Current Practice of airway stenting in the adult population in Europe: a survey of the European Association of Bronchology and Interventional Pulmonology (EABIP).

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Abstract

Background

Airway stenting (AS) commenced in Europe circa 1987 with the first placement of a dedicated silicone airway stent. Subsequently, over the last three decades, AS was spread throughout Europe, using different insertion techniques and different types of stents.

Objectives

This study is an international survey conducted by the European Association of Bronchology and Interventional Pulmonology (EABIP) focusing on AS practice within 26 European countries.

Methods

A questionnaire was sent to all EABIP National Delegates in February 2015. National delegates were responsible for obtaining precise and objective data regarding the current AS practice in their country. The deadline for data collection was February 2016.

Results

France, Germany and UK are the 3 leading countries, in terms of number of centres performing AS. These 3 nations represent the highest ranked nations within Europe in terms of gross national income. Overall, pulmonologists performed AS exclusively in 5 countries and predominately in 12. AS is performed almost exclusively in public hospitals. AS performed under general anaesthesia is the rule for the majority of institutions. Local anaesthesia is an alternative in 9 countries. Rigid bronchoscopy techniques are predominant in 20 countries. Amongst commercially available stents, both Dumon and Ultraflex are by far the most commonly deployed. Finally, 11 countries reported that AS is an economically viable activity while 10 claim that it is not.

Conclusion

This EABIP survey demonstrates that there is significant heterogeneity in AS practice within Europe. Therapeutic bronchoscopy training and economic issues/reimbursement for procedures are likely to be the primary reasons explaining these findings.

Introduction

The main purpose of airway stenting (AS) is to restore and maintain luminal patency. Any endoluminal or extrinsic pathology causing more than 50% reduction in the size of the airway lumen can lead to debilitating symptoms such as dyspnoea. These symptoms can be significantly improved by the placement of an airway stent [1, 2]. Although many attempts were made to stent the central airway in the past [3-14], it was not until the late twentieth century that the commercial era of airway stenting commenced in Europe. A French doctor, Jean Francois Dumon was the first physician to place a dedicated and specially designed airway silicone stent in 1987 [15]. Subsequently, several companies developed other airway stents using silicone or metallic components. In the last 30 years numerous reports have been published describing the placement of self-expanding and balloon expandable metal stents for the treatment of central airway diseases [16-33]. However, despite the availability of additional commercial products on the market, the Dumon stent (Tracheobronxane®, Novatech, La Ciotat, France) remains the most commonly placed stent worldwide and the "gold standard" for the treatment of both benign and malignant airway stenoses over the last 20 years. [1, 2] These stents have 2 specific designs: straight and Y-shaped (for disease involving the carina) [34]. Silicone stent placement requires a skill set in rigid bronchoscopy while metallic stents placement can be performed using flexible bronchoscopes.

The EABIP was founded in 2002 with the objective to exchange knowledge and experience amongst interventional pulmonologists within Europe. This has been achieved through joint international multicentre research projects, establishing procedural and training standards, and agreeing a unified terminology to improve communication within the community of European Interventional Pulmonologists. A European survey was launched through the EABIP executive board to investigate AS practice in the 26 European countries represented by an EABIP national delegate.

Materials and Methods

A questionnaire was developed by the EABIP board members and sent to all EABIP national delegates representing 26 European countries (Appendix 1). Each national delegate was responsible for obtaining the most precise and objective data regarding AS practice in his/her country.

Statistical analysis of the data was performed using the software package IBM SPSS Statistics 20 (Statistical Package for the Social Science). Continuous parameters are presented by means when normally distributed or medians and standard deviations or range. Categorical variables are reported as frequencies and percentages. Univariate analysis involved the use of analysis of variance (ANOVA) for multiple continuous variables. For the analysis of correlation Pearson correlation test for was used for continuous data and Spearman test for categorical data. Statistically significant values was considered as the level of significance of $p < 0.05$.

Results

All 26 European national delegates responded to the questionnaire.

