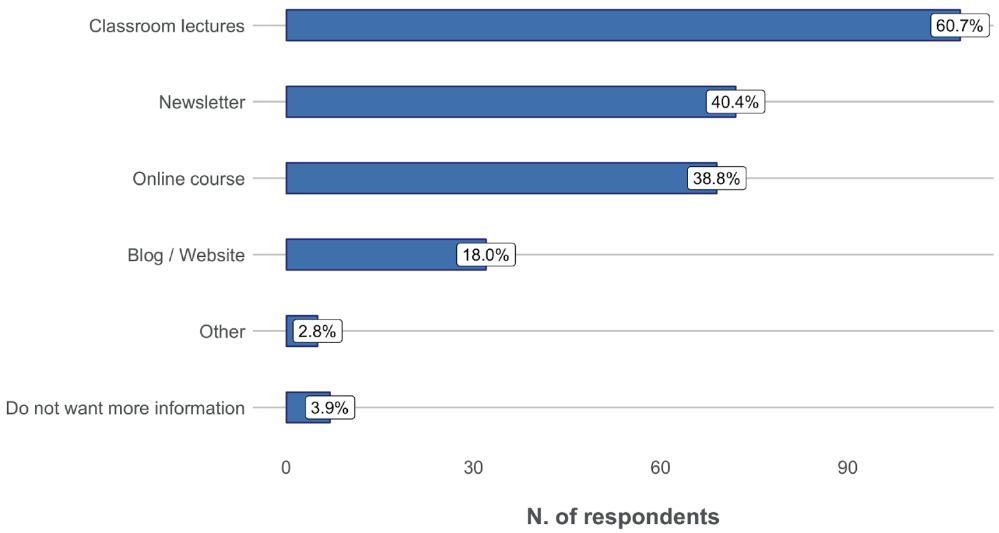

Figure 1. How do students acquire further information on Health Technology Assessment?

Topics	Questions (number)	Mean section correctness score (95% CI)	Score summary
Definitions	11-13-15	86.9% [83.7%, 90%]	++
HTA utilisation	12-14	58.7% [54.8%, 62.6%]	–
HTA regulation	17-20-21	58.6% [55% - 62.2%]	–
Methodological aspects and indicators	16-18-19-22	63.1% [59.6%, 66.6%]	+

Table 1. Performances of young residents in the four specific areas described above (definitions, HTA utilization, HTA regulation, methodological aspects and indicators). We calculated a mean section correctness score and use symbols (-; +; ++) to visually summarise performances.

swer to first and second knowledge question (see Supplementary Table 1 - Questionnaire for further details).

On the other hand, our youngest colleagues didn't know which the real purpose of HTA is (a bridge between the political and scientific world to guide the decision-making process); as a matter of fact, only 17.4% of the selected sample (95% CI [12.2%, 23.8%]) gave the correct answer.

Furthermore, we noticed that regarding methodological aspects and indicators, our colleagues seemed to be more aware of the meaning of ICER (64.6%; 95% CI [57.1%, 71.6%]) compared with QALY (26.9%; 95% CI [20.6%, 34.1%]). We assumed that a possible explanation is the predominant presence of cost benefits analysis in literature as compared to cost utility.

We also analysed the correlation between the self-reported level of preparation and correct answers. As we expected, people who already heard about HTA (see Q2, Table 2) have more than twice the odds to respond correctly to the specific questions compared to those who never heard about it.

In addition to this, we evaluated the correlation between the knowledge of the specific year in which there is a specific course on HTA and the results of the answers ("I don't know the year in which the specific course on HTA is present/course not present"): people who responded that the specific course is on the third year (correct answer in most of the Italian schools) had a better score in technical part. The correlation was statistically significant. Then we tried to consider if there was a correlation between a better performance in the score of people who declared to read articles/books or papers on HTA and people who didn't read anything. There was a statistically significant difference between people who read independently or under the advice of someone (e.g. professors) and people who didn't read at all.

On the other hand, people who followed congresses/masters/courses during their traineeship had an improvement which was statistically significant in the percentage of correct answers compared with people who did not respond at all.

Students which prefer to follow practical lessons compared to half-day frontal ones performed better, especially those who preferred a full day course. This is probably a proxy indicating that more interested students prefer a more involving type of formation and that this teaching method should be preferred.

