A Haemodialysis Journey from the West to the East

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After having been trained and having worked in the UK National Health Service (NHS) for almost 3 decades, I now have the privilege to be involved in the launch of a new renal service in the University of Hong Kong Shenzhen Hospital (HKU-SZH). The city of Shenzhen was commissioned as the very first special economic zone in China in 1979. From a small fishing and farming population of about 30,000, the population has reached 11 million permanent residents in 2014, with a further 6 million of commuting and non-resident workers. As a new, open, young, daring, high-tech and vibrating metropolis, it has attracted and kept a young and talented working force from all over the country as well as expatriates from abroad. The average age is less than 30 years, and its population is composed of professionals on the one hand and common labourers on the other. It has the 4th highest gross domestic product of China [1].

As early as 2003, the Shenzhen Municipal Government has been looking into ways to experiment with new health care approaches, with a major medical reform in mind. This has brought forth the medical joint venture between the Municipal Government and the HKU in 2009. The HKU-SZH is the first joint adventure of Shenzhen and HKU in promoting quality as well as fair and affordable medical services; it is thus a turnkey hospital for the health care reforms of public hospitals in China. To support this mission, the hospital has been endowed with a premise of

367,000 m² with 2,000 beds [2]. The dialysis unit has been in service for 2.5 years, with Ms. H.-X. Sui as sister in charge of the haemodialysis (HD) centre.

The Journey Eastward

Nephrology and dialysis have travelled a long way in the UK in the last 2 decades when I had been working there. In the early 1990s, the HD take-on rate in the UK was merely about 50 per million population (pmp) per year. Even in the mid-1990s, peritoneal dialysis (PD) was the default treatment, and twice- instead of thrice-a-week HD was necessary in some parts of the country because of lack of HD slots. But from 2005 onwards, and largely due to increased NHS investment, the UK take-on rate has increased significantly, reaching 400 pmp per year in the >70-year-olds in 2010, and patients were given free choices between HD and PD. In China, in 2013, there were 260,000 patients on HD against 40,000 on PD. The patient ratio for HD to PD is roughly 7 to 1 due to the favourable insurance reimbursement for hospital HD compared to PD [3]. To cater for the demand, many of the new hospital HD centres have over 50 HD stations [4], including ours designed for 69 HD stations. Yet, almost half of the Chinese HD patients are on twice- instead of thrice-a-week HD to reduce the high HD co-payment charges. Now, when I recollect my UK journey, it seems that I am re-living a similar time again in China, but there

is far more to it. I am fortunate in that my exposure to the two worlds has given me a lot to ponder over and a chance to try to draw their best parts together for the advancement of medical care.

Different Health Care Systems and Health Insurance Policies

The UK NHS has been set up to provide free health care from 'cradle to grave'. Most UK physicians are salaried doctors, and there is a strong trust and respect between doctors and patients. On the other hand, health care in China is not free. Most public hospitals have to meet their own costs, and staff salary is generally low. Consequently, the staff is often under pressure to see more patients to make up their income from bonuses. The lack of consulting time is directly translated to poor communication. Over-investigation and -treatment are not uncommon as a means to lift the hospital and personal income, hence leading to mistrust between patients and doctors.

The UK population is about 65 million compared with 1.3 billion in China. By 2011, 1.3 billion Chinese in China were supposed to be part of 1 of 3 insurance schemes [5, 6]. Residency and employment will determine which scheme he/she could join, and the scheme will determine how much the patient will need to pay or co-pay for the medical treatment. Dialysis dependency is regarded as a serious illness like cancer, and eligible patients and residents of Shenzhen may get up to 90% cover, but the overall insurance reimbursements are very variable. Some uraemic patients choose to shy away from the hospitals because the medical bill may bring economic ruin to an often poor household with little or no insurance.

Further, in China, teamwork and inter-professional collaboration is lacking, because many hospitals/medical units tend to keep the chronic patients under their care alone and long term as a source of income. Patients often seek out specialists on behalf of the opinions circulating among the patients or the reputation of the medical units rather than on behalf of inter-professional referral. It is not unusual for a dialysis patient to choose to have his/her arteriovenous fistula made in one centre and the parathyroidectomy in another. This sort of patient behaviour is rare in the UK. Indeed, this 'hospital shopping' could create all sorts of problems as patients move from one centre to another. Our hospital advocates teamwork and encourages a multi-disciplinary approach to provide patients with all-round and streamlined health care, saving the patients' time and sparing them frustration and pains.