AS (Figure 1) is performed in more than 30 centres in 3 countries (France, Germany and United Kingdom), between 21 to 30 centres in 2 countries (Italy and Spain), between 11 to 20 centres in 2 countries (Belgium and Poland), between 6 to 10 centres in 5 countries (Austria, Finland, Netherlands, Portugal and Switzerland), between 2 to 5 centres in 11 countries (Bulgaria, Denmark, Estonia, Greece, Hungary, Ireland, Norway, Romania, Slovenia, Sweden and Turkey) and in a single centre in 2 countries (Croatia and Serbia). In addition, since the close of the survey in February 2016, two more centres have started performing AS in Serbia. Finally one national delegate reported that AS was not performed (Macedonia).

With regard to the specific specialities performing AS, delegates reported that it is exclusively performed (Table 1) by pulmonologists in 5 countries (Croatia, Netherlands, Portugal, Romania, and Serbia) and predominately by pulmonologists in 12 countries (Austria, Belgium, Bulgaria, France, Germany, Greece, Hungary, Ireland, Norway, Sweden, Switzerland, and Turkey). A further 3 delegates reported that AS is mainly performed by thoracic surgeons (Estonia, Finland and Poland). Finally, AS is equally performed by pulmonologists and thoracic surgeons in 4 countries (Italy, Slovenia, Spain and UK), and equally performed by thoracic surgeons and ENT surgeons in one country only (Denmark). In total, ENT surgeons perform AS in 14 countries (Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Norway, Poland, Sweden, Switzerland and UK). In addition, radiologists perform AS in 4 countries (France, Hungary, Spain and UK).

In all countries, AS is predominately performed within the public hospital sector. In only 10 of the 26 countries (Table 1), AS is performed in private hospitals.

General anaesthesia is almost the exclusive mode of anaesthesia in the majority of countries; indeed 16 nations reported that the use of GA is exclusive. However, within the UK system both GA and local anaesthesia are equally utilized. Stents are placed under LA in 9 countries (Table 1).

Rigid bronchoscopy is the main technique for AS in 20 countries (Table 1). Among these 20 countries, RB is the exclusive technique in 5 countries (Croatia, Hungary, Italy, Romania and Slovenia) and 3 countries reported that RB and FB are equally performed (Denmark, Switzerland, and UK). Conversely, FB is the favoured technique in 2 countries (Finland and Norway).

Table 2 demonstrates the commercially available stents on the market in each country. Overall, the Dumon straight and Y –shaped stents, Polyflex, T-Tube, Ultraflex, Dynamic and Silmet stents are the most widely available stents. Delegates from eight countries reported that there were more than 10 commercially available brands available on the market in their country (Austria, France, Germany, Netherlands, Spain, Sweden and Turkey). On the other hand, 2 countries have less than 5 commercially available stents available (Norway and Serbia).

Amongst the commercially available stents (Table 2), the Dumon and the Ultraflex stents are by far the most commonly placed stents. There is an almost an even split between the popularity of the Dumon and Ultraflex stents - The Dumon stent is ranked within the top 3 stents in 18 countries; while this position belongs to the Ultraflex in 15 countries. After these two leading stents, third place is occupied by the Aerstent; which is in the top 3 rankings in 4 countries and additionally it is the number one placed stent in an additional three countries. Finally five countries reported that centres also place Silmet and Microtech stents.

In total, twelve countries report that AS is an economically viable activity while, 10 countries, claim that it is not financially rewarding for their health system (Table 1).

Table 3 reports the data on global net incomes and per capita income per country. This demonstrates that countries with a total number of AS centers between 11 and 20 have the highest average global net income. Countries with 6 to 10 centers have the highest average per capita income. There is a statistically significant association between the number of centers and the average global net income of that nation ($F=3,453$, $p=0.018$). In addition, there is a strong statistical correlation between the number of centers per nation and it's overall ranking on the global net income list ($\rho=0,822$, $p=0,000$). Finally, there was statistical

correlation between number of centers per nation and overall ranking on per capita income list (ρ=0,466, p=0,016).

Discussion

The EABIP undertook this survey to assess the current practices of airway stenting in adults within Europe; the birthplace of this technique. On current geographical and political definitions, Europe represents a total of 51 countries; however only 26 countries have a national delegate represented within the EABIP. Among these 26 countries, with a total population of 580 million, AS is performed in all but one country (Macedonia).

Of the remaining 25 countries, 3 of the 4 largest nations, in terms of population, have greater than 30 centres practicing AS: Germany, the UK and France. It appears based on the results of this survey that more than 200 centres perform AS in Germany. In addition, these 3 nations represent the highest ranked nations within Europe in terms of gross national income (GNI). These results show that these countries have one AS centre for every 2.3 million population.

