

Opportunities and challenges for thoracic surgery collaborations in China: a commentary

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Abstract: Through a unique combination of factors—including a huge population, rapid social development, and concentration of resources in its mega-cities—China is witnessing phenomenal developments in the field of thoracic surgery. Ultra-high-volume centers are emerging that provide fantastic new opportunities for surgical training and clinical research to surgeons in China and partners from other countries. However, there are also particular shortcomings that are limiting clinical and academic developments. To realize the potential and reap the rewards, the challenges posed by these limitations must be overcome. Thoracic surgeons from Europe may be particularly well-placed to achieve this through multi-dimensional exchanges with their Chinese counterparts.

Keywords: China; Europe; collaboration; clinical research; training; thoracic surgery

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“Ici repose un géant endormi. Laissez le dormir, car quand il s'éveillera, il étonnera le monde.”

“Here lies a sleeping giant. Let him sleep, for when he wakes up, he will shock the world.”

—Napoleon Bonaparte on China [1803]

This is not a scientific paper. This is an opinion piece discussing a personal perspective on one of the potentially most important trends emerging in thoracic surgery today. However, this trend is not about an exciting new operative technique, or a mind-boggling technological breakthrough. It is about the ascent of a continent in general: Asia, and of China in particular.

It is impossible today to go through a single day without reading or hearing about the growing influence China now has on the world. This ranges from its massive industrial capacity to its ambitious economic ambitions (1-3). It encompasses its impact on international security as well as its influence on global environmental issues (4-6). It should therefore come as no surprise that China is also progressively demonstrating to the world that it has a presence in medical practice worldwide that cannot be ignored.

China's “coming of age” in thoracic surgery is already being felt in Europe (7). At the 23rd European Conference on General Thoracic Surgery held in June 2015 in Lisbon, Portugal, there were more attendees from China than from any other single country—including every European country. Over the last two years, there were more submissions from China to the *European Journal of Cardio-Thoracic Surgery* than from any other single country on the planet (8).

So what does this growing Chinese presence in international thoracic surgery circles mean for Europe and the world? Perhaps it means the same as any new development in our specialty—whether it is the latest minimally invasive surgical approach, or an expensive new instrument. Perhaps it means that there are exciting new opportunities and challenges for those intrepid enough to seek them.

What China offers

If what China had to offer the medical world needed to be summed up in one word, then that word would be: people.

It may seem tedious to repeat the cliché that China is the world's most populous country (9). Nonetheless, the fact that one in every five people on earth lives in China remains a very important statistic. The sheer volume of humanity that experiences disease and requires healthcare in this country means that the lessons learned here can have far-reaching implications for the rest of the world (7,10).

Furthermore, it is not just the numbers alone that are noteworthy. China is undergoing a rapid urbanization, with an internal migration of people moving from a rural environment to an urban one happening at a rate unprecedented in human history (11,12). This has several implications.

First, the risks to health that they are exposed to are becoming ever closer to those seen in the “developed” Western world. Unlike fellow population giant India where thoracic surgery is overwhelmingly a specialty involved with managing inflammatory (rural) conditions, China has a pattern of thoracic surgical disease that closely matches that in the West (lung cancer predominates) (13-15). The experiences learned in China are therefore much more relatable to Western surgeons than those gained in other non-Western countries.

Second, the urban environment fosters better education and access to information (11,12). The burgeoning middle class in China—even larger than that of the United States—is very knowledgeable about basic healthcare essentials and has easy access to both healthcare information (via the internet) and medical facilities at very low cost (by Western standards) (16). It is not a wonder that the rate of detection of lung cancer at an early stage in this supposedly “developing” country already rivals that in many economically more advanced countries in the West (17,18). Often it is simply a matter of a well-informed populace having access to CT scanning that they can afford. The knock-on effect is that patient demand and expectations are also more likely to mirror those seen in Europe and the West (11,12).