The Culture Difference: Beliefs and the Use of Traditional Chinese Medicine

Even though the average age of the Shenzhen city dwellers is 30 years, the age of our dialysis patients ranges from 21 to 90 years, with a mean of 56 years. In China, many patients have little knowledge of their conditions and treatment and resist any suggestion offered. It is not uncommon for Chinese patients to present with advanced uraemia requiring urgent HD. Education is usually poorly undertaken because of a lack of time and incentive to do so. On the other hand, in the UK, much time and effort has been spent in pre-dialysis education because it is believed that early preparation leads to better outcome and saves money.

Many Chinese adult patients knew about their kidney failure but chose traditional Chinese medicine (TCM) in the hope of avoiding dialysis. In this respect, it might be helpful if we go back to the old China to understand how the beliefs and culture influence the sickness behaviour. In China, Confucius is respected as the most influential personality, teacher, ideologist and philosopher. He upheld 'zhong yong' (中庸), meaning the middle way. He emphasized respect for each other, for tradition, convention, rituals, family and state, authority and hierarchy, the status quo. On the religious side, hundreds of millions of Chinese are followers of Buddhism and Taoism. For the former, human life follows the circle of birth, aging, illness and death, leading to rebirth. The circle should be respected and followed. As for the latter, its leading concepts are 'wu wei' (無為), meaning no action or interference, and 'ziran' (自然), meaning naturalness and simplicity. One of their by-products has been that Chinese people tend to suppress their inner emotions for fear of prejudice or discrimination. With this background, the Chinese have formed and developed their own medical care, TCM. TCM encompasses a range of practices including herbal medicine, acupuncture, therapeutic massage, movement and exercise, and dietary therapy. It has been popular with the Chinese because of the low cost, the 'curative' action, and, seemingly, the mild side effects. Yet, TCM is probably the cause of acute kidney injury and advanced kidney diseases in up to 10% of cases.

In 2011, out of a total of 2.5 million doctors and assistants, there were about 300,000 TCM doctors [6]. The Chinese medical profession and the Government are working hard to integrate the western medicine into TCM. The scope and possibilities of this 'integration' is extremely important, exciting and relevant to the health care and the discipline of medicine in the future.

Postgraduate Medical Training and Clinical Practice

In the UK and Hong Kong, the training curriculum, assessment, examination and certification of basic trainees and specialists are well structured and regulated. The Royal College of Physicians, through its various committees, is responsible for the specialist curriculums, training, supervision, assessment, exams and certification. In China, there existed a wide variety of residency training programs before 1995. In 1995, the Ministry of Health established the Council for Graduate Medical Education. In 2009, Beijing, Shanghai and Guangzhou Municipal Governments introduced specialist training programs including nephrology [7]. However, there was no uniform curriculum, training, supervision, assessment methods, exams and certification for the programs. As a consequence, the doctors' competency and performances are very different.

An interesting observation might be added here. Most Chinese medical graduates preferred to go to the white 'ivory tower' for research, because academic success would speed up their career and keep them away from the hard clinical duties. In China, many doctors tend to take a narrow focus of patients' symptoms instead of looking at the patient as a whole. In Shenzhen, we are seizing the opportunity to develop a curriculum based on the Hong Kong and UK medical colleges while taking into consideration the basic requirements of China. We also refer to the UK 'Good Medical Practice' in the hope to make training well grounded, substantial and sufficient, clinically, ethically and knowledge-wise, to meet the demands and requirements of a specialist.

We also encourage our doctors to engage in dialogue with the outside world. They are given the opportunity to participate in the activities of the HKU, Queen Mary Hospital (QMH), clusters. Further, we have established web streaming with the Royal College of Physicians (Edinburgh) so that they could get more exposure to and broader views of the profession and profit from the interaction.

Nurses' Training and Practice

As late as 1999, as many as 95% of the practicing nurses in China were educated and trained in the health schools affiliated with, or rather subordinate to, hospitals; 530 schools turned out some 40,000 nurses annually. Despite a state curriculum and exams, the nurses turned out to have very variable competency, performances and ethics. The teaching, practices and ethics of their supervising hospitals must have exerted different life-long impres-

sions and influence on them. In 2011, there were 2.497 million registered nurses [8].

The first 10 of our dialysis nurses were trained in 8 different health schools/hospitals. Not surprisingly, each of them has brought with her her own experiences and beliefs, some of which are not necessarily evidence based. For instance, our nurses expressed concern about the use of permanent necklines as to temporary ones because they thought patients would complain because of the high cost. There is also a lack of experience in permanent neck-line insertion amongst nephrology doctors in general, and thus, we developed the strategy of asking our interventional radiologists for assistance. Soon, both patients and staff came to appreciate the indication and safety of permanent necklines. Many of our nurses also held onto their own individual beliefs, such as the best means of exit site care, dressing and others. It took some efforts and team discussion, as well as a visit to our sister centre, the HKU-QMH, before a care plan was agreed on, acted upon and revised with excellent results.