Turkey, which is the third largest country in Europe, based on population (6^{th} in terms of GNI, 26^{th} in terms of Per Capita Income), has only 2 to 5 centres performing AS. However, AS is a relatively new procedure available in Turkey and it is possible that training is still required to increase the number of centres offering the technique. The Turkish national delegate stated that: “In Turkey, stent placement should be standardized and we will begin a certificate program which lasts 6 months including theoretical and practical education with the Ministry of Health. Interventional Pulmonology is not a subspecialty in Turkey as it is in the rest of Europe. However we think that education and interventions have to be strictly standardized to ensure a good and effective clinical approach”.

The next two most populated countries, Italy (4th) and Spain (5th) have between 21 to 30 centres respectively. This represents 1 centre for every 1.8 to 2.6 million inhabitants. These are followed by two countries (Poland and Belgium) listed 7th and 10th respectively in terms of population. These countries have between 11 and 20 centres performing AS, equating to 1 centre for 1.23 to 2.24 million population.

Four more countries, Austria, Finland, Portugal and Switzerland, listed 15th, 19th, 12th and 15th respectively in terms of population, have between 6 and 10 centres each, i.e. 1 centre for every 0.8 to 1.3 million population.

Twelve countries, with close to a total population of 168 million, have between 2 to 5 centres performing AS. Amongst these countries there is a large heterogeneity in terms of centres per population; for instance, Turkey has one centre for approximately 15 million inhabitants while Estonia has one centre for less than 1 million people.

Finally, two countries, Croatia and Serbia, report one centre performing AS in the country. This represents 1 centre per 6.25 million population.

Therefore, in summary of the above results, this paper demonstrates that the most populated countries in Europe have more centres than the least populated nations. However, when the data is analysed per population, there is good homogeneity between all countries with roughly one centre for 1.3 to 2.2 millions of people, with the exception of Turkey, Croatia and Serbia.

Even from the earliest years of Interventional Pulmonology, AS has been performed by different specialties: pulmonologists, ENT surgeons, thoracic surgeons and radiologists. For instance, JF Dumon, L Freitag and Marc Noppen are pulmonologists while William Montgomery was an ENT surgeon. In addition, numerous thoracic surgeons have been trained in this technique. In many cases this was a skill set learned by the thoracic surgeon to repair

post-surgical anastomotic complications but the skill was additionally used to manage central airway disease. Our survey has demonstrated that AS is exclusively or predominantly performed by pulmonologists in 17 out of the reporting 26 countries and equally performed by both specialty in 3 nations. Otherwise, AS is primarily performed by thoracic surgeons in 3 countries (Estonia, Finland, and Poland). The national delegate from Finland explained this finding by stating that the procedure is only economically viable if performed as a surgical procedure.

Overall it is difficult to explain the variation in terms of AS operator between the European countries. We would suggest that each country should review their AS practices both current and historical as this may assist in explaining the differences in national practices. We can make the hypothesis that these variations are due to a number of factors that not only vary from country to country but also from unit to unit within a country, for example skill set/training of the operator, training in rigid bronchoscopy, accessibility to a dedicated unit, availability and ease of access to general anaesthesia, tradition, and most significantly reimbursement patterns in each health care structure. However, despite these multiple factors it does appear that AS remains within the domain of pulmonologists in the majority of European countries.

In all reporting European countries, AS is performed primarily within the public hospital sector. As per our previous analysis it is unclear why this pattern exists and indeed without precise and exhaustive analysis of individual health services, which differ significantly from nation to nation within Europe, it is impossible to be certain of this result. However we have hypothesized that only large volume private institutions can offer the procedure at a high enough frequency to make it financially viable. In addition, most AS services have developed in institutions with onsite thoracic surgery facilities, these are often not available in medium

sized private hospitals. In our opinion, the presence of a thoracic surgery department is mandatory for a safe AS service and for interventional pulmonology will have patients who require stent placement after surgical interventions and in addition our surgical colleagues are occasionally needed to assist in the care of patients developing complications after endoscopic procedures. In certain countries, current AS reimbursements are not rewarding enough for private structures to develop these techniques.