Thirdly, the concentration of patients in large conurbations lead almost inevitably to the major healthcare institutions in these mega-cities accumulating vast clinical experience and expertise (11,15). They quickly become centers of excellence with clinical volumes equalling or surpassing those anywhere else in the world, and clinical skillsets become world-class (15,19,20). For the thoracic surgery world, that means that their clinical research output can no longer be dismissed and much can be learned from their achievements. For folk within China, that means

that even more patients are increasingly attracted to seek treatment in those major centers (11,12). In the two largest thoracic surgery units in Shanghai, the number of major lung resections performed annually has effectively doubled in the space of the last 2 years alone (14,15,19,20). This positive feedback loop of excellence attracting every greater case numbers which further drives improvements shows no signs of abating at the time of this writing.

The net result of the above factors means that China has now much to offer Europe and the rest of the world in the field of thoracic surgery. These can broadly be categorized into two areas: surgical training, and clinical research.

Opportunities in training

The Shanghai Pulmonary Hospital now has a fairly legitimate claim to be possibly the largest thoracic surgery unit in the world (15,20). In 2015, 8,320 thoracic surgical operations were performed there. Of these, around 80% are performed using video assisted thoracic surgery (VATS), and around half of those are performed using a Uniportal approach. This equates on average to 30–40 operations on every working day of the year. The Shanghai Chest Hospital, a cross-town friendly rival, also boasted of over 8,000 thoracic surgical operations in 2015 (19). On top of that, a good number of other major hospitals in Shanghai also offer thoracic surgery, often with volumes unimaginable in Europe. And all that is just in one city: Shanghai. Huge volumes of operations are also being performed in the other Chinese mega-cities, including Beijing, Guangzhou, Chengdu and others (14). It has been estimated that over 700,000 patients from across the country enter Beijing every day to seek medical care of one sort or another.

While such staggering numbers may create headaches for healthcare administrators, they are a delight for another group: those wishing to train in thoracic surgery. When a single hospital can provide up to 40–50 operations a day to observe, assist in, or perform, a trainee can gain an incredible amount of live experience in a very short period of time (15,20). Moreover, because so many operations are being simultaneously performed by different surgeon teams in different operating rooms, the trainee can see not just one style or approach, but a variety—allowing a much, more balanced perspective of thoracic surgery than would normally be possible just shadowing a single surgeon mentor.

The emergence of these ultra-high volume units in China is therefore opening up a modality of surgical



Figure 1 Thoracic Surgery experts have been welcomed to China for years to share their experiences. From left to right: Chia-Chuan Liu (Taiwan); Diego Gonzalez Rivas (Spain); Gening Jiang (Shanghai Pulmonary Hospital); Alan D. L. Sihoe (Hong Kong); Chang Chen (Shanghai Pulmonary Hospital)—taken at the Shanghai Pulmonary Hospital, Oct 2013.

technique training hitherto not seen in traditional training in the West (21–23). Namely, it is now possible to offer short-duration, high-volume, clinical immersion training. Traditionally, a clinical attachment in the Western setting may involve an attachment at a renowned hospital for weeks to months, during which a trainee may hope to see zero to a few operations each day (21–23). What is demonstrated is often simply whatever patients happen to come in requiring operation that day. In a center offering dozens of operations each day, the variety of pathologies and of surgical approaches demonstrated becomes much greater (15,19,20). Furthermore, within a short attachment of simply a couple of weeks, it is possible to see a number of operations only possible after months of attachment elsewhere. Having such intensive attachments benefits not only the trainee (who doesn't have to take so much leave) but also the trainee's parent unit (which doesn't have to cope with one less staff member for quite so long) (23).

A large unit such as the Shanghai Pulmonary Hospital would be running such short-duration, high-intensity courses on a very regular basis for thoracic surgeons from across China (20,24). Almost every month, trainees and even more senior surgeons from across the country could come to learn the latest VATS and uniportal techniques. Because the attachment duration is short thanks to the high daily volumes, new trainees can be brought in frequently, ensuring that training can reach as many centers across the country in as time-efficient a manner as possible.