Finally, we decided to build a decision tree model in order to identify combinations of answers which were particularly predictive of good or bad performance in the knowledge part of the questionnaire (Figure 2). The worst performance is associated to people who never heard about HTA or to those who heard about it but would not want to attend long and/or practical courses on the topic. On the other hand, people who are already familiar with HTA, prefer more complex workshops on the topic, are not at the first year of training and do know about the existence of a specific course in their school, have the highest rate of correct responses. First year students who would prefer web based tools to learn about HTA also performed better than colleagues who decided otherwise.

Discussion

Mapping knowledge and expectations of young residents in Public Health is a way to find areas of the formation that are poorly represented or even missing. The analysis of existing literature showed that there is a general lack of international studies that describe the level of preparation, self-reported knowledge and expectations of young residents in Public Health in the field of Health Technology Assessment. We found that, despite its importance in all the fields of Public Health, HTA teaching had not always have its own and proper space amongst the training programs of the Italian Schools of Hygiene and Preventive Medicine. We developed a reliable questionnaire with good content validity for evaluating knowledge and expectation of Italian residents in Public Health on HTA which seemed to indicate that young residents in Hygiene and Preventive Medicine are not interested as a whole in Health Technology Assessment: the majority of respondents belong to the first years of specialization and their interest in this topic appears to be lessening as they proceed. As a matter of fact, the number of respondent for the fourth and fifth year was really low and in our opinion indicates the disinformation or the lack of interest of the specialists-to-be. This result is probably closely related to the fact that the program of the specialization is wide and

	OR	95% CI	Statistic score	P-value
Q1:"Which is your year of training?"				
First	Ref.			
Second	1.26	[0.99, 1.59]	1.89	0.058
Third	1.54	[1.21, 1.98]	3.44	< 0.001 ***
Q2: "Have you ever heard the acronym "HTA"?"				
No	Ref.			
No answer	2.68	[1.82, 3.94]	5	< 0.001 ***
Yes	2.16	[1.56, 2.99]	4.63	< 0.001 ***
Q3: "Is there a specific course on HTA during your training in your School?"				
No	Ref.			
Don't know	1.34	[0.995, 1.79]	1.92	0.054
Yes	0.9	[0.71, 1.14]	-0.87	0.387 ns
Q4: "If a course is present, in which year does it take place?"				
Course not present/Don't know about it	Ref.			
First	0.93	[0.63, 1.37]	-0.37	0.709 ns
Second	1.02	[0.59, 1.77]	0.078	0.937 ns
Third	1.77	[1.21, 2.59]	2.92	0.004 **
Fourth	1.42	[0.88, 2.29]	1.45	0.148 ns
Q5: "Have you ever attended any congresses, courses, seminars or masters on HTA?"				
No	Ref.			
Yes, organized by the School	1.2	[0.88, 1.64]	1.17	0.244 ns
Yes, not organized by the School	1.29	[0.92, 1.81]	1.46	0.144 ns
Q6: "Have you ever read books, articles and other written material (also online) about HTA?"				
No	Ref.			
Yes. I was advised by some professors or I was interested after having attended specific courses on HTA organized by my School	1.59	[1.15, 2.19]	2.83	0.005 **
Yes, autonomously and for my own interest	1.53	[1.23, 1.9]	3.79	<0.001 ***
Q7: "Would you like to have more information on HTA?"				
No	Ref.			
Yes	1.46	[0.88, 2.45]	1.46	0.145 ns
Q8: If you answered "Yes" to the previous question, in which way you would prefer to receive more information? (Multiple choice question. The effect sizes are relative to having chosen the specific mean against not having chosen it)				
Traditional university course	0.85	[0.69, 1.05]	-1.5	0.133 ns
Online course	1.42	[1.14, 1.75]	3.19	0.001 **
Newsletter	1.17	[0.89, 1.54]	1.11	0.266 ns
Verified website / blog	1.39	[1.12, 1.71]	3.03	0.002 **
Other means (specify)	1.23	[0.65, 2.33]	0.64	0.523 ns
Q9: "In case of a HTA workshop, which modality would you prefer?"				
A half-a-day lesson, only theoretical.	Ref.			
A one-day lesson, both practical (case study) and theoretical.	1.41	[1.03, 1.95]	2.12	0.034 *
A one-day lesson, only theoretical	1.16	[0.74, 1.83]	0.659	0.510 ns
A half-a-day lesson, both practical (case study) and theoretical.	1.35	[0.97, 1.89]	1.76	0.078 .
Other (specify)	1.24	[0.57, 2.71]	0.538	0.590 ns

Table 2. Correlation between school organization, interests, training expectations on HTA of students and correct rate to questions in the knowledge part of the survey (See Supplementary Table 1 for further details). The correlation is estimated using univariate mixed effects, Bayesian regularized, models with a random intercept at the school and individual level.