In the majority of European countries, AS is performed under general anaesthesia and this survey has shown that the procedure is performed exclusively under GA in 16 countries. A further 9 countries have reported that AS can be performed under local anaesthesia. This is most likely explained by physician difficulty in accessing operating room facilities and anaesthetic cover. The lack of rigid bronchoscopy skills remains an important factor explaining why some centres still perform AS using flexible bronchoscopes [35]. For instance, in the UK, pulmonologists do not have easy access to RB as it is generally performed by thoracic surgeons. The recommendations of the British Thoracic Society guidelines [36] states that "the majority of the published case series regarding outcomes and complications of stent deployment are for deployment by rigid bronchoscopy only. Flexible bronchoscopy is an alternative to rigid bronchoscopy to deploy metallic airway stents". Although NICE guidelines [37] state that all cancer centres need to provide access to airway stenting the subsequent British Thoracic Guidelines supported stenting under flexible bronchoscopy guidance. This is despite these guidelines clearly stating the significant benefits of rigid bronchoscopy over flexible bronchoscopy techniques. However they completed the guideline by stating that most clinicians did not have adequate training or a skill set in rigid bronchoscopy and therefore flexible procedures were acceptable. The outcome of these statements is that, pulmonologists in the UK continue to place metallic stents using a flexible bronchoscope with or without GA while surgeons are capable of placing both metallic and

silicone stents using rigid bronchoscopy. It is also important to recognize that rigid bronchoscopy is generally necessary to place stents in patients who have airway obstruction secondary to anything other than routine malignant tracheobronchial disease [37]. Rigid bronchoscopy requires either a state-of-the-art bronchoscopy suite equipped to provide general anaesthesia or an operating room. This scenario is rarely available to pulmonologists in the UK. In addition, few operators have adequate volume to demand a dedicated session in the operating room. As can be expected and in particular at the early stage of service development, referred cases can be irregular and erratic thus leading to uncertainty in procedure scheduling compared to more established and higher volume surgical procedures. Dedicating one or two half-day lists per week for procedures allows for more consistent scheduling, but it does not eliminate the issue of obtaining regular operating room time [38].

This survey demonstrates that RB is favoured in 20 countries and equally utilized with FB in 2 other nations. Only 2 countries favour FB. Physicians with adequate RB skills are probably the primary factor for deciding the type of AS procedure and stent selection. The lack of RB training remains a significant factor, despite the recommendations of respiratory societies. The ACCP guidelines state [39] that "dedicated operators performing airway stenting should have extensive experience in flexible and rigid bronchoscopy and management of central airway lesions. To maintain competency, dedicated operators should perform at least 10 procedures per year. In order to make the best choice for the individual patient, the dedicated operator should be proficient in the placement of both flexible and silicone stents. The ATS and ERS statement [40] wrote: "Stent insertion should be reserved for bronchoscopists who have had ample experience with rigid/ flexible bronchoscopy and endotracheal intubation. In order to maintain competence, 5–10 procedures per year should be performed".

The volume of procedures, in these two recommendations, is probably not enough to maintain competence especially if a unit is utilizing multiple stent types. Our questionnaire has shown

that there are 14 brands available in Europe and in addition 3 countries have locally developed stents available. The survey has shown that 8 countries have more than 10 types of stents available for use while 2 countries have less than 5 stents on the market. Surprisingly, Turkey, which has only 2 to 5 centers performing AS, has 13 different stent types on the market. There is no doubt that companies have focused on this country as an emerging market for future sales.

The most widely available stents in Europe are the Dumon, Polyflex, T-tube, Ultraflex, Dynamic and Silmet stents. Not surprisingly, all of these stents are distributed by the two biggest and historically most active companies in this field: Novatech SA and Boston Scientific. Of the top 3 stents, Dumon (silicone stent) is available in 18 countries, and Ultraflex (self-expandable nitinol stent) is available in 15 countries. These stents are clearly the market leaders. Other silicone stents such as the Polyflex and Noppen stents appear to have a limited market share while the newer brands of fully covered metallic stents such as Aerstent (3rd rank), Silmet (4th rank) and Microtech stents (5th rank) may need more time to establish themselves in this area and ultimately challenge the monopoly enjoyed by the Dumon and the Ultraflex stents.

The choice of a stent, as already stated, relies not on evidence based medicine but primarily on the skills of the procedularist in both FB and RB, on stent availability, on overall commercial strategies and on other multiple subjective and expert-opinions positions.