In recent years, this concept has expanded across national

borders. Units such as the Shanghai Pulmonary Hospital are now welcoming foreign trainees and surgeons from across the globe to come to learn the latest minimally invasive techniques (15,20,24). Over the past 2 years, over 100 surgeons and trainees from across Europe, the Americas, Africa, the Middle East, and all of Asia have come to Shanghai for immersion training in VATS. Many come for a couple of weeks, but some stay for up to half a year or more (25). For the latter, the hands-on surgery they are allowed to experience exceeds what they would have gotten in their parent units in Europe. Moreover, the surgical training is now often supervised by internationally recognized experts (*Figure 1*). Dr. Diego Gonzalez Rivas—world-famous for the uniportal VATS approach—is now the Course Director for a number of Uniportal VATS Training Courses held each year at the Shanghai Pulmonary Hospital (24,25). Each course lasts 2-weeks and includes wetlab hands-on experiences at the world-class clinical training facilities available in Shanghai (*Figure 2*). These courses are invariably popular and over-subscribed.

The success of the Uniportal courses raises another very important concept: that of “modular” training in thoracic surgery (26). Traditionally, a trainee would attach to a large unit in the West to learn “thoracic surgery” in general for many months, hoping to see a wide range of pathologies and management in that time (21–23). However, with short-duration, high-intensity immersions, it now becomes possible for a surgeon to take maybe a couple of weeks off from work and go to a single ultra-high-volume center to



Figure 2 Surgeons and trainees from around the world visit a state-of-the-art critical care training facility during their Uniportal VATS Training Course at the Shanghai Pulmonary Hospital. VATS, video assisted thoracic surgery.

learn just one specific item that that center specializes in or is most famous for. A surgeon may choose to spend 2 weeks in hospital A learning uniportal VATS, then 4 weeks later in the year in hospital B learning tracheal surgery, then maybe another 2 weeks in hospital C learning about non-intubated thoracic surgery (26). The large volumes in these large Chinese centers allows a surgeon to potentially select “modules” of training in specific areas, tailoring the training to suit his/her own practice needs and time available off work at the parent unit.

Another upshot of the sheer patient volumes in China is the rapid accumulation of a vast video library of operations (25,27). It is an undeniable trend around the world that many surgeons now learn or refresh their memories about certain operations through watching videos online. The pros, cons and potential hazards of this practice are beyond the scope of this article, but there hardly exists a thoracic surgeon today who has not watched an online surgical video at one time or another. With the large video libraries now building up in China from the large numbers of operations, the “Chinese style” of VATS is now increasingly spreading in influence (25,27).

So what does all of the above mean for thoracic surgeons in Europe?

For young trainees in Europe, it obviously means there are now great opportunities to come to train in China (21-23). They can observe more in a shorter space of time, and they can tailor their training more specifically to suit their needs and schedule (26). This is on top of gaining and invaluable exposure to Thoracic Surgery overseas in a foreign land—that still has recognizable patterns of disease not unlike

those in Europe. There is an added bonus for the younger surgeon in the fact that costs of living in China are generally lower than in Europe, and many doctors in the larger cities can speak quite good English.

For more experienced surgeons, there is the chance to come to China for a relatively short time to learn a specific skill or technique—such as uniportal surgery, for example (26). The other potential opportunity for the avid teacher is perhaps to partner with a Chinese hospital to run advanced training courses in China (28). The marriage of local patient volumes with international expertise promises to make available very attractive training opportunities for trainees in China and overseas.

Opportunities for research

Having large patient numbers also means “big data”. A great volume of clinical information can potentially be collected in a relatively short space of time. This is invaluable for clinical research (29-31).

Retrospective studies should theoretically be easy. Even in a single institute in China, accumulated data for more common diseases (for example lung or esophageal cancer) can number into hundreds or thousands. The opportunity to identify broad demographic or clinical trends is tremendous (29,30). With such a large catchment of cases, the chance to find a substantial series of rarer diseases also increases greatly. This would potentially allow ready analysis of uncommon conditions that would have taken many years or many centers to gather sufficient information about in other countries.

Prospective studies are of course where the greatest interest lies. With so many operations being performed every year, there are a number of great opportunities (31). First, clinical trials can be completed in a much shorter time than possible elsewhere. Second, in a given study period, greater numbers of subjects can be recruited allowing a study even greater power and accuracy. Third, it is possible to run trials with more concurrent study arms for even more detailed analyses.

As mentioned above, having many operations in a single hospital in a single day also means that there is potentially more variation in surgical approaches being used (29-31). This further gives a natural advantage if different study approaches need to be compared, as experts of different techniques are readily available and yet perioperative management within a single institute can be kept relatively homogeneous to minimize other confounding variables.