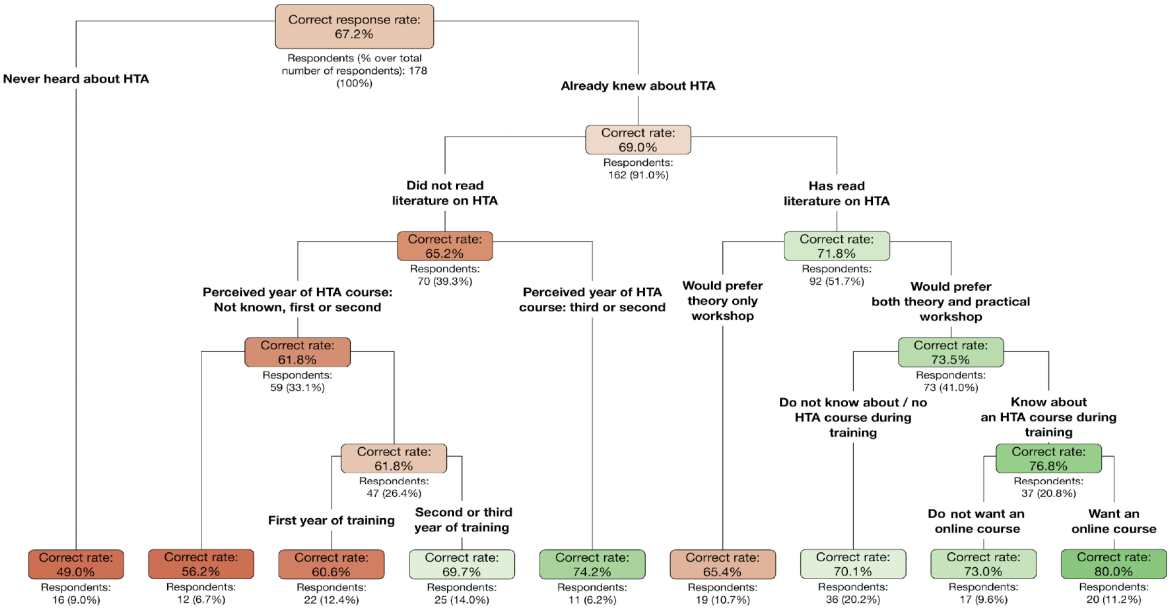

Figure 2. Decision tree model predicting the correctness rate on knowledge questions based on combinations of attitude questions. The model automatically stratifies and selects only questions which are really predictive of different knowledge scores.

not standardized among all the Italian schools: there is not an integrated course on HTA in all the universities.

At the same time, training needs are high among respondents; the main expectation is to attend specific frontal lessons with practical exercises and examples. Our colleagues generally preferred reading books, articles and paper as compared to attend masters or courses on HTA, because they are more affordable and accessible. Fortunately, people who keep themselves informed showed best performances in the answers to technical questions versus people who were not informed, as we expected, and the difference was statistically significant. Although the structure of the questionnaire was not particularly detailed and more research are needed to better define these results, the results indicate that overall residents' knowledge is barely sufficient or even insufficient on the regulation part and on why HTA is important for the community as well.

They also showed gaps in methodological concepts and indicators, as they were probably not used to read articles on HTA. We concluded that Italian residents in Hygiene are unprepared to understand and apply a report of HTA in a decision-making process.

Our work has some limitations. The analysis of the results of the questionnaire was based on the responses of 215 residents, out of the total number of 549 residents (response rate: 39,2%). Moreover, the simplified nature of the questionnaire in the knowledge section (fixed-choice) limited the possibility to clarify some issues for the responders. At the same time, the response rate was high (more than 65%) in the first three years, when the students are more likely to gain knowledge about HTA; moreover, the structure of the questionnaire allowed us to easily analyze the results and offer an immediate image of the role played by HTA in Italian postgraduate learning. We hope that this article could give a cue to provide a better organization of HTA teaching at the national level, both implementing pre-existent universities' programs and creating new courses inside and outside universities, taking into account the expectations of residents as described above.