However, the divergence of our nurses' training also brings out invaluable experience and, occasionally, a touch of ingenuity under adverse conditions. For example, when an advanced uraemic patient arrived from outside of Shenzhen with little money or no insurance to pay for the first dialysis, the nurses would often use a technique called 'direct puncture' instead of a temporary vascular catheter to save patient costs. This took me back to the arteriovenous shunt that has been used in acute patients in the UK more than 20 years ago but has faded away. Direct puncture is used to provide a single HD treatment by inserting a dialysis needle into the radial artery, and blood is returned through a more proximal cephalic vein for the entire duration of the HD session. This technique is also performed occasionally in very ill patients where vascular catheter insertion is impossible. In exceptional cases, the ulnar artery (fig. 1) or dorsalis pedis may be punctured directly but only by the most skillful nurse.

Here is another example of how the dialysis unit staff shows its ingenuity and adaptability. Plasma exchange using a continuous renal replacement therapy circuit in China is expensive and beyond the means of many patients. In order to make plasma exchange affordable to seriously ill patients, we have successfully undertaken the therapy in several patients within the dialysis centre using the Dialog+ HD machine. To do so, a double-lumen vascular catheter connects the patient to the Dialog machine and circuit at a blood pump speed of 100 ml/min. The blood passes through a plasma filter, and the filtrate is removed at a rate of 1,000 ml/h, which matches the infusion

Fig. 1. Showing the dialysis needle being inserted into the ulnar artery.

fluid given as 4.5% albumin into a peripheral vein. The rates of the infusion fluid and filtrate are controlled by two separate infusion pumps, and close monitoring is required to ensure equal balance (fig. 2). If the rate of replacement fluid exceeds the filtration rate, the patient may develop pulmonary oedema. If the opposite happens, hypotension may occur. This shows how the staff works their best within restriction and limitation.

Renal Causes and Long-Term Complications

In the UK, chronic glomerulonephritis is the cause of end-stage kidney disease (ESKD) in about 20% of the cases, whereas it causes 50% of ESKD in China. In the UK, only about 20% of IgA nephropathy progresses to ESKD, but IgA nephropathy is not a benign disease in China in that one third of patients have been reported to progress to ESKD [9]. The mean age of our chronic HD patients is 56 years (range 21–90). Many of the young dialysis patients presented for the first time with advanced kidney disease and hypertension with no past medical history, others had established proteinuria but had not been followed up.

Severe hyperparathyroidism is decreasing in the UK as non-calcium- and non-aluminium-based phosphate binders have become available for more than a decade, and Cinacalcet, a calcimimetic agent, since 2007. On the other hand, uncontrolled hyperparathyroidism remains very common in dialysis patients in China as a result of poor diet adherence, lack of dietetic input, lack of phosphate binder choice and expense, coupled by inadequate dialysis. In Chi-

nese patients, vascular and valvular calcifications are common findings as part of the cardiology workup. On the other hand, anaemia therapy, namely erythropoietin in its generic form, and intravenous iron are widely used because their costs are covered by dialysis insurance. Dietetic input is inconsistent in most Chinese dialysis units. Hypertension is common, and high salt intake is partly to blame.

In our Shenzhen centre, we give nurses time to talk to patients about their diet, medication and treatment. We have produced and printed a series of leaflets and booklets to educate our patients, including topics on chronic kidney disease and dialysis, and our hospital pharmacist has produced an information leaflet on commonly used renal drugs such as phosphate binders and vitamin D. The non-calcium-containing phosphate binders and calcimimetic drug have recently gained their license in China; thus, there are some additional tools to control mineral bone disorder but, unlike in the UK where these drugs are free, they are not covered by dialysis insurance in China. In our centre, we are providing patients with free dietetic review as required on a monthly basis. We also formed an HD and a PD patient group including renal doctors and nurses. The HD group meets up for social activities every 6 months, whereas the PD group has an active WeChat circle where information may be exchanged.

In our cohort of 108 patients, the majority are dialyzing 3 times a week, 4 h each time, but overall in China, about half of the patients are receiving HD only twice a week. Only 10% of our patients have pre-dialysis blood pressure in excess of 160/90 mm Hg. After 2 years of time and effort in educating patients, most but not all of our chronic patients have agreed to have their haemoglobin (Hb), mineral bone profile and pre- and post-dialysis blood urea nitrogen tested due to the added cost.