The large operation volumes not only provide data, but if the proper mechanisms and infrastructure are established, the prospects for developing very powerful tissue banks are also tremendous (32,33). Many of the larger hospitals in China are already banking tissue. However, the challenge would be to systematize the collection and regulate the storage and access protocols. Considerable work remains to be done in many Chinese hospitals in order to make tissue banks a strong, viable producer of research output.

To support the above potential for research, China also has advantages beyond sheer patient numbers.

The first is the staff. China produces a remarkably high proportion of frontline clinicians with academic postgraduate degrees (14,34). This may be partly due to the perceived career structure within China for doctors, and the phenomenon has also raised issues in surgeon training that have not yet been fully reconciled within the country (34,35). For example, after receiving an academic degree, many young surgeons go on to pursue clinical service exclusively in their careers and neglect research in comparison. Nevertheless, the upshot of having many scientifically trained academics who are now surgeons means that there is a hypothetically large talent pool whose potential to produce good research is still not fully realized. The staffing advantage is not only in terms of doctors. Nurses are also well-trained and many also have academic degrees (36). Each of the larger hospitals also maintains relatively large teams of research staff—both in terms of post-graduate fellows and also research assistants. The availability and quality of Chinese research personnel is well recognized internationally, with many Chinese scientists now working

in major laboratories around the world. Within China, research staffs in the hospitals are on hand, managing everything from running sophisticated experiments to simply phoning patients to check on follow-up status. Having well-qualified staffs at all levels means that any collaboration with European and other foreign colleagues will be much smoother.

The other key advantage is that China's enormous national resources are being mobilized to boost medical research (11,37,38). China's investments in medical research are growing at a pace that far outstrips that in the West. There have been estimates that medical research spending in China could soon overtake that in the United States within the coming 10 years (37). What this means for European partners is that any collaborations will be supported on the Chinese side by well-funded departments, well-equipped state-of-the-art laboratories and facilities, and political backing. Lack of material resources is unlikely to be a limiting factor for any planned project.

What China needs

Having outlined the bright prospects China has to offer, it is time to return to a starker reality. Although China offers fantastic promises in terms of quantity, in clinical medicine it sometimes fails to deliver in terms of actual quality.

This is especially easy to demonstrate in terms of scientific research. Chinese authors have published 230,000 medical papers in the leading scientific journals included in the Scientific Citation Index (SCI) from 2010 to 2014, ranking second in the world in this statistic (38). However, when one scratches beneath the surface, problems appear. Of the many papers published by China in scientific journals, only 0.56% were amongst the top 1% of most-cited papers—an indicator of the quality of the papers (39). This percentage was less than half of what was achieved by Western countries, such as the United States (1.19%), the United Kingdom (1.44%), or Germany (1.21%). In Cardiothoracic Surgery specifically, the situation is similar. Chinese authors submitted more papers to a leading cardiothoracic surgery journal than any other country, accounting for over 16% of all submissions in 2014 (8). However, Chinese-authored papers only ended up accounting for barely 10% of all papers ultimately published by that journal. In other words, the rate of rejection of Chinese papers was proportionately higher than most other countries. This again reflects a simple truth: quantity does not always equate with quality.

It is conceivable that this suspicion of disappointing

quality can be extrapolated from clinical research to clinical practice. Do all those claims of vast patient numbers being operated on in China really mean that all the operations were being done well? Certainly, foreign attendees of the training courses in Chinese hospitals mentioned above virtually all attest to the very high standard of technical skill in the operating room (15,24,25). But this is subjective, anecdotal evidence. For objective evidence, one must look at published clinical data. When one reads the results from China, they again almost invariably paint a very rosy picture with great outcomes (14,38). However, is this publication bias? Moreover, are the publications plagued by the inadequate quality as suggested above, and are they believable?

There are obviously many quality issues that must be addressed in China in the realms of both clinical research and clinical practice. Until these are addressed, it is difficult for Chinese thoracic surgery to become fully established on the international stage and gain the recognition it hopes for. Until these are addressed, it is difficult for European surgeons wishing to work with or in China to find common ground for collaboration. The following are a few of those issues that observers from within and without China most commonly identify as limitations to the quality of thoracic surgery in China.