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Supplementary Table 1

Questionnaire

FIRST SECTION

1. Indicate your School of Specialisation: (Specify)

2. Which is your year of training?

   - First
   - Second
   - Third
   - Fourth
   - Fifth

3. Have you ever heard the acronym "HTA"?

   - No
   - No answer
   - Yes

4. Is there a specific course on HTA during your training in your School?

   - No
   - Don't know
   - Yes

5. If a course is present, in which year does it take place?

   - Course not present/Don't know about it
   - First
   - Second
   - Third
   - Fourth
   - Fifth

6. Have you ever attended any congresses, courses, seminars or masters on HTA?

   - No
   - Yes, organized by the School
   - Yes, not organized by the School

7. Have you ever read books, articles and other written material (also online) about HTA?

   - No
   - Yes. I was advised by some professors or I was interested after having attended specific courses on HTA organised by my School
   - Yes, autonomously and for my own interest

8. Would you like to have more information on HTA?

   - No
   - Yes

9. If you answered "Yes" to the previous question, in which way you would prefer to receive more information? (Multiple choice question)

   - Traditional university course
   - Online course
   - Newsletter
   - Verified website/blog
   - Other means (specify)

10. In case of a HTA workshop, which modality would you prefer?

    - A half-a-day lesson, only theoretical
    - A one-day lesson, both practical (case study) and theoretical
    - A one-day lesson, only theoretical
    - An half-a-day lesson, both practical (case study) and theoretical
    - Other (specify)

SECOND SECTION

11. What does it mean the acronym "HTA"?

    - Highly Technical Assessment
    - Health Threat Administration
    - Health Technology Assessment OK
    - I don't know

12. Why Health Technology Assessment is used for evaluation?

    - It's a multidimensional and multidisciplinary approach to analyse the clinical, social, organisational, economical, ethical and legal implication of an health technology through an efficacy, security, costs, social and organisational impact. OK
    - It's the process of analysis and evaluation of the health needs of the population as a whole, oriented to program health policies.
    - It's the process to define the priorities in the field of health assistance and, in general, health promotion.
    - I don't know

13. A health technology is:

    - A drug
    - A surgical procedure
    - A diagnostic method
    - All the previous answers OK
    - None of the previous answers

14. Which aspects are generally considered in an HTA report?

- Technology and organisation
- Technology, organisation and economics
- Technology, organisation, economics and ethics OK
- Technology, organisation, economics, ethics and leadership

15. Find the wrong answer:

- HTA should consider all the subjects interested in health assistance
- "Immaterial" health technologies should consider organisational and welfare models, clinic files and documents and regulation systems
- HTA is a multidisciplinary process, which is distinct and independent from other welfare and technical processes OK
- HTA is a continuous process that has to be initiated before the introduction of new technologies and during all the life-cycle of the technology itself.

16. HTA studies are used to verify:

- Security
- Efficacy and effectiveness
- Acceptability of technologies
- All the previous answers OK
- None of the previous answers

17. Which are the organisations which do HTA evaluations in Italy at an institutional level?

- Health Ministry
- Istituto Superiore di Sanità
- AGENAS (Agenzia per i Servizi Sanitari Regionali)
- AIFA (Agenzia Italiana del Farmaco)
- All the previous answers OK

18. What kind of economic evaluations are used to test the effectiveness of an health technology?

- Cost-efficacy analysis
- Cost-benefit, cost-utility, cost-efficacy and cost-minimization analysis OK
- Cost-benefit and cost-minimization analysis
- Incidence and prevalence studies, cost-efficacy studies, cost-utility and cost-benefit

19. Where are QALY (Quality Adjusted Life Years) used?

- Risk-benefit analysis
- Cost-benefit analysis
- Cost-utility analysis OK
- Cost benefit and cost efficacy analysis

20. Why is HTA different from pure scientific research?

- Political orientation: it is a contribution to decisional processes OK
- Synthesis of information, data collection, diffusion and communication of results
- All the previous answers
- None of previous answers: HTA is a field of the scientific research

21. HTA is an instrument for regulation to:

- Define strategies to keep new technologies accessible at higher speed
- Conciliate efficacy and security with social expectations of innovation
- Provide governance and sustainability
- All previous answers OK
- None of previous answers

22. What is ICER (Incremental Cost Effectiveness Ratio)?

- A model to estimate the ethical implications of an HTA study
- An indicator to evaluate social implications of the introduction of a new technology
- An indicator used in addition to the QALY to evaluate health outcomes
- An indicator, associated to the willingness to pay, which is used to decide how to allocate resources OK