Unfortunately the growth of AS may be limited by local and national reimbursement strategy more than patient benefit. Overall, 12 countries stated that the procedure of AS is financially viable. Within these countries, financial viability relies on a combination of factors: commercial stent price, favourable stent and procedure reimbursement by local national

institutions or private insurance companies to ensure that the overall financial position for the institution is favourable.

On the other hand, 10 national delegates stated that AS is not financially worthwhile in their jurisdiction. For instance, in Bulgaria, the national delegate wrote that "AS is not reimbursed and patients have to pay for the procedure themselves (about 700 euro for a silicone stent and 1300 euro for a metal stent). The National Health Insurance Fund pays about 450 euros for this interventional procedure. Therefore airway stenting is not a profit-earning activity for our institutions"

The delegate from Croatia stated that "the price for stent placement is less than the cost of the stent itself. By including the price of dilatation and other procedures performed before stent placement, we can reach an amount that is greater than the price of the stent"

In Hungary, the delegate reported that "stents are reimbursed on a case by case basis, strictly by the cost of the stent, without any further reimbursement. It means that it is not worth doing this kind of service". In Portugal, "there is no reimbursement for stents and every time we place a stent the cost comes out of the hospital's budget"

In Romania, AS is not financially viable "because the price of the stent is very high (between 500- 1000 Euro) comparing with the average income of people (200-300 Euro) and the price of the stent is not covered by health insurance. The National Health Insurance scheme does not pay for the interventional procedures and the reimbursement for one bronchoscopy is about 100 – 150 Euro, no matter how complex the procedure is (the same price for diagnostic and interventional procedures)".

The Serbian delegate stated that "our Medical Authorities do not reimburse stenting anymore so our procedure rate has decreased significantly".

There is very little published data regarding the economic value of AS. Lund et al [37] wrote that, in the USA, considering the time necessary for performing advanced therapeutic bronchoscopy, the professional fees are not attractive. The net facility reimbursement largely depends on stent costs and airway stent placement is not reimbursed at competitive rates and may even lead to a net loss for the facility.

The practice management benefits of central airway therapy are probably best obtained by a multidisciplinary airway team within an established cancer centre structure. It is obvious that airway stenting in a pulmonary practice requires expertise with other procedures and a substantial capital investment (e.g., for thermal ablation technology, bronchoscopes, and rigid bronchoscopy equipment).

The finances of stenting and interventional bronchoscopy differ greatly between a multidisciplinary disease management team and a physician in private practice. Most reimbursement schemes will pay for a single procedure irrespective of the complexity of the intervention. For example, if an interventional bronchoscopy procedure requires the destruction of a tumour followed by a bronchoplasty with stent placement in the bronchus, the reimbursement is substantially lower than that obtained if each procedure was performed individually.

The complexities of stenting require both rigid and flexible bronchoscopy facilities and is dependent on the airway disease and stent type required. Unfortunately, the skillset required, training, associated risks, and limited pool of technical competency in performing rigid bronchoscopy are not recognized.

Improved reimbursement for bronchoscopic stent placement is required. These are high risk and complex procedures and are usually performed in patients with poor physiologic reserve and significant co-morbidities and associated poor performance status. However, current

reimbursement is a significant deterrent to airway stenting. Current facility reimbursement rules are a disincentive to developing outpatient procedures and the use of metallic stenting. Currently, it appears that the best business model is a hospital funded or health system-funded regional centre of excellence using a cost-centre approach to evaluate the real return on the investment.

This survey was performed to assess the current status and practices of AS in Europe. There are however a number of limitations in the results. It was not possible to collect precise data with respect to the indications for AS or the total number of stents placed per centre and per country. In some countries (UK, Poland, Denmark), the national delegate was unable to provide accurate data on the most popular stents placed in their region. However, the merit of this collaborative work is to provide a snapshot of AS practice in the 26 European members of the EABIP.

It is impossible to draw accurate conclusions, guidelines or recommendations on AS practice given the limitations of this work and given the heterogeneity in practice and economic variability within countries. The EABIP has no role in the strategic planning of the health services of each country; however the association can support and develop AS within Europe by developing ongoing training programs and courses and ensuring that skills and knowledge are shared amongst centers to create a greater standardization of practices within the region.