Guidelines and auditing

Clinical guidelines exist in China—as they do in Europe and elsewhere in the Western world (14). Chinese society as a whole does respect such guidelines. However, one of the key differences with the West is that the concept of auditing is not well ingrained (40). Clinical audit is defined as “a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change” (41). While guidelines containing criteria as set by “experts” exist, mechanisms for comparing practice against those guidelines generally do not. The reasons why this is so are complex and beyond the scope of this simple article. It may have something to do with the political history of modern China: where official targets and directives are set for the economy and units across the country, and those units in the past have reported “compliance”—even when those targets were ultimately not met in reality (42).

Regardless of the reasons, it is common to find Chinese clinical reports stating that “all operations were completed successfully with no complications”, in a similar fashion as

a work unit would report to the party commissar. What is less easy to find are establishment of quantified benchmarks for clinical practice, and systematic comparison of achieved outcomes against those benchmarks. This is a standard practice in Europe, but conspicuously rare in China (43). The lack of a culture of objective auditing of clinical performance in China is a weakness, and it undermines efforts to portray the quality of surgery and to improve it. It also adds difficulty to collaborations between surgeons in Europe and China by obscuring assessment of clinical quality.

Patient follow-up

Most Chinese thoracic surgeons recognize that one of the main sources of criticism of their publications in the West has been the lack of good clinical follow-up. In the West, a patient typically is followed up regularly after any thoracic operation by the operating unit or by other primary care physicians (43). This follow-up is often systematic, and involves recognized steps to exclude morbidity and recurrence of disease. For example, a lung cancer patient may be followed up with routine schedule imaging at intervals defined by guidelines to rule out recurrence.

In China, however, this is often not possible (44,45). As noted above, many patients receiving surgery in a hospital often come from very far away. It is often not convenient to journey across the country to attend a follow-up. Furthermore, given that many patients are relatively poor, they may often refuse the travel back for follow-up because of the costs involved. Primary care is also underdeveloped in China, and sharing of clinical information between hospitals in the big city (where the operation was performed) and in the provincial town (where the patient lives) is also limited. This means that any follow-up in the patient's place of residence is also often unreliable or of inconsistent quality.

For clinical studies, most major big city institutes can only rely on calling patients by phone as the primary (or only) means of follow-up (44,45). Cellular telephone communication is actually well developed in China, and claims of “100% follow-up” of all patients may actually be true as they can often be readily reached. However, a telephone conversation is never the same as a proper clinical evaluation. Other than ascertaining that the patient is still alive, relatively little useful or reliable clinical information can be obtained. For example, how can a patient tell his telephone interviewer whether or not he/she has an

asymptomatic recurrence of cancer? The telephone follow-ups also tend to be conducted only when it is decided to perform a “study”. Hence, those telephone interviews do not occur at regular scheduled intervals after surgery, but only at a fixed time—giving rise to a cross-sectional survey that includes patients at very different intervals after their operation.

The lack of good clinical follow-up is a major weakness in clinical studies in China, and seriously restricts the ability of many Chinese units to look at longer-term clinical outcomes. That is one of the reasons why many papers from China can still only focus on immediate postoperative outcomes (7). To improve the situation, however, is no easy task. Developing a system like those in many European countries to allow patients to have regular specialist follow-up would require a massive overhaul of the healthcare system—and that may be a prohibitively big step to currently undertake.

A possible interim solution may be to establish better prospectively collected clinical databases in China (46). Even if patients cannot physically return for follow-up, at least the telephone interviews can be conducted at defined intervals, and data collection could be conducted systematically according to the data field requirements in the database.

Over-reliance on reporting bland data

In many Chinese publications in thoracic surgery, the results section is often blandly formulaic. The mortality and morbidity rates are reported, as are distribution of surgical indications, operating times, blood loss, lengths of stay, and a vague claim that ‘all patients were satisfied’ with their operations. The conclusion is therefore that surgical approach “X” is “safe and feasible”. For thoracic surgeons in China, this is a perfectly reasonable article because that is how most clinical papers in Chinese medical journals are written up. However, for Western readers, reviewers and editors, such writing is painfully boring (7,8,47). Worse, such papers often appear to be little more than a boastful advertisement of what operations have been done in the authors’ own unit. The papers may get published because of the sheer size of the cohorts involved—including surprising numbers of rare diseases, for example. However, they report little that is novel or “interesting”. It is often not surprising that—as alluded to earlier—citations of Chinese papers are often relatively few (47). It needs to be appreciated that readers are simply not that excited by “look at what I did”

papers.