In our group of patients, dialysis adequacy, Hb and other dialysis parameters are being audited continuously. 90% of our patients achieved a Hb >10 g/dl. Half of our patients achieved a serum phosphate level and parathyroid hormone level within the KDOQI recommendation. Most patients have become interested in and are even controlling their own dialysis parameters. Something that is regarded as simple and is a matter of course in the West has taken so long to be realized in China.

Dialysis Vascular Access

In the UK, great effort has been put into getting patients ready for dialysis. Even though PD is about a third cheaper in the UK compared with HD, most patients can

Fig. 2. a Drawing of the plasma exchange circuit. **b** Infusion pumps.

choose freely between home-based therapy and centre-based treatment unless there is a clinical contraindication to one or the other. Further, as the highest take-on rate of dialysis patients includes the 75- to 85-year age group, many of them with extensive co-morbidities, there has been a growing interest in providing conservative therapy or maximum medical supportive treatment to this group of patients.

In our Shenzhen centre, we have developed a vascular access pathway with close collaborations with our interventional radiologists and vascular surgeon. More than 50 cuffed vascular catheters have been inserted in our digital subtraction angiography suite with no major complications. The average waiting list for an arteriovenous fistula is <3 weeks. About 90% of our prevalent patients have a functioning arteriovenous fistula which is similar to the rates in the UK.

In the UK, there is a genuine concern about catheter-related bacteraemia in HD patients. Different protocols have been employed varying from antibiotic to citrate to taurolidine lock [10]. In our centre, by following a strict guideline and by using 2% chlorhexidine to care for the exit site, we have not encountered any catheter-related bacteraemia after more than 6,000 catheter days. The results are comparable with the best in the West.

The Medical Quality Safeguard

The Chinese standard operational procedure [11] is similar to that of the KDOQI guideline, but not much pressure is put on its reinforcement or precise sanctions for its violations. Biochemical surveillance is often ignored and intra-comparative audit is not a standard requirement. It was said in China that 'laws and regulations could not work on and by themselves'. Apparatus and people are needed to enforce them. The development of a national registry is just underway, and renal IT is new in China. Clinical audit, risk management, incident reporting and continuous quality improvement programs are all new concepts in China health care. Our hospital has put quality and safety as a top priority. To affirm this, our hospital is the first in China to take part in the Australian Council on Healthcare Standards (ACHS) accreditation exercise. Staffs are given quality and safety training through workshop discussions, team meetings and feedback sessions both at hospital and department level. Further, the renal doctors and nurses are encouraged to follow the KDOQI guideline, and internal audits are mandatory as a quality indicator.

Challenges, Aspirations, Contributions and Possibilities

After 2.5 years in the job, I have learned that we just cannot simply transplant the western medicine to the East and apply it here. For a millennium of years, China had its own ideologies, religions, beliefs, cultures, wisdom and ways of life. The Chinese tend to shy away from seeking medical care and from bad news, partly because of their cultural belief that illness is 'natural' and should be endured, and partly because medical bills may bring economic ruin to a usually poor household. This explains why the Chinese delay to see doctors until it is too late, or avoid them completely. In this regard, we have held and promoted the 'World Kidney Day' each year, and we are

developing the role of specialist nurses educating patients that to be sick is 'natural' but it may be prevented and treated. Our hospital also makes an effort to improve staff communication skills by providing necessary training. Restoring the trust and respect between doctors and their patients is vital, and we set out to do so by providing our doctors and nurses with fair wages, so there is no pressure to make 'extra' income. When other renal centres shy away from providing PD therapy because of the poor reimbursement rate, we have decided to take it on and to give patients free choice between HD and PD. Also, the promotion of a team approach and inter-professional collaboration has brought better results and satisfaction. All in all, through our work and conduct, we are building a bond of trust and respect between the patients and our health personnel. This bond between the free NHS and the public has existed in the UK for some decades, to the envy of its world counterparts. However, the same might not be easily achieved elsewhere.

In China, in 2010, life expectancy stood at 75 years. In 2010, the total health expenditure was RMB 199.8 billion (USD 29.51 billion), representing 5.1% of the GDP [5]. There are now increasing health co-operation programs between China and Central and South East Asia. Our experience in China will be relevant and useful in the sense that China and these regions have so much in common and share many bonds. It is hoped that our hospital because of its unique nature, mandate, positioning and timing could play a role in bridging the East and the West and contributing towards the health care reform of China. Progress has been made. Let's hope the health care reform of which we are a part will become a forerunner for the rest of China.

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Conflict of Interest Statement

The author has no conflicts of interest to disclose.

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