Appendix 1: QUESTIONNAIRE

- Country:
- Population of your country?
- Is airway stenting performed in your country? Yes: No:
- If yes, and to your knowledge:

1. How many centers in your country provide this technique?

A : 1	
B : 2-5	
C : 6-10	
D : 11-20	
E : 21-30	
F : >30	

2. Who performs this technique?

	Never	Rarely	Often	Always
Pulmonologists				
Thoracic surgeons				
ENT surgeons				
Radiologists				

3. In which institution?

	Never	Rarely	Often	Always
Public hospital				
Private hospital				

4. Is stenting performed under local or general anesthesia?

	Never	Rarely	Often	Always
Local anesthesia				
General anesthesia				

5. Is stenting performed using flexible or rigid bronchoscopy?

	Never	Rarely	Often	Always
Flexible				
Rigid				

6. Commercially available stents in your country? (please tick more than one if appropriate)

	Yes	No
Ultraflex stents (Boston Scientific, Natick, MA, USA)		
Aero stents (Merit Medical, South Jordan, UT, USA)		
Micro-Tech stents (Micro-Tech, Nanjing, China)		
Aerstents (Leufen, Germany)		
NiTi-stents (Taewoong Medical, Seoul, North Korea)		
Hanaro stents (M.I.Tech, Seoul, North Korea)		
Silmet stents (Novatech, La Ciotat, France)		
Dumon straight stents (Novatech, La Ciotat, France)		
Polyflex stent (Boston Scientific, Natick, MA, USA)		
Noppen stent (Reynders Medical Supply, Lennik, Belgium)		
Hood stents (Hood Laboratories, Pembroke, MA, USA)		
Dynamic Y-Stent (Boston Scientific, Natick, MA, USA)		
Dumon Y-stents (Novatech, La Ciotat, France)		
Montgomery T-Tube (Boston Medical Products, Waltham, MA, USA)		
Other (specify)		

7- Among the commercially available stents in your country, which are the 3 most commonly placed (in decreasing order)?

8- Would you say that airway stent placement is economically worth in your country?

a. Yes
b. No

Why? (Free text to explain):