In contrast, many Chinese authors remain envious of how European authors appear to easily publish clinical papers in the best journals despite often small case numbers. The key to success was not in relying on large volumes alone, but in delivering an important message (48-51). To make a study appeal to readers, reviewers and editors, it must say something that is clinically relevant, intellectually interesting, and/or practically useful. This can be achieved without lots of patients. What it does require, however, is to ask the right question (48). If the authors ask a question that many readers have wondered about, and then they set about providing the answer through a well-designed study, the chances are that the results will be relevant, interesting and/or useful. This is something that European surgeons have been doing very well, producing high-quality, frequently-cited papers (23,50,51). They seem to better understand that readers are more excited by papers that say: “You know that problem we all had? I think I may have found a solution!”

To improve Chinese papers, one key step is to stop the over-reliance on sheer volume of data alone. The study should never be to start with the intention of “getting an SCI publication”. It should also not start with the intent to simply advertise their own unit’s prowess. Instead, it is necessary to look at what unanswered clinical questions there may be, and using their clinical data to answer it (48,49). In this regard, European surgeons have many things to teach their Chinese counterparts (50,51).

Cultural misunderstandings, not linguistic deficiencies

A common belief among authors whose native language is not English is that when their papers are rejected, it is because of poor English. This is actually not true. Most—if not all—good journal editors can see past linguistic deficiencies and identify whether the science behind the words is worthy of publication. Nonetheless, this misconception is often held in China. The problem with this misconception is that by blaming their own poor English (or the reviewers’ intolerance of it), the authors fail to see that it is the deficiencies within the paper that led to the rejection. In turn, this means that the authors may not realize where they need to improve.

However, although language is not the barrier, there is a chasm between Western and Chinese authors that is relevant to whether a paper is accepted (7). That chasm is not linguistic, but cultural. Western peoples (including

surgeons) have some deeply held beliefs and conventions that an Asian author may not understand, and vice-versa (7,52,53). When the misunderstanding appears in a medical paper or in the way an operation is performed, then it is easily misconstrued as a lack of quality (instead of a difference in beliefs or conventions). To illustrate this, one commonly encountered example is in surgery for primary pneumothorax. In most European countries, bullectomy is almost invariably accompanied by pleurodesis (either mechanical or chemical) (54). However, in East Asian countries like Japan, Korea and China, bullectomy alone is commonly done and pleurodesis omitted (55). A Chinese author may write about bullectomy only as a matter of course as it is the norm in his/her country, but a Western reviewer not familiar with this would be aghast at this “inadequate” surgery and be inclined to reject the paper out of hand. Another example is when an Asian author writes about the cosmetic result from minimally invasive surgery, and claims that the improved appearance may appeal especially to “female patients” because they “care more about appearance” (56). This kind of writing may actually be quite normal and innocent in East Asian cultures, even amongst female authors and readers. However, in the eyes of a Western reviewer, this would be blatantly sexist and could be reason alone to reject the paper outright (57).

The solution is quite simple: the chasm can be bridged through more cross-cultural exchanges. If the aim is for Chinese surgeons to publish in SCI journals, then the onus is certainly on the Chinese authors learning more about Western and European conventions. They must leave behind the notion that writing a paper for an SCI journal is simply a matter of translating a Chinese medical journal paper into English. Instead, they need to realize that writing for an international journal often requires a completely different set of rules to appeal to the different culture of international reviewers and readers. That can only be done through getting to know European counterparts better (7).