Figure 1: Number of centers performing airway stenting in 26 European countries

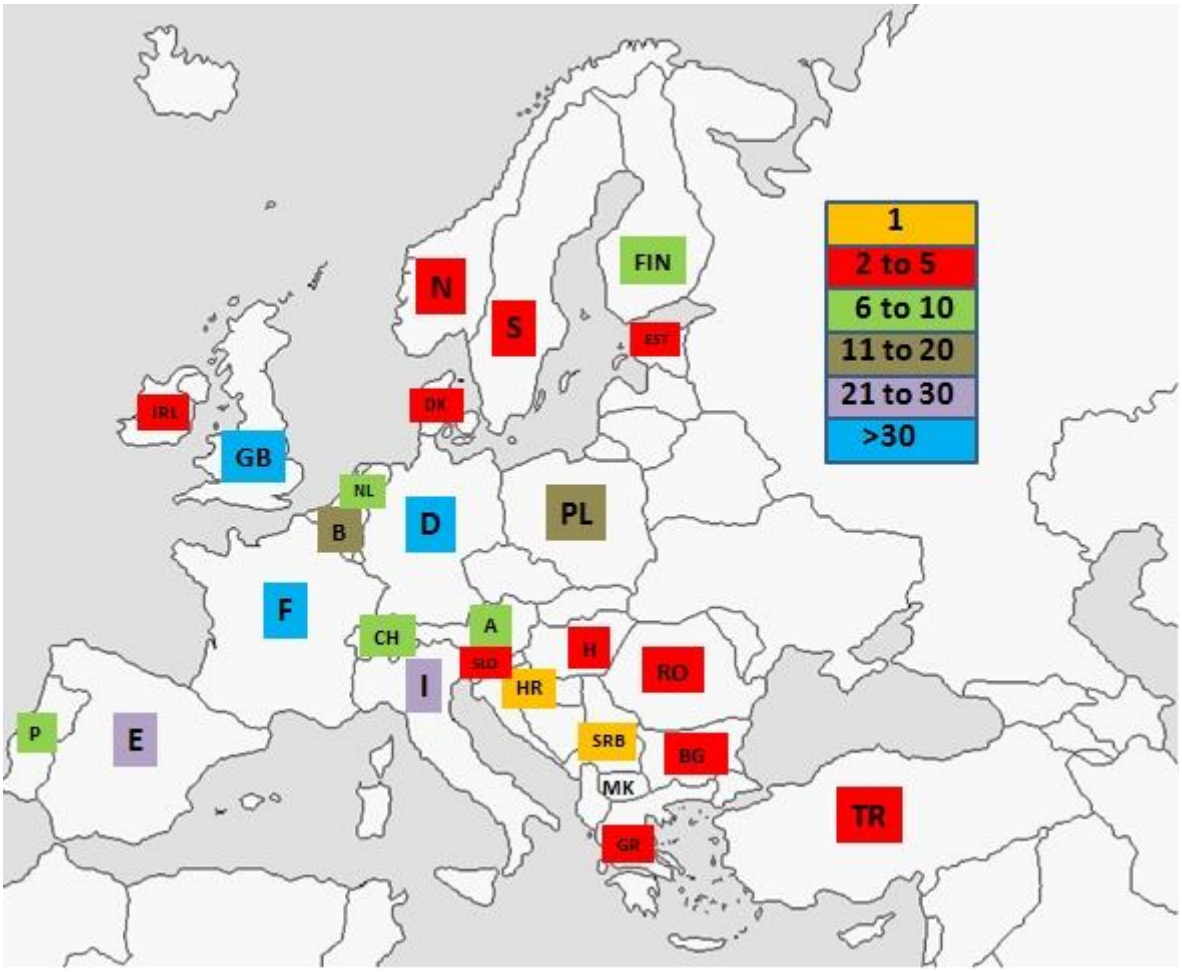

Table 1: Summary of national delegates answers to the questionnaire:

GNI: global net incomes; PCI: per capita incomes; Pul: pulmonologists; TS: thoracic surgeons; ENT: ears nose and throat surgeons; Rad: radiologists; Pub: public centre; Pri: private centre; GA:general anesthesia; LA: local anesthesia; RB: rigid bronchoscopy; FB: flexible bronchoscopy.

	Population (millions) (rank)	GNI (billion dollars) (rank)	PCI (dollars) (rank)	Nb centres	Who	Where	LA/GA	FB/RB	Economically worth
Austria	8 (15)	361 (12)	43901 (3)	6 to 10	Pul>TS	Pub>Pri	GA	RB>FB	No
Belgium	11 (10)	422 (9)	40357 (6)	11 to 20	Pul>ENT	Pub	GA>LA	RB>FB	Yes
Bulgaria	8 (15)	105 (21)	15105 (22)	2 to 5	Pul>TS=ENT	Pub>Pri	GA	RB>FB	No
Croatia	4,5 (22)	79 (23)	17649 (21)	1	Pul	Pub	GA	RB	No
Denmark	5 (20)	211 (17)	37942 (9)	2 to 5	TS=ENT	Pub	GA	RB=FB	Yes
Estonia	1,31 (26)	30 (25)	23801 (17)	2 to 5	TS>Pul	Pub	GA>LA	RB>FB	Yes
Finland	5,3 (19)	195 (19)	37105 (11)	6 to 10	TS>ENT>Pul	Pub	GA>LA	FB>RB	Yes
France	66 (3)	2273 (3)	34305 (12)	>30	Pul>TS=ENT=Rad	Pub>Pri	GA	RB>FB	Yes
Germany	81 (1)	3227 (1)	39841 (7)	>30	Pul>TS= ENT	Pub	GA>LA	RB>FB	Yes
Greece	11 (10)	267 (15)	24788 (16)	2 to 5	Pul>TS=ENT	Pub>Pri	GA>LA	RB>FB	No
Hungary	9,8 (13)	197 (18)	19820 (20)	2 to 5	Pul>TS=ENT=Rad	Pub	GA	RB	No
Ireland	4,6 (23)	190 (20)	39398 (8)	2 to 5	Pul>TS	Pub	GA>LA	RB>FB	No
Italy	61,7 (5)	1805 (4)	29264 (13)	21 to 30	Pul=TS>ENT	Pub>Pri	GA	RB	Yes
Macedonia	2 (24)	26 (26)	10790 (25)	0	NA	NA	NA	NA	NA
Netherlands	17 (9)	696 (8)	41256 (4)	6 to 10	Pul	Pub	GA	RB>FB	Yes
Norway	5 (20)	282 (13)	54820 (1)	2 to 5	Pul>ENT	Pub	GA	FB>RB	No
Poland	38,3 (7)	814 (7)	21228 (19)	11 to 20	TS>Pul=ENT	Pub	GA	RB>FB	MD
Portugal	10,5 (12)	243 (16)	22500 (18)	6 to 10	Pul	Pub>Pri	GA	RB>FB	No
Romania	20 (8)	281 (14)	13000 (23)	2 to 5	Pul	Pub	GA	RB	No
Serbia	8 (15)	80 (22)	11161 (24)	1	Pul	Pub	GA	RB+FB	No
Slovenia	2 (24)	56 (24)	28416 (15)	2 to 5	Pul=TS	Pub	GA	RB	Yes
Spain	48 (6)	1389 (5)	29096 (14)	21 to 30	Pul=TC > Rad	Pub>Pri	GA	RB>FB	No