There is one further, more sinister, aspect of the cultural gap between East and West in academic medicine. In 2014, *BioMed Central* retracted 42 papers submitted by medical researchers from China (58,59). This was an unprecedented move, and was a humiliation for many major institutes in China. The retractions, it turned out, were almost entirely due to a systematic abuse of the peer-review system. *BioMed Central* explained the retractions by saying that: “a systematic and detailed investigation suggests that a third party was involved in supplying fabricated details of potential peer reviewers for a large number of manuscripts

submitted to different journals” (58,59). In China (as in some other Asian countries), a number of third party agencies have thrived by selling language-editing and manuscript “preparation” services to clinician authors. It appears that these agencies have often “suggested” reviewers to journals for the papers they submit—a practice normally welcome by some journals. Regrettably, the reviewers suggested by the agencies were sometimes fraudulent or fabricated. The shocking issue in this episode is that so many different institutes across China were involved (even though they may not have known of the action by the agencies). In a landmark Editorial, *The Lancet* commented that: “This episode suggests that misconduct might not be limited to isolated individuals or institutions, but rather that it could have infiltrated the country’s research culture more widely” (59). This editorial clearly locates a serious problem at the fundamental level of national culture. A major change in that culture is a pressing necessity, and that may certainly require assistance through greater exchanges with Europe and the West (59).

How Europe can play a key role

The above discussions identify what colleagues in Europe may gain by interacting with China in the field of thoracic surgery. China offers incredible opportunities in surgical training, and exciting prospects for clinical research. However, the situation in China is not perfect, with major deficiencies also as considered above. Therefore, to access the potential rewards in China, colleagues in Europe may be invited to assist in solving some of the deficiencies. There appear to be three broad categories where Europe can play a very substantial role in this.

Systemizing clinical practice

While Chinese surgeons are proud of their operative skills, their experience in regulating perioperative practices lags far behind Europe. Europe has many years’ of experience honing authoritative practice guidelines, designing effective clinical pathways, and performing objective clinical auditing (43,46,52,54,60-62). These are driven at the institute level, but also but national authorities. More importantly, this systemization of practices has often been supervised or guided by international professional bodies, such as the European Society of Thoracic Surgeons (ESTS) (52,62). The concentration of expertise in bodies such as the ESTS means that access to it is readily available. The authority of

the European organizations means that their experience and guidance are well respected in China. They are therefore ideal vehicles to aid Chinese Thoracic Surgeons in designing and maintaining their own clinical systems. These would include:

- (I) Setting up clinical pathway algorithms for perioperative care (54);
- (II) Regulation of surgical training (including standard setting) (23,28);
- (III) Accreditation of thoracic surgery units (63);
- (IV) Establishment of clinical practice benchmarks on a national (not institutional) level (43,64);
- (V) Auditing of clinical performance against those benchmarks (60);
- (VI) ... and others.

Europe is perhaps better suited to assist in the process of refining clinical systems in China than other places, including the United States. Although both Europe and America possess outstanding experience in the items mentioned above, Europe may prove more accessible to surgeons in China. American guidelines and benchmarks are usually framed around the homogenous healthcare system of a single nation (the United States). However, American measures of performance are not always directly compatible with Asian ones (65,66). For example, the importance of remuneration considerations and urgency of discharge away from the surgical ward that are ubiquitous in American practices are relatively minor issues in East Asian practices. In Europe, practices do tend to match American practices more than Asian ones. However, the need to accommodate the many differences between the constituent nations within Europe gives bodies such as the ESTS considerably greater powers of inclusiveness and understanding of foreign cultures (64). It is no accident that European conferences in Cardiothoracic Surgery attract more delegates and speakers from Asia than equivalent American ones. The bridge between China and Europe may possibly prove an easier one to cross for all parties than a bridge across the Pacific.

Raising the academic standard

As discussed above, there are many shortcomings with Chinese academic medicine (despite its many strengths). The good news is that those shortcomings all have potential solutions. These solutions in turn can be greatly aided by having input from European colleagues.

The issues of auditing and lack of follow-up, for example,

may be addressed by establishing world class clinical databases. In this area, Europe has a huge experience. The ESTS database is a paragon for being comprehensive, stringent, and accessible, and has acted as the cornerstone for many important clinical studies over the years (61,62). The experience from Europe would be invaluable in helping set up similar databases in China. Individual centers in China already have their own databases, but occasionally suffer from some flaws. The databases are sometimes institution-specific and exchange of data for collaborations may be difficult. Also, many Chinese clinical computer systems still rely on Chinese language syntax entry of information, making extraction of information subsequently very tedious if not impossible. European experience could help in linking databases, standardizing definitions and data quality across institutes—possibly leading to an eventual national database. The European experience working across many nations may also prove important in transforming data from a language-syntax form to a digitalized format that facilitates data retrieval and inter-institutional collaborations (61,62).