Sweden	9,5 (14)	394 (10)	40499 (5)	2 to 5	Pul>ENT	Pub	GA>LA	RB>FB	Yes
Switzerland	8 (15)	370 (11)	45934 (2)	6 to 10	Pul>>ENT	Pub>Pri	GA>LA	RB=FB	Yes
Turkey	75 (2)	822 (6)	10184 (26)	2 to 5	Pul>TS	Pub>Pri	GA	RB>FB	Yes
UK	63,7 (4)	2378 (2)	37306 (10)	>30	Pul=TS>Rad=ENT	Pub>Pri	GA=LA	FB=RB	MD

Table 2: Commercially available as well as the 3 most placed stents per country.

	Silicone stents						Hybrid stents	Metallic stents								
	Dumon	Polyflex	Noppen	Hood	T-Tube	Dumon Y	Dynamic Y	Ultraflex	Aero	Micro-Tech	Aerstent	Hanaro	Silmet	NiTi	Others	Total
Austria	2	x			x	x	3	x	x	x	1	x		x		11
Belgium	1	x	x		x	x	x	2		3			x			9
Bulgaria	1	x			2	x	x	x		3						7
Croatia	1	x				x	x	x			3	x			Egis (2)	8
Denmark	x			x	x	x	x	x	x	x	x					9
Estonia	3	1			x	x	x	x		2					Egis	8
Finland	x	x			x	x	x	1		x			x	2		9
France	1	x		x	x	x	x	3	x	x	x	x	2	x		13
Germany	1	x	x		x	x	x	2		x	x	x	x	x		13
Greece	1	x			x	x		x	3	x			2			8
Hungary	1					x	3	x					2	x		6
Ireland	2	x				x		1	x				x	3		7
Italy	1	x			x	x	x	2					3			7
Netherlands	2	x	x		x	x	x	3	x	x	1	x	x			12
Norway	3			2	x			1								4
Poland	x	x			x	x	x	x		x			x			8
Portugal	2	x		1	x	x		3				x	x			8
Romania	1	x			x	x		2					3		Enbio	6
Serbia		2			x		3	1								4
Slovenia	1	3			x	x	x	2					x			7
Spain	1	x		x	x	x	x	2	x		3		x			10
Sweden	2	x		x	x	x		3		1	x		x	x		10

Switzerland	2	x			x	x	x	3		x	x		x			9
Turkey	1	x		x	x	2	x	x	x	3	x	x	x		Enbio	13
UK	x	x			x	x	x	2					x	1		8
Total	24	23	3	7	22	23	19	24	8	13	10	7	18	6		

Table 3: Statistical analysis between global net incomes, per capita incomes and number of centres per counrtry.

GNI (billions USD)

Variable	Number of centers	*N*	*Mean*	*Std. Deviation*	*Minimum*	*Maximum*	*Value*	*Sig.*
	30+	3	2.63	0.523	2	3		
	21 to 30	2	1.60	0.294	1	2		
	11 to 20	2	618.00	277.186	422	814		
	6 to 10	5	373.00	195.618	195	696	3.453	0.018
	2 to 5	11	257.73	215.529	30	822		
	1	2	79.50	0.707	79	80		
	0	1	26.00	NA	26	26		
	Total	26	235.85	240.971	1	822		

		GNI rank	**PCI rank**
Number of centers	Correlation Coefficient	0,822	0,466
	Significance	0,000	0,016

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