The Chinese issues of uninteresting studies and cultural misunderstanding would also be perfectly addressed by greater exchanges with European friends. The European flair for identifying stimulating clinical questions, and the European code of strict adherence to the highest standards of professionalism and ethics in research are all things which Chinese surgeons should learn and embrace (28,48,52,59). These qualities can be taught. The ESTS, for example, conducts highly successful workshops in Medical Writing to instill in young surgeons the skillsets and principles needed to craft good scientific papers (28). Although some Chinese workshops do exist, it would be perhaps more productive for Chinese surgeons to attend those taught by European experts so that European research culture can rub off on them. Ideally, European friends could come to China to help in this. The above qualities could also be shared outside the classroom. Simply by engaging in collaborative research efforts with Chinese counterparts, European surgeons can already demonstrate many aspects of good academic practice (66). This is the classic ‘win-win’ situation: where European friends stand to gain access to Chinese patient volumes for research, and Chinese clinicians can learn from some of the best academic surgeons in the world.

Providing the platforms for exchange

One of the best aspects of the thoracic surgery community



Figure 3 The 23rd European Conference on General Thoracic Surgery, held by the ESTS in June 2015 in Lisbon, Portugal was well attended by some of the leading thoracic surgeons in China. This was a valuable opportunity for Chinese and European experts to learn from one another. From left to right: Diego Gonzalez Rivas, Jianxing He, Toni Lerut, Haiquan Chen, Gonzalo Varela, Gening Jiang, Lunxu Liu, Alan Sihoe, Long Hao, Frank Detterbeck, Keneng Chen. ESTS, European Society of Thoracic Surgeons.

in Europe is that it already contains many platforms for international exchanges between surgeons of different countries in Europe. Bodies such as the ESTS and others offer a wide range of platforms, including: annual meetings; technical and academic skills workshops; educational courses; specialty examinations and credentialing; research collaboration hosting; and so on (52,64). Professional bodies like the ESTS also provide sponsorships for trainees to travel to learn in different centers, and serve to facilitate such training exchanges (23). The ideal is therefore to explore if these opportunities can be opened to surgeons and trainees from Asia. As said, the inherent inclusive nature of Europe may help it to better accommodate partners from Asia. For years, prominent European thoracic surgeons have travelled to China on an individual basis, helping the development of the specialty there (67). More recently, there is a growing trend for exchanges at an institutional and professional society level—as exemplified by the ESTS-Chinese Association of Thoracic Surgeons Joint Session during the 23rd European Conference on General Thoracic Surgery in June 2015 in Lisbon (68) (*Figure 3*). Perhaps in future, it is not just a matter of Chinese surgeons travelling to Europe to learn at the above platforms, but European teachers coming more and more to China (20,24,25).

Of course, the bridge does work in both directions. It is hoped that more European trainees may also have the opportunity to come to train in China. As already said, they have much to gain from the unique training opportunities in China. However, their presence in China will also help

greatly in demonstrating European perspectives on clinical and academic practice to Chinese colleagues around them. Any attachment has the opportunity of allowing a very fruitful bi-directional cultural exchange.

Conclusions

Napoleon's famous quote about China being a sleeping giant is prescient. This famous European foresaw long ago the great potential in the Middle Kingdom that waited to be realized. Over the past few decades, European industrialists, financiers, and traders can confirm that China has indeed arisen in economic terms—and many have thrived on the collaborations between East and West. Today, it is perhaps the turn of European surgeons to experience the unique opportunities that modern China brings.

The sheer scale of surgical practice in China opens up unprecedented prospects for training and research collaborations. To tap into these, however, requires facing up to the challenges that also hinder clinical and academic practices in China. Nevertheless, Europe is in an ideal position to work with thoracic surgeons in China, providing invaluable experience and guidance but potentially reaping rich rewards. The giant has awakened, but shocking the world is better achieved with good partners